THE BALANCE OF POWER IN OUTER SPACE

by

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Whereas control and free use of the seas have long been key factors in projecting power, the advances in air power during and after World War II have made control of airspace a critical factor in military operations. According to current international conventions, the "atmospheric space" in which aircraft operate is subject to sovereignty of the underlying states, while being free for the use of all over the high seas. The exact altitude at which outer space begins has never been precisely defined, but this entire region is generally regarded as *res communis omnium*, or "things common to all," and therefore incapable of appropriation. It is in this "no man's land" of extraterrestrial space that only the superpowers of today's world—the United States and the Soviet Union—can compete. The total region of space is immensely vast compared to earth and its atmosphere and can be divided into a number of subregions with differing physical characteristics. However, this paper primarily addresses the operational region of today's artificial satellites, namely from about 90 miles up to 22,300 miles (geostationary orbit altitude), with only limited excursion into the military potential of deeper space.

THE MILITARY IMPORTANCE OF SPACE

The importance of controlling space, or at least precluding control by a hostile power, could be just as critical in the future as control of the seas or airspace. As a minimum, free access to and free use of space for US defense purposes are of strategic significance right now. The United Nations-approved Outer Space Treaty, signed by the United States, the USSR, and others in 1967, forbids: placing nuclear weapons or other weapons of mass destruction in space either in orbit or on celestial bodies; conducting weapons tests or establishing military bases on the moon or other celestial bodies; or claiming of sovereignty by any nation over any extraterrestrial area.[1] The treaty does not prohibit the use of space for many purposes having military significance, and since Sputnik ushered in the Space Age in 1957, the United States has developed a number of sophisticated systems which routinely provide information and services of military value. The varied functions of communications, meteorological survey, navigation, and mapping are all performed to some degree by means of artificial earth satellites. The Soviet Union has developed similar capabilities suited to its particular needs. In fact, it can be reasonably argued that the similar space capabilities of the two superpowers have contributed significantly to reducing the probability of general war, since each nation is acting with more reliable information about the other.

While the space treaty is very important and serves to abate a frantic arms race for control of space, it must be realistically recognized that a determined aggressor nation may violate any treaty. Certainly for the superpowers, a treaty can be only a piece of paper combined with a moral commitment to honor its content, because no other nation or organization could enforce the treaty's provisions. Consider the 1925 Geneva Protocol on chemical and biological warfare. No one denies the moral suasion this international agreement provided against the use of chemical and biological weapons. For example, in World War II the United States and Japan did not use such weapons, even

though they were not signatories to the protocol. Yet it still behooves any nation to be prepared at least to the extent of having an adequate defensive capability lest some adversary violate the protocol. Similarly, it seems logical that the United States must continue to assess all Soviet space activities, develop the means to avoid an imbalance in military capabilities which could lead to coercion, and defend freedom of access to and use of this nonsovereign region.

REAL-TIME OPERATIONS USING SPACE

The space systems mentioned previously are all strategic in nature and benefit all the military services. For example, they definitely influence national decisions on force structure, materiel development, and operational planning. The ability to derive valuable terrain information on extensive geographic areas has been enhanced considerably through data obtained from space sensors such as those aboard the Earth Resources Technology Satellite (ERTS). However, such benefits are long-term and do not represent the kind of real-time capabilities which immediately impact on the nation's security or its ability to project and sustain military forces overseas.

Defense of the United States and its worldwide interests relies heavily on the ability to project power overseas. This includes all forms of power: economic, technological, and psychological, as well as naval, air, and land power. Coupled with the projection capability in the nuclear age is the clear trend toward increased centralization of command and control at the highest level, the National Command Authority (NCA). Thus, communications, command, and control capabilities—the so-called C^3—assume paramount importance in orchestrating US military actions around the globe. Satellite communications bring the distant trouble spot into nearly instantaneous contact with the NCA and the Pentagon.

Strategic communications serve another purpose in the area of logistics. Heavy reliance on computers and data processing systems has made high digital transmission capacity an absolute necessity. While the peacetime flow of data is enormous, in a crisis or conflict situation the requirements would increase manyfold, and the need to get the right item to the right place in the shortest possible time would become even more important.

In addition to using satellites to provide secure strategic communications, the Army is also using satellites to solve a long-standing communications problem of a tactical nature. Today, a tactical satellite communications system permits rapid establishment of a net in a remote locale, independent of existing facilities, regardless of difficulties caused by terrain, and with a modest amount of equipment. This capability is particularly significant in permitting the armed forces to respond rapidly wherever the need arises and to be more effective as a fighting force upon arrival.

The future navigational satellite system—the NAVSTAR Global Positioning System—will likewise be relied on heavily, especially in areas where local navigational aids are inadequate for the degree of control required for military operations. This system will eventually provide a positioning capability of unprecedented accuracy in both horizontal and vertical axes for military aircraft, ships, and land vehicles.[2] Depending on the size and cost of ground terminal equipment, such a system meeting the needs

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of all three military services would undoubtedly replace a number of current techniques, many of which duplicate and overlap one another, and each of which has its own shortcomings, vulnerabilities, and restrictions.[3] In the course of time, practically all military positioning requirements could come to depend on this system.

The contribution of early warning sentries in space to the nation's security is invaluable when compared to the northernmost American radars in Alaska and Greenland. Assuming that the Soviets also have an effective system for detecting a surprise ICBM attack, these space sensors are a powerful deterrent against preemptive attacks by either country.

VULNERABILITY AND SURVIVABILITY OF SPACE SYSTEMS

Any space system is comprised of complex, precision equipment designed to provide high operational reliability under normal conditions. However, if the operating environment becomes hostile, today's satellites are relatively soft and can be disabled by an enemy who is prepared to expend the effort and funds required to do so. They are, therefore, individually vulnerable to enemy action, and various techniques must be considered to make an overall system survivable against attack.[4] The inherent survivability of the space system depends on the type of orbit used, the type of satellite, and the number of satellites required for a particular function.

With respect to communications satellites, for example, survivability options include a few very high geostationary satellites, many satellites at lower altitudes, satellites in elliptical polar orbits, or some combination thereof.[5] Using the traditional concept of air defense interception, the cost of antisatellite attack on an entire system could be enormous, basically requiring a complete missile launch for each satellite to be knocked down. This gives one cause to ponder the potential utility of antisatellite attack for the USSR, or to search for alternative weapons concepts.

Analysis of the Soviet Union's space program achievements provides sufficient evidence of their capability to carry out an antisatellite interception mission. Their extensive use of satellites indicates an adequate tracking and orbit prediction capability. With the use of a larger (and much more expensive) launch vehicle, there is no apparent reason why intercepts could not be accomplished up to geosynchronous orbits. Therefore, the United States must assume that a Soviet threat of space system denial does exist. Accordingly, US space system planning must consider loss replacement measures and, where possible, alternative means of carrying out functions performed from space.

Given the feasibility of antisatellite operations, what countermeasures can reasonably be taken by the United States? The recent comprehensive Library of Congress report for the Senate Committee on Aeronautical and Space Sciences addresses this specific problem:

> Any space power must worry about the possibility that another space power may decide to escalate rivalries to the point of interference with satellites in orbit, whether it is to blind the eyes of some, to deafen the ears, or disrupt communications, or take away some abilities to navigate. This means that such nations must consider a range of both passive and active countermeasures available on a contingency basis. . . . Passive measures may include steps to make radar and visual detection more difficult, or possibly to have so many decoys that the expense of interception would be very heavy for the returns; also, there might be increasing use of signals buried in "noise" so they were harder to intercept, and more of them might be highly directional, further adding to the difficulty of finding them. For the longer run, some types of payloads may be placed at greater distances from Earth.[6]

Some have suggested the use of a warning device aboard US satellites to indicate when

any inspection or interference occurs.[7] This could even be accompanied by a capability to maneuver when threatened. However, this action would only be of local significance, i.e., during a one-on-one engagement. Such an approach to satellite physical survivability could include communications systems, as well as the future NAVSTAR Global Positioning System.

DIRECTED-ENERGY WEAPONS

For years before the discovery and development of the laser, science fiction literature had described the ultimate in warfare. Men would employ rocket ships to maneuver in space while guided missiles and death rays would be used to destroy enemy spacecraft. In the short period of 16 years since the laser principle was first demonstrated, advances in high energy laser technology have brought the space warfare concept of the science fiction writer into the foreseeable future.[8]

There are numerous technical difficulties, to be sure—such as power requirements, optics, target acquisition, pointing, and tracking—but these have all been addressed to some degree in other space applications. The methodology used in assessing the vulnerability of individual satellites to laser attack is highly technical. Basically, vulnerability depends on satellite characteristics such as materials used, electronics, optics, operating temperature, power sources, and antenna systems. Today US and Soviet research is proceeding on laser techniques for numerous military applications.

Projecting the laser concept into the future, a maneuverable satellite carrying a laser weapon would present a more formidable threat than either the very costly spacecraft interceptor or the ground-based laser weapon. However, far more significant than its offensive potential against satellites is its disarming defensive potential. As described in *The Superwarriors*:

> Combining low and high power may be the key to the laser as the kingpin defensive weapon of the future. United with radars, lasers instantly would get the drop on any target that the radars spot. . . . Their lasers would 'shoot' at 186,000 miles per second. This would mean instantaneous detection and destruction of bombers or missiles. . . . So quick is the laser that only one, tracking and beaming on radar, could pick off descending multiple warheads in miniseconds. The lasers' swiftness would permit defenders to detonate missiles far down-range from the missiles' targets. In tests, high-energy lasers have burned through the nose cones of missiles built to withstand the scorching, searing heat of reentry from space.[9]

As early as 1962, the perceptive Air Force Chief of Staff, General Curtis LeMay, spoke about the potential of space weapons systems and their influence on warfare as we know it today. General LeMay stated:

> Space capabilities may bring about the technological disarmament of nuclear weapons. As one example, beam-directed energy weapons may be used in space. And the energy directed by these weapons could travel across space essentially with the speed of light. This would be an invaluable characteristic for the interception of ICBM warheads and their decoys. We've looked into the phenomena associated with this kind of weapon. We have evidence from scientific papers they have published that the Soviets are also interested. And Khrushchev himself has boasted publicly about 'fantastic weapons.' Suppose the Soviets were first to develop advanced weapons of this sort and to employ them aboard maneuvering spacecraft? If they could neutralize our ICBMs with such a system, they could change the balance of decisive power in their favor. If they could neutralize satellites and spacecraft with such a weapon, they could prevent us from developing an equal defense against their ICBMs. And they could even prevent us from going into space for peaceful purposes.[10]

A recent, apparently well-documented magazine article alleges that the Soviet Union is far along the way to developing a charged-particle beam device designed to intercept and destroy US intercontinental and submarine-launched ballistic missile nuclear warheads.[11] The implications of such a capability, coupled with high-energy laser developments, are ominous indeed, and there can be only one conclusion: the United States cannot risk being second behind the Soviet Union.

CONDITIONS OF SPACE ATTACK

Having compared the international nature of space to that of the oceans, one may also compare the satellite to a naval vessel or aircraft flying the US flag. An attack on any one of these would constitute an act of belligerency which could logically evoke some response from the US Government. Action could range from diplomatic protest to military show of force and even to reprisal.

It could be argued that there is a fine line of difference with respect to the unmanned satellite. However, whether a military or commercial satellite would be involved, its country of origin would be well-known and any action to damage or destroy it, or to thwart its purpose, should be considered hostile, or as a minimum, a flagrant violation of international law. Resort to normal military means of protesting the action would be an alternative, but the chance of human casualties would be increased, and the credibility of US space defense would not be established.

Under what conditions would the Soviet Union launch an attack against American satellites? In keeping with the concept of flexible response, both limited objective use and general attack scenarios could be envisioned. With the one-for-one direct intercept technique, the general attack on US spacecraft as a precursor to a nuclear strike is not likely due to the barrage of rockets it would require and the strain it would place on tracking networks. Even if possible, such an aggressive move might provoke an immediate nuclear strike in reply. A general attack would become more feasible if the Soviets placed several maneuvering spacecraft with laser weapons in orbit, perhaps in combination with powerful ground-based lasers. With appropriate timing, the US early warning sentries, as well as key communications and navigational spacecraft, could be blinded or rendered inoperative in a brief period. This devastating space attack followed by nuclear strike would not leave the United States completely helpless, but the limited warning information and diminished space functions would inhibit its second strike capability.

The limited attack scenario is perhaps more feasible in a crisis situation involving the superpowers. For example, if US forces were dependent on a satellite for communications in a remote region operation, an attack against that particular satellite might also be used as a signal and denial measure. In such a case the US satellite would be unmanned and therefore a tempting target.

SPACE DEFENSE CONSIDERATIONS

While the need for a space defense capability has been established on the basis of protecting our operational space systems, there is yet another Soviet initiative to be considered: the placement of nuclear weapons in orbit. If this offensive capability were achieved in violation of the 1967 Outer Space Treaty, it would constitute a grave threat to the United States.

Assuming that the Soviets could control and target multiple nuclear weapons from orbiting space platforms, the principal advantage gained would be an increased capability for surprise attack. As with ICBMs, loaded weapons would be pointed at the United States, but their times of flight from firing to target detonation would be drastically reduced. A decreased warning time of this magnitude would not only present a defense problem, but could also have a psychological impact on the American people. With a condition of rough equivalence in current strategic missile systems, the employment of weapons in space by the Soviets could tip the strategic power balance, especially if the United States did not have a

countercapability. All other things being equal, the United States would, in effect, be hostage to the USSR.

It is unlikely that the Soviet Union would employ such an orbital weapon system unless the stakes were very high. In this event, the US response might well be an ultimatum to remove the weapons from orbit or accept attack.

That the Soviets did develop a fractional orbital bombardment system (FOBS) in the late 1960's is known.[12] However, FOBS has not been flown since 1971, presumably in deference to the treaty barring weapons of mass destruction in space. The principal advantage of the Soviet FOBS was its approach to the United States from the south where the main defensive radars would never pick it up. From its low semi-orbit, it could be called down to impact in about six minutes. While it lacks the accuracy to attack hardened targets, the FOBS retains utility in the Soviet arsenal as a coercive weapon effective enough to threaten Strategic Air Command bases and other soft targets. Perhaps more important, by virtue of their early decision to develop an offensive space weapon system, the Soviets have gained valuable experience which can be extended to more advanced offensive systems as their space technology improves through other space programs.

FUTURE BASES IN SPACE?

The future space activities of the United States, both military and civilian, are very closely tied to success of the space shuttle. It is by means of this reusable half-rocket, half-airplane vehicle that the cost of placing satellites in orbit will be greatly decreased and new opportunities for maintenance and retrieval of malfunctioning satellites will eventually be possible.[13] Also, large space stations could be assembled in orbit from sections ferried from earth on repeated shuttle trips. The potential applications are many and varied, and the popular appeal of the space shuttle is great. However, while the United States is systematically developing the means to further the use of space, it is not alone in this pursuit.

The Soviet Union has foreseen the same space shuttle requirement and is actively pursuing development of its *rocketoplan*. Some estimate that the Soviets are fully three years ahead of the United States in this endeavor and even further ahead in developing the complementary orbit-to-orbit shuttle system required to transport payloads to higher orbits than the primary shuttle can reach (100 to 600 miles).[14] Assessing US space programs in comparison to the Soviets, Peter James, former intelligence analyst on space systems, sounded a dire warning to the American public in 1974 when he concluded in his book, *Soviet Conquest from Space*:

> It is the Soviet objective to develop an orbiting defense network that can neutralize US spacecraft and space stations, ICBMs and ABMs. [If the current space program trends continue], it must be concluded without reservation that the Soviets will achieve clear-cut military, strategic, and space superiority over the United States.[15]

In contrast to the coordination problems between NASA and the Air Force over the sophisticated US "Space Tug" program, the Soviet program is clearly managed by the military, and the orbit-to-orbit shuttle is designed for economy and large payloads. Additionally, while the Soviets have aggressively pursued a near-earth manned space program, US efforts have declined markedly. Extensive experiments have been conducted with the versatile *Soyuz* spacecraft system, which is both a maneuverable spaceship and a "mini" orbital space station, and with the *Salyut* space station.[16]

The concept of the space station bears further examination. Viewed solely as a scientific platform or as a manned facility for observation and spacecraft maintenance, its cost effectiveness might be questionable. As permanent command and control centers for multiple systems, however, including potential weapons systems and continuous surveillance systems, space stations could achieve their ultimate utility.[17] Soviet space stations could play the same role in space that American aircraft carriers currently play on

earth—a constant show of strength and presence for all the world to behold. Soviet orbit-to-orbit shuttles could then be likened to fighter aircraft ready to engage in space battle and return to their space base. They could provide the performance needed for inspection of hostile satellites, and, perhaps equipped with a small laser weapon, could destroy them at short range. They could also serve to transport nuclear weapons covertly to the space stations in preparation for a superpower confrontation, the space station being a platform equipped for their launch against earth targets. Thus, the opportunity for war *in* space and *from* space may be fast approaching for mankind.

THE MILITARY BALANCE

During the past year, US Government leaders and the American public have become increasingly aware of Soviet activities in space which threaten "peaceful coexistence" in that medium. Likewise, the steadily growing US military dependence on sophisticated space systems to support peacetime and wartime operations has become more apparent. One might ask what prompted President Carter on March 9, 1977 to reveal that he has already suggested to the Soviet Union "that we forego the opportunity to arm satellite bodies and also to forego the opportunity to destroy observation satellites."[18] In so doing, Carter became the first President even to mention the possibility of fighting with space satellites. Is the US position one of strength or weakness? Does this announcement recognize a Soviet lead in space weaponry? If so, what chance does the United States have in negotiating a satisfactory treaty? Or does the United States have some super weapon as a counter to the Soviet challenge? The answers to these key questions will probably not be clear in the near future.

We have reviewed the military utility of space today, the technological potential for advanced space systems—both offensive and defensive applications, and the apparent drive of the Soviet Union to achieve space supremacy relative to the United States. Having established the impacts which space systems have made—or can make—on a nation's capability both to deter and to prosecute warfare on this earth, there is still a question in assessing the weight of space power in the overall military balance: Can it be decisive in a terrestrial conflict between the superpowers? Dr. Malcolm Currie, former Director of Defense Research and Engineering, recently testified as follows:

> The Soviets are investing increasing resources in space technology for military purposes. Their level of activity reached an all-time high in 1975, and the systems they put into orbit are significantly more sophisticated than those deployed in the past. The trend signified by these activities indicates that their space systems will soon contribute substantially to the effectiveness of their command and control systems, and directly to the performance of their strategic and general purpose forces. Soviet space technology must be taken into account in the strategic equation, in calculating the balance of forces for conventional war.[19]

In the final analysis, the answer to the decisiveness of space power must be expressed in relative terms. If both sides have significant support from space at more or less equal levels, then the decisive factors will lie elsewhere—so long as the capabilities to negate this support remain in balance. If, however, one side achieves exclusive use of space or even a preponderant amount of space support, the probability of a decisive effect from space appears to be very high.

An arms race in space, with its cost impact on the annual defense budget, would certainly not be welcomed by the United States. Unfortunately, the Soviets are pursuing their goals in space along more militaristic lines than the United States. They have seized the initiative and have raised the specter of space as a "fourth dimension" of warfare. They are continuing to exploit technology and to increase their commitment in space to the point where US space systems are threatened and where space could by

default become a Soviet sanctuary for military operations. Restraint on both sides is indeed desirable, as President Carter has suggested, but the United States cannot allow the Soviet Union to develop an asymmetry in space capability.

It is clearly in the US national interest to insure free access to and use of space both for military support purposes and for continuing civilian pursuits affecting the daily lives of American citizens. In order to avoid Soviet coercion, the United States must take measures to improve the survivability of its space systems in a hostile space environment. As a minimum, these measures should include added protection for individual satellites.

A robust, forward-looking national space program is definitely not a frill, but could well be critical to the survival of the United States as an independent society. In the longer term, regular manned operations at orbital altitudes could radically change the practical utilization of space for all mankind. Used for aggressive purposes, however, manned spacecraft equipped with exotic weapons also offer the possibility of imposing absolute control over all space activity. Therefore, a significant unilateral space capability achieved by either the United States or the Soviet Union could decisively shift the global balance of power.

NOTES

1. US Department of State, *United States Treaties and Other International Agreements*, Vol. XVIII, pt. 3, pp. 2413-14.

2. Robert Hotz, "The Military Role in Space," *Aviation Week and Space Technology*, 7 October 1974, p. 7.

3. Barry Miller, "Defense Navstar Program Progressing," *Aviation Week and Space Technology*, 12 January 1976, pp. 45-50.

4. *Survivability.* The capability of a system to withstand a man-made hostile environment without suffering abortive impairment of its ability to accomplish its designated mission.

Vulnerability. The characteristic of a system which causes it to suffer a finite degradation in the capability to perform its designated mission as a result of having been subjected to a certain level of effects in a hostile environment.

5. Edward M. Sinclair, "Use of Communications Satellites to Improve SAC Command and Control in the 1980's" (Air University Research Study, May 1974), p. 47.

6. US Congress, Senate, Staff Report to the Committee on Aeronautical and Space Sciences, *Soviet Space Programs, 1971-75*, 94th Cong., 1976, p. 491.

7. Thomas O'Toole, "US Draws Up Plans For War in Space," *The Washington Post*, 10 January 1977, p. 1.

8. Drew Middleton, "Powerful Lasers Reported Bound for American and Soviet Arsenals," *The New York Times*, 16 February 1977, p. A2.

9. James W. Canan, *The Superwarriors* (New York: Weybright and Talley, 1975), p. 274.

10. Erik Bergaust, *The Next Fifty Years in Space* (New York: Macmillan Company, 1964), p. 117.

11. Clarence A. Robinson, Jr., "Soviets Push for Beam Weapon," *Aviation Week and Space Technology*, 2 May 1977, pp. 16-17.

12. Edgar Ulsamer, "Will the Soviets Wage War in Space?" *Air Force Magazine* (December 1976), 30.

13. "Bigger Role for Military in Space," *US News and World Report*, 26 April 1976, pp. 86-87; "An 8-Billion Dollar Space Shuttle: Its Impact," *US News and World Report*, 27 September 1976, pp. 69-70.

14. Peter N. James, *Soviet Conquest From Space* (New Rochelle: Arlington House, 1974), p. 150.

15. *Ibid.*, p. 30.

16. *Ibid.*, pp. 155-56.

17. *Ibid.*, pp. 164-65.

18. George C. Wilson, "Carter Concerned on Outer-Space War," *The Washington Post*, 10 March 1977, p. A11.

19. Ulsamer, p. 31.