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## Paper Session II-C - Assured Access To and Use of Space: A Military Perspective

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ASSURED ACCESS TO AND USE OF SPACE:

A MILITARY PERSPECTIVE

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TABLE OF CONTENTS

SECTION

I INTRODUCTION

II ACCESS TO AND USE OF SPACE

SPACE SYSTEMS

SPACE OPERATIONS

SPACE MISSIONS

III THE THREAT

WHAT U.S. SPACE SYSTEMS WILL  
BE ATTACKED?

HOW WILL U.S. SPACE SYSTEMS BE  
ATTACKED?

IV ASSURING ACCESS TO AND USE OF SPACE

SYSTEMIC SURVIVABILITY

PROTECTION

STRONG AND FLEXIBLE RESERVE

V CONCLUSION

NOTES

ILLUSTRATION

FIGURE

1 RELATIVE ADVANTAGES

## SECTION I

### INTRODUCTION

On 23 September 1985, the Joint Chiefs of Staff (JCS) formed the Unified Space Command (USSPACECOM) with headquarters in Colorado Springs, Colorado. The components of the new command are the Air Force Space Command, the Naval Space Command, and the Army Element. General Robert T. Herres was named Commander-in-Chief of the Aerospace Defense Command (ADCOM) which began deactivation after formation of USSPACECOM.<sup>1</sup>

The missions of ADCOM were divided between USSPACECOM and the North American Aerospace Defense Command (NORAD). Those ADCOM missions reassigned to USSPACECOM are Attack Warning/Attack Assessment and Space Defense, renamed Space Control. Space Support, a previously unassigned space operation, was also assigned to CINC USSPACECOM or CINCSPACE.

Formation of USSPACECOM is an acknowledgement of the extent to which the National Command Authorities (NCA) and worldwide air, land, sea, and other space operational forces depend on the missions which space systems perform. CINCSPACE is responsible through the JCS to the NCA for conducting effective military space operations and integrating them into the military operations of the traditional forces. Space operations, therefore, will become more responsive to NCA direction and to the operational needs of the unified and specified CINCS.<sup>2</sup>

The JCS tasked CINCSPACE TO "maintain assured access to and use of space for the U.S. and her allies at all times."<sup>3</sup> The purpose of this paper is to examine that task. What are the basic elements of space operations? How important are they? Is there a threat? If so, are U.S. space systems and operations strong enough to survive in the face of a determined effort to defeat them?

## SECTION II

### ACCESS TO AND USE OF SPACE

The idea of access to and use of space involves terms and concepts which require discussion. Chief among these are space systems, space operations, and space missions. Space systems and space operations are the tools and activities required to perform space missions. Space missions are the services or functions which space systems provide to national and military users worldwide. In other words, space missions are the "...users..." of space, while space systems and operations represent "...access..." to it.

### SPACE SYSTEMS

Any system which includes, supports, or is directed at an

earth orbiting satellite is a space system. Satellites, spacetrack sensors, the Space Shuttle, expendable boosters, upper stages, anti-satellite weapons, and a myriad of facilities and air, land, and sea equipment are all space systems. The primary space systems exist because there are satellites. It is the earth orbiting satellite which actually exploits the uses of near-earth space in support of terrestrial forces.

Basically, satellites are composed of a platform and a payload. The platform contains all support subsystems required to serve the payload. These subsystems include the structure, automatic data processing, communications, electrical power, telemetry, orbit control, and attitude control. In addition, manned satellites contain life support and man-interface subsystems.

Military satellite payloads fall into one of four categories: sensor, communications relay, positional reference, and, in the future, weapons. A satellite's payload determines its mission. Some satellites have more than one payload. Some of these have more than one mission.

Whether it be one or many, the entire number of a particular kind of satellite performing a specific function or mission is referred to as a satellite constellation. Some satellite systems or the missions they serve are actually systems or constellations. Frequently, for example, an information collection constellation will relay information through a communications relay constellation.

Constellations are supported by launch and deploy facilities and vehicles, satellite control facilities, payload control or processing facilities, and recovery systems. These are referred to in this paper as earth support systems.

Space launch systems are the space launch vehicles and the facilities from which they are launched. Launch vehicles are more or less complex depending upon whether they are manned or unmanned, reusable or expendable, and upon how heavy a load they must carry how high.

The major launch facilities are located at Kennedy Space Center, Florida and Vandenberg Air Force Base, California. There is also a small facility at Wallop's Island, Virginia. Kennedy and Vandenberg have 14 launch complexes between them.<sup>4</sup> Launch complexes include not only the gantries from which the launches occur, but also associated tracking, control and support facilities. Launch facilities represent ports of access to space.

U.S. space systems represent some of this country's most advanced technologies. They are unsurpassed in capability, sophistication, and longevity, however, Col Robert Griffin, author of U.S. SPACE SYSTEM SURVIVABILITY, states that U.S. space

systems "... are frequently capable of 'gee whiz' performance, but are often complex and expensive."<sup>5</sup> Capability, sophistication, and longevity are expensive and require small constellations with low replenishment production rates for satellites, boosters, and upper stages. While this may appeal to a cost accountant in peacetime, it has alarming implications to military operators and users confronted by satellite attrition in crisis or conflict.

#### SPACE OPERATIONS

Space operations are categorized as either space support operations or space control operations.

Space support operations are those activities required to tend or support satellite systems and include launch, satellite control, and recovery. The purpose of space launch operations is to place satellites into orbit. DOD space launch operations are complex. DOD Space Shuttle launch operations are conducted in cooperation with the National Aeronautics and Space Administration (NASA). The Air Force is the executive agent for DOD space launches, shuttle or otherwise.<sup>6</sup> Air Force Systems Command executes Air Force launch responsibilities through its Space Division. Space Division, which is operationally responsive to USSPACECOM, conducts space launch activities primarily with an extensive network of commercial contractors.

The purpose of satellite control is to assure that satellite payloads are functioning properly and are programmed as required. Some satellite systems have dedicated control activities for these purposes. Others are controlled by the common user network called the Air Force Satellite Control Network (AFSCN). The Air Force Satellite Control Facility (AFSCF) at Onizuka Air Force Base, California plus seven Remote Tracking Stations (RTS) around the world make up the common user network. Additionally, the Consolidated Space Operations Center (CSOC) at Falcon Air Force Base near Colorado Springs, Colorado is taking on many responsibilities now carried by AFSCF and will provide redundancy.<sup>7</sup> Further, another RTS will be located on the CSOC complex. Whether dedicated or common user, satellite control operations depend on many nodes or "choke points" of activity. Destruction of these nodes is system fatal.

Space recovery operations have yet to be fully defined, but will include the recovery of orbiting objects for operational or logistical reasons and the recovery and turnaround of reusable vehicles such as the space shuttle.

Space control operations include spacetrack, protection, and negation.

The purpose of spacetrack is to detect, track, and catalogue all man made objects in earth orbit. USSPACECOM radar and optical Sensors around the world relay more than 45,000 daily

observations on approximately 7000 orbiting objects to the Space Surveillance Center (SSC) in Cheyenne Mountain, Colorado.<sup>8</sup> Based on this data, the SSC computes past, present, and future location of on-orbit satellites for various purposes and users. Spacetrack data and computations are fundamental for space operations.

CINCSPACE conducts space protection operations through the Space Defense Operations Center (SPADOC) also in Cheyenne Mountain. Space protection includes assessing all-source data to determine if hostilities in space are imminent or taking place, advising/ warning satellite owners/operators of such assessments, and, in the future, countering and defeating attacks against U.S. space systems.

CINCSPACE will also conduct space negation operations through the SPADOC when and if weapons are developed for that purpose. Negation operations do not fit into this discussion of access to and use of space. They are mentioned here only to complete the list of space control operations.

#### SPACE MISSIONS

Space missions are the services that spacecraft provide for DOD forces. They may be categorized as either force enhancement or force applications.<sup>9</sup> Force enhancement missions are combat support in nature and include communications, surveillance, reconnaissance, navigation, meteorology, and geodesy.<sup>10</sup> Force application are direct combat operations which might employ earth-to-space, space-to-space, or space-to-earth weapons.

Space based sensors are the only systems capable of providing continuous, complete surveillance of the oceans and the Asian land mass to warn of sea and land launched ballistic missiles. This warning is a critical element in guaranteeing that U.S. strategic retaliatory forces will not be caught and destroyed by surprise.

Reconnaissance and intelligence have always been critical elements of military operations. The more reliable and timely the intelligence, the more valuable it is. Satellites in earth orbit are uniquely situated to gain routine and detailed observations of enemy positions at full depth.

Communications may be the most important activity conducted in crisis and conflict. Emergency action messages, command and control, intelligence, and logistics traffic must continue unimpeded and secure from interception to assure that forces are deployed, employed, informed, and supported when and where needed. Seventy percent of long haul communications pass through at least one satellite relay enroute.<sup>11</sup>

Aside from communications, soldiers, sailors, and airmen benefit most directly and routinely from space based navigation

and meteorology systems. The accuracies associated with NAVSTAR Global Positioning System significantly improves navigation, geopositioning, and targeting. "Consider how important a meteorological satellite... would have been to General Dwight D. Eisenhower in June 1944".<sup>12</sup> Throughout history weather has intervened in military operations positively or negatively on a tactical or strategic scale. Sufficient information to accurately predict weather would allow strategists and tacticians to exploit conditions rather than be their victims.

Force applications space missions may be space oriented as with earth-to-space or space-to-earth systems. These could be used defensively to protect U.S. satellites under attack or offensively to negate enemy satellites. Such systems could also be used to defeat missiles in flight in a missile defense role. Earth oriented space weapons may provide new, more effective ways to perform air or sea supremacy missions, interdiction, close support, or suppression.

When force applications missions can be performed effectively by space systems, then it will be true of space what Major Billy Mitchell said of air power in 1917: "A cardinal principle in warfare (is that) a decision in the air must be sought and obtained before a decision on the ground can be reached."<sup>13</sup> Look down/shoot down spacecraft will not be invincible, but they will have a profound advantage over terrestrial forces. Mature technologies of the type which the President's Space Defense Initiative promises will be able to destroy not only missiles and spacecraft, but also aircraft, ships, equipment, and facilities on earth.

Force enhancement missions cannot affect military operations as directly as force applications, but they have become critical in their own right. Well trained and disciplined military forces are able to fight effectively as individual units, but they must be able to group and attack the enemy when and where he is weak or vulnerable. Timely reconnaissance and surveillance and reliable and secure communications are required for this, especially at the campaign or theater levels of action. Moreover, the effectiveness of such attacks must be enhanced by accurate navigation and targeting and must not be stalled by weather conditions which could have been avoided or exploited.

### SECTION III

#### THE THREAT

U.S. military forces have grown to depend on the support that space systems provide. It is a mistake, however, to take for granted that space systems will be there whenever needed. There is a threat. The Soviets will attack U.S. space systems in crisis or conflict. It is consistent with their doctrine, with the fact of their weapons development, and with reason.



The tone of Soviet military doctrine is captured by Col A.A. Sidorenko, Doctor of Military Science, in the introduction to his book The Offensive: "...only the offensive leads to the attainment of victory over the enemy."<sup>14</sup> The Defense Intelligence Agency suggests that "Space Supremacy" is what the Soviets will seek in order to prevail on "Space Warfare".<sup>15</sup> Space Supremacy is defined as a "...situation in which the military space systems of one side have decisive superiority over the systems of the other side".<sup>16</sup> The methods to such an end are described in the Soviet Military Encyclopedia under "Antispace Defense". "Antispace Defense can be thus accomplished through such means as building satellite sensors, jamming communications, and destruction of ground installations as well as destruction of the spacecraft itself".<sup>17</sup>

The state of Soviet space weapons developments suggests that the above doctrinal statements are more than mere academic definitions. The Soviet Union already has an operational antisatellite (ASAT) weapon. The 1985 edition of Soviet Military Power describes numerous space weapons developments including ground based and airborne lasers, neutral particle beam weapons, high energy microwave, and high velocity impact weapons.<sup>18</sup> Aside from the doctrinal statements and the implications of their weapons development, it stands to reason that the Soviets will attack U.S. space systems in crisis or conflict. They would gain more than they would risk. Figure 1 below poses the four possibilities with respect to the wartime operational status of U.S. and USSR space systems and assesses the relative advantage of each.

|    | <u>U.S.</u> | <u>USSR</u> | <u>ADVANTAGE</u> |
|----|-------------|-------------|------------------|
| 1. | OP          | NON OP      | U.S.             |
| 2. | OP          | OP          | PARITY           |
| 3. | NON OP      | NON OP      | USSR             |
| 4. | NON OP      | OP          | USSR             |

Figure 1

Relative Advantages

In line 1, the U.S. has wartime advantages because its space systems are operational but Soviets' are not.

Line 2 suggests that the U.S. and Soviets sustained their own space operations. Despite the earlier discussion of the technological superiority of U.S. space systems, the assessment

in line 2 is "Parity". There are two reasons. First, Soviet space systems may be less capable than those of the U.S., but that is not to say that they are inadequate. Second, Soviet space systems are designed to perform specific military functions and are not required to perform the multiple or non-military tasks as is usually the case in U.S. space systems. Soviet Deputy Minister of Defense, Admiral Gorshkov is credited with having said, "Better is the enemy of good enough".<sup>19</sup> No matter how much better U.S. space systems might be, Soviet space systems are good enough.

Line 3 represents a devastating ASAT campaign by both sides after which neither side has operational space systems left. The Soviets have the advantage for three reasons. First, the Soviets depend on their space systems less than U.S. forces do.<sup>20</sup> The probable location of a future conflict will be closer to the USSR than to the U.S., thus long haul satellite communications will not be as critical to Soviet forces as to those of the U.S.. Moreover, the Soviets save older systems rather than discard them, thus contributing to their depth. Second, while Soviet forces have real numerical superiority, it is U.S. forces that need force multiplication. Attribution on both sides favors the larger forces. Third, the Soviets will start the war and, therefore, will have the advantage of the initial offensive. Offensive forces certainly rely on communications, surveillance, and reconnaissance, but not to the extent that a defending smaller force must.

Line 4 is the reverse of line 1 and the Soviets have the advantage.

If one accepts the above as representative, then it is clearly to the Soviets' advantage to attack U.S. space systems even if their own is lost in the process. The worst result they face for the attempt is the parity of line 2. If they are confident in their launch reserve to fill attrition losses, they can optimistically expect the advantage in line 4.

The Soviets will attack U.S. space systems as soon as they have decided that conflict with the U.S. is necessary and unavoidable.

#### WHAT U.S. SPACE SYSTEMS WILL BE ATTACKED?

With unlimited resources, Soviet leaders would destroy all U.S. space capabilities. Each lost U.S. mission would have a debilitating effect on the forces which depended upon it. They will not have unlimited resources, so they must establish priorities.

Earlier, communications, reconnaissance, and surveillance were said to be critical force enhancement space missions. Generally, any critical capability for one side is a critical target for the other. The Soviets will have delivered a severe

blow if they are able to deny the United States use of its reconnaissance, surveillance, and communications satellites.

Early warning surveillance satellites, however, fall into a different category of consideration. Certainly the missions they perform are critical. Their loss would degrade the survivability of strategic retaliatory forces. But Soviet attacks, or even suspicion of such attacks, against early warning systems would alert U.S. forces and possibly drive them to preemptive strikes. The potential consequences of attacking U.S. early warning systems outweigh the benefits.

#### HOW WILL U.S. SPACE SYSTEMS BE ATTACKED?

Space systems can be defeated by attacking the satellite constellation, its earth support system, or both. The methods for destroying earth support systems are not new. As a matter of fact, they are all too simple. Unconventional forces, sleeper agents, and surrogate terrorists can destroy satellite control stations, launch sites, or user processing facilities using small arms, plastic explosives, incendiaries, biological/chemical agents, trucks, automobiles, or airplanes. Such forces and attacks would be hard to detect and defend against.

Destroying satellite control stations and user processing facilities would force satellite platforms and payloads to go untended. Some systems, such as communications satellites, would degrade gracefully. Sooner or later, however, they would drift out of attitude or orbit limits and become useless. The degradation would be more abrupt on other satellites which require frequent and periodic programming. They would come to the end of their last programmed activity and cease to perform their mission. "The worst case is a low altitude reconnaissance satellite that requires both frequent command and control and a great deal of processing to get the reconnaissance information, into usable form."<sup>21</sup>

Destroying launch sites augments as ASAT campaign. As the ASAT attacks destroy on-orbit capability, launch site destruction prevents replacement from the earth. Striking launch sites would be an effective way of separating an enemy from his reserves.

The advantages of attacking earth support systems are simplicity, covertness, and multiplicity of effects. Simple weapons and methods against a few well selected earth support targets can be broadly effective in degrading space missions. Further, enemy actions in the form of sabotage or terrorism might be hard to distinguish from the civil turmoil which likely will accompany the crisis at hand. Finally, successful attacks against launch and satellite control facilities would produce collateral or spillover impacts on all satellites dependent on those facilities for support.

There are also advantages in attacking satellite

constellations. The space segment may be the most vulnerable target in the system. Destroying a two or three satellite constellation in low orbit will be a relatively immediate and permanent way of denying a space mission capability. There is no graceful degradation to a space mission when the constellation is destroyed. Finally, destroying satellites somewhere in orbit will unlikely raise public ire as much as destroying a shuttle on the pad or any other facility in the U.S. with full media coverage. This may be an important consideration during a crisis before hostilities begin.

Anti-satellite weapons (ASATs) fall into three categories; kinetic energy weapons (KEWs), directed energy weapons (DEWs), and electronic warfare weapons (EWs).<sup>2</sup> Any of these can be mounted on mobile or fixed land, sea, or air platforms. In the future, they will also be mounted on satellites. A single weapon at a fixed location will have as few as two windows of opportunity per day against a low orbit target simply because that is how often the target crosses the area of weapons control. More proliferated, geographically dispersed systems or mobile systems increase those windows of opportunity. The best of all worlds would be proliferated air, land, sea, and space mounted weapons.

The only operational ASAT in the world is a Soviet KEW, the orbital ASAT. Employing a space booster, it achieves an orbit from which it can overtake and fire a single shot of pellets at its target.<sup>3</sup> The U.S. developmental air launched ASAT is also a KEW. It is launched from an F-15 fighter aircraft, not into orbit, but on a direct ascent course to intercept its target. KEWs could also be mounted on small boosters or on satellites. The time duration between attack initiation and culmination can be an important consideration with KEWs. If the ASAT requires an hour or more of pursuit, the target can evade destruction provided it is configured and adequately warned to do so. It is even conceivable that a KEW ASAT could itself be destroyed in flight by space protection forces. Barring such an anti-ASAT development, the final results of a KEW ASAT campaign would depend on whether the ASAT attacks could be sustained longer than the target constellation could evade.

DEWs will strike targets at the speed of light and will thus eliminate time duration considerations. If these weapons can deliver enough energy to catastrophically destroy satellites, then the attacker will indeed have the advantage.

EWs can be employed to interfere with or otherwise impair satellite operations. Electronic jamming could be employed against satellite or earth support receivers to prevent uplinks or downlinks respectively. Except for some rare cases where a satellite was critically dependent on an uplink or downlink to or from a particular satellite control station, the effect of jamming satellite command and control links seems to be very transient and non-lethal. The most effective EW jamming would be

against geostationary communications satellites. Effective jamming of a sufficient number of satellites would critically reduce communications worldwide.

The most likely Soviet strategy would be to combine attacks against earth support and satellite constellations of a few selected space missions. The missions selected would be those considered most threatening to Soviet forces or most debilitating to U.S. forces. The combined effect of such an attack on all fronts would be their best bet for denying the U.S. use of its space resources.

#### SECTION IV

##### ASSURING ACCESS TO AND USE OF SPACE

The JCS tasked CINCSPACE to "maintain assured access to and use of space at all times." This is an imperative which stands during peace as well as national crisis. The discussion in Section II listed the elements of access to and use of space, but the tasking included the words "...maintain assured..." and "...at all times...." These words require determination. U.S. space systems must survive a determined Soviet attack. The published material available on space system survivability and endurance can be reduced to three concepts: systemic survivability, protection, and reserve strength and flexibility.

##### SYSTEMIC SURVIVABILITY

Systemic survivability is the capability inherent in a system's design or configuration to survive damage or component failure. No space system is invulnerable, but certain features of design or deployment minimize the danger and effect of damage. In his book, Col Giffen lists the following features which enhance systemic survivability: hardening, autonomy, and mobility and maneuverability.<sup>24</sup> In different ways, they apply to both the earth support system and the satellite constellation.

Self contained power generation systems, protected air and water supplies, and bunkered or underground facilities are but a few examples of earth support physical hardening. Protected electronics and jam-resistant communications will keep the facility functioning within its system. Air, land, and sea mobile platforms provide flexibility and proliferation which add to the survivability of a system.

These and other hardening features are being applied to many existing and future earth support systems, in some cases at considerable cost. Other systems, however, do not lend themselves to hardening. To harden launch facilities, for example, would require new concepts for booster and satellite design.

Systemic survivability also applies to spacecraft and their

constellations. Electronic and physical shielding will prevent some levels of damage to sensitive components. Jam-resistant and encrypted communications links will keep the system operating without interference from hostile radio electronic combat. A satellite which can maneuver frequently and on command is an elusive target for KEWs in flight. Contingency maneuvers when approaching active, hostile DEWs will increase survivability when running those gauntlets. Higher orbits are safer than lower ones.

Booster throw weight is precious. For every pound of spacecraft weight devoted to survivability, a pound of mission capability is left behind. Spacecraft fuel for maneuverability is not only heavy, but it is limited. Sooner or later the spacecraft will exhaust its fuel, lose mission capability, and become an easy target. Some missions can be performed from high orbit, but others cannot.

The measures above can add to the survivability of some space systems, but they alone cannot give needed assurances.

#### PROTECTION

CINCSpace is responsible for the space protection operations, but space protection is still in its infancy. Basic responsibilities remain unclear. CINCSpace provides advisories and warnings of space hostilities to space systems owners/operators through the SPADOC. Beyond that, he may provide active satellite defense if that kind of capability is developed. But, who is responsible to secure earth support facilities? The host military organization is responsible for tenants on military reservations. Normal security protection may not be sufficient in the face of determined, clandestine operations. Further, who is responsible for those earth support facilities not on military reservations, such as Kennedy or Johnson Space Centers?

As the world order degrades in some hypothetical future crisis, critical earth support facilities must be guarded. Effective contingency plans to secure these facilities from a variety of air, land, and sea attacks must be in place. This kind of protection, however, is difficult at best. Consider the difficulty of securing the Kennedy or Vandenberg launch complexes for example. Serious difficulties exist, as well, in securing remote satellite control stations spread around the world.

To be effective, assessments and warnings of attacks against satellite constellations must be made early enough to allow contingency actions. However, the assessment process can be slow. It depends on all-source intelligence information, on detailed satellite status information from owners/operators, and on spacetrack data from the spacetrack network.<sup>25</sup> Analysis of this information must produce sufficient evidence to distinguish between an unfortunate, but not uncommon satellite failure and a deliberate, destructive attack. Warnings must then be

transmitted to all satellite operators and to the NCA as quickly as possible. There is no tangible protection in this unless the warning keys the operator to execute systemic shielding or evasive actions.

It has been suggested that an antisatellite system similar to the F-15 air launched ASAT would protect U.S. space systems by deterring Soviet ASAT attacks.<sup>26</sup> This logic is unclear. The discussion of Figure 1 in Section III suggested that the Soviets would gain an overall advantage by destroying U.S. satellites, even if their own were destroyed in the process. However, a fundamental prerequisite for deterrence is that "...the enemy must value and rely on his space systems as much more than you do...."<sup>27</sup> The F-15 air launched ASAT would not deter Soviet ASATs any more than the F-15 fighter itself would deter Soviet Migs.

There will not be any real protection of U.S. satellites until protection forces have the capability to destroy Soviet ASAT weapons. KEWs could be destroyed in flight by advanced DEWs for example. As difficult as that would be, that is the easy case. What about weapons which attack too quickly to be destroyed in flight? What about DEWs, EWs, or hypervelocity weapons based in the Soviet Union, where to destroy the weapon would be to attack the Soviet homeland. Soviet ASAT facilities would undoubtedly be damaged or destroyed during a central nuclear exchange, but it was suggested earlier that Soviet ASAT activity could be expected much earlier than that. A decision to attack facilities within the Soviet Union during a serious crisis or conflict would have grave implications, yet not doing so, or deciding to do so too slowly, would result in the loss of critical satellites or even constellations.

#### STRONG AND FLEXIBLE RESERVE

Despite efforts to develop survivable space systems and effective protection systems and operations, critical space systems are too few to escape significant loss in conflict. Space system survivability efforts must include the ability to replace attrition losses with strong and flexible reserves.

Redundant, proliferated facilities and mobile earth support platforms provide reserve and flexibility to sustain space operations. Civil satellite operations could provide reserve satellite control and user processing facilities if agreements which allow commercial cargo aircraft to augment DOD airlift in emergencies might serve as examples. Compatibility and incentive issues could be worked out.

In space, large constellations provide inherent reserves. Some orbits, usually high orbits, allow the luxury of on-orbit satellite sparing. Not all satellites fly in high orbits nor in large constellations however. Many fly in small constellations at low altitudes. These depend on reserves which must be

launched from Kennedy or Vandenberg when needed.

Each space launch, Space Shuttle or otherwise, represents the end of a lengthy and carefully phased pipeline which may have begun years earlier with booster and satellite procurement programming. Ideally, booster and satellite launch ready dates coincide with operational need dates. While this scheme has served the practical concerns of cost effectiveness very well, it provides little or no ready reserve for premature failure, or, more to the point, attrition.

## SECTION V

### CONCLUSION

Space systems perform critical space missions for the NCA and U.S. military forces in peace, but especially in crisis and conflict. Admiral James D. Watkins, Chief of Naval Operations, stated during the May 1985 Naval Space symposium at the Naval Post Graduate School:

Our ability to maintain sea control will be in jeopardy without space control. Our capability to win the battle of the first salvo will not be determined solely by our performance within the classic three dimensions of the terrestrial ocean environment. Rather, it will be determined by the way we use all four dimensions - air, sea, undersea, and space.

Major General Robert A. Rosenberg, Director, Defense Mapping Agency and former Vice CINCNORAD, wrote, "The simple fact is ...that advantage is dependent on our exploration of space for the support of our forces."<sup>28</sup>

Further, General Rosenberg asks, "At what point can an adversary engage American forces and not afford to hold satellites at risk?"<sup>29</sup>

The United States and the Soviet Union could be drawn to the brink of conflict by conditions which neither side could completely control. If conflict appeared unavoidable to Soviet leaders, they would direct their space forces to attack the most critical U.S. space systems.

U.S. space systems must survive such an attack to enhance and multiply the effectiveness of terrestrial forces. To survive, they must be capable and rugged, but that is not enough. No space system is invulnerable. Earth support systems as well as satellites must be protected. Forces and strategies must be developed to put teeth into space protection concepts in order to defeat attacks and suppress enemy ASATs. Even with survivability features and protection forces, considerable U.S. space systems will be struck and destroyed during a conflict. They are too important and there are too few of them to expect otherwise.



Reserve capability must be available to replace losses. There are ways to do it.

Maintain assured access to and use of space at all times. Take the high ground and hold it. This is the task of CINCSPACE.

#### NOTES

<sup>1</sup>Memorandum, Ronald Reagan, To Casper Weinberger, Activation of U.S. Space Command, August 30, 1985.

<sup>2</sup>Office of Assistant Secretary of Defense (Public Affairs), Formation of the United States Space Command (USSPACECOM), News Release, Washington, D.C.: U.S. Government Printing Office, November 30, 1984.

<sup>3</sup>Memorandum, Joint Chiefs of Staff, to Unified and Specified Commanders-in-Chief, USCINCSPACE Mission Responsibilities, 12 February 1985, SM-94-85.

<sup>4</sup>Reginald Turnill, ed., Jane's Spaceflight Directory, (London, U.L.: Jane's Publishing Company Limited, 1984), pp. 284, 285.

<sup>5</sup>Robert B. Giffen, U.S. Space System Survivability, Strategic Alternatives for the 1990's, (Washington, D.C: National Defense University Press, 1982), p.21.

<sup>6</sup>U.S. Air Force, Military Space Doctrine, AFM 1-6, (Washington, D.C.: Department of the Air Force, 1982), pp. 7, 8.

<sup>7</sup>Thomas C. Brandt, "Military Uses for Space," Air University Review, November-December 1985, p. 50.

<sup>8</sup>Giffen, Space System Survivability, p. 26.

<sup>9</sup>USAF, AFM 1-6, pp. 8,9.

<sup>10</sup>Brandt, "Military Uses for Space, " A U Review, p. 46.

<sup>11</sup>Giffen, Space System Survivability, p. 23.

<sup>12</sup>Robert A. Rosenberg, "The Air Force and Its Role in Space," Air University Review, November-December 1985, p. 53.

<sup>13</sup>I.B. Holley, Jr., (quoted in), Ideas and Weapons, (Washington, D.C.: U.S. Government Printing Office, 1983), p.47.

<sup>14</sup>A. A. Sidorenko, The Offensive (A Soviet View), (Translated and published by the United States Air Force, Washington, D.C.: U.S. Government Printing Office, 1973), p.1.

<sup>15</sup>Defense Intelligence Agency, Soviet Military Space Doctrine, (Washington, D.C.: U.S. Government Printing Office,

1984, p. 9.

<sup>16</sup> *ibid.*, p. 16.

<sup>17</sup> *ibid.*, p. 13.

<sup>18</sup> Department of Defense, Soviet Military Power, 1985, (Washington, D. C.: U.S. Government Printing Office, 1985), p. 56.

<sup>19</sup> Donald L. Litke, Logistics Symposium Speech, Warner Robins, Georgia, 1978.

<sup>20</sup> Giffen, Space Systems Survivability, p. 21.

<sup>21</sup> *ibid.*, p. 38.

<sup>22</sup> *ibid.*, pp. 26, 27.

<sup>23</sup> DOD, Soviet Military Power, 1985, p. 55.

<sup>24</sup> Giffen, Space System Survivability, pp. 35, 37, 40.

<sup>25</sup> Col. Eugene McGarrity, SPADOC Orientation Briefing, Cheyenne Mountain, Colorado, 1984.

<sup>26</sup> Rosenberg, "Air Force and Its Role in Space," A U Review, p. 53.

<sup>27</sup> Giffen, Space System Survivability, p. 34.

<sup>28</sup> Rosenberg, "Air Force and Its Role in Space," A U Review, p. 53.

<sup>29</sup> *ibid.*, p. 53.

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