The Army's Stake in Emerging Space Technologies

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On 29 May 1940 in Washington, D.C., Robert A. Goddard, the father of American rocketry, briefed representatives of the Army Air Corps, Army Ordnance, and the Navy. He urged that unmanned rockets could deliver more explosives, more accurately than manned bombers. His audience was courteous but unimpressed—certainly unmanned rockets could never thus outperform manned bombers![1] Almost half a century later, the importance of space technology to military operations is no longer subject to such doubt.

The 1988 Military Posture Statement of the Joint Chiefs of Staff states that "space-based systems have clearly demonstrated their value in support of the planning and execution of US military operations, thereby contributing to deterrent and defense capabilities."[2] US space systems currently support multiple peacetime and wartime military activities critical to national security. These include command-control-communications, navigation, meteorology, oceanography, weather reporting, geodesy, ballistic missile attack warning, surveillance, and treaty monitoring.[3] It is likely that by the mid-1990s military applications of space technology will extend to precision-guided weaponry, secure communications in the conduct of conventional or nuclear war, and computer-assisted battlefield management.[4] Moreover, the deployment of weapons in space capable of supporting ground, sea, and air combat operations as early as the turn of the century is a technological possibility.[5] The conduct of war in space itself is a distinct possibility in the 21st century.[6]

The Soviet space program underscores the military importance of space. Although the Soviet Union is less militarily dependent on space-based support systems than the United States, the Soviets nonetheless invest $20 billion a year in military space activities versus the annual $8 billion investment of the United States. Ninety percent of Soviet space launches are military in character, and the Soviet Union's launch rate is five times that of the United States. In May 1987 the Soviets tested their new heavy-lift rocket, *Energia*,

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a space vehicle capable of lifting four times the load that the American shuttle can carry.[7] The Soviet Union has deployed the *Salyut 7/Cosmos 1986* modular space station. As of 1 August 1984, Soviet man-days in space exceeded those of the United States 3346 to 1094. The Soviet anti-satellite and Moscow-based anti-ballistic missile systems are the only such operational weapon systems in the world.[8] Finally, the Soviet Union possesses the Electronic Ocean Reconnaissance Satellite and the nuclear-powered Radar Ocean Reconnaissance Satellite, systems that detect, locate, and target naval forces for destruction by anti-ship weaponry. At present the United States has no counterparts for these space systems.[9]

In 1832 Carl von Clausewitz observed that the command of heights conferred the military advantages of enhanced tactical strength, protection from access, and a broader view.[10] Today, his words have an extraterrestrial significance as well. Space is "'the new high ground'—a theater of operations which must be exploited because of its tremendous military potential."[11] The US Army has a stake in that potential. For the West, it is a political imperative that space technology in support of land warfare be developed. Deterrence, whether predicated on the basis of Mutual Assured Security[12] or Mutual Assured Destruction, cannot otherwise be maintained on earth in the face of a Soviet Union armed with space-based offensive weaponry.

Since World War II, the defense policy of the United States has never attempted a man-for-man or weapon-for-weapon match with the Soviet Union. Rather, the United States has consistently sought to overcome Soviet numerical superiority by resorting to the technological advantage inherent in its free economy and those of its allies.[13] This approach has served the interests of national security well. For example, stealth technology and precision-guided weaponry have offset Soviet tank and air defense advantages. Maritime superiority is sustained, in part, on the basis of submarine-quieting and antisubmarine-warfare technologies, and American superiority in computer technology and software gives the United States military advantages across the entire spectrum of conflict. Finally, recent breakthroughs in the field of superconductivity signal the advent of an era in which electrical energy will be much more exploitable as a result of the elimination of conductor resistance.[14] This portends expanded potential for earth- or space-based directed energy weaponry and highly mobile military land and aerospace vehicles requiring combustion in lesser degree or not at all.

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Emerging technologies may render mid-to-high intensity conflict in the future more fluid, more intense, more sophisticated, and more far-reaching than any in history. To conduct war of this kind, especially against an enemy that has us outgunned and outmanned, the Army's AirLand Battle doctrine requires that land forces employ initiative, agility, depth, and synchronization at the tactical and operational levels of war in conducting ground combat operations.[15] Without high-technology "leveraging," the demands of the major functional areas of combat—maneuver control, fire support, air defense, intelligence and electronic warfare, and combat service support—could not be sustained, particularly against enemy forces supported from space.[16]

The Army Space Operational Concept recognizes the potential importance of space-based technology to success on the AirLand battlefield.[17] It sets out the following visionary conclusions:

- Space operations are a logical extension of the battlefield;
- Space offers the commander a substantial increase in operational capabilities;
- Space control and use will be directly linked to success on the terrestrial battlefield;
- Space-based command and control systems will provide the means for true battlefield synchronization of all combat functions;
- Space provides a unique view of the battlefield that offers the commander a significant operational and tactical advantage;
- Space-basing provides unique security advantages in support of all combat functions.[18]

That the Army has adopted such a concept is not the result of fanciful thinking. Army access to space must be secured if the full potential of AirLand Battle doctrine is to be realized.

Space-based technology promises the Army enhanced capacity to control maneuver in the AirLand Battle. Space assets would afford terrestrial commanders increased ability to pierce the fog of the close, deep, and rear battlefield with a near-real-time clarity not before possible. As a result, enemy strengths might be more effectively avoided as weaknesses were exploited. Space-based communications capability would provide improved command, control, and intelligence capacity. Surveillance capability located in space would improve attack warning, aid engineers in the identification of enemy countermobility efforts, enhance air defense, and assist in avoiding nuclear, biological, and chemical contamination—and all notwithstanding weather and terrain. Moreover, high-technology communication assets in space would provide the National Command Authority improved capacity to control special operations forces in the field by secure means and aid in the transmission of critical intelligence and target-acquisition information.[19]

Space-based sensors also promise to make available around-the-clock, all-weather, worldwide target acquisition data for fire support missions.

Such technology would bolster the deep attack by simultaneously guiding smart weaponry against multiple high-priority targets and by providing long-range, secure communications to aircraft flying any mission, including nap-of-the-earth and Joint Air Attack Team missions. The Army would benefit as well from improved close air support, target designation, battlefield air interdiction, air traffic management, and navigational assistance.[20]

The technologies requisite to enhanced AirLand Battle in the near term—the next 10 to 15 years—are currently under development or feasible. Assault Breaker, a program of the Defense Advanced Research Projects Agency, offers an improved battlefield surveillance capability in the interim until more-advanced space-based systems can be deployed. Designed to provide deep interdiction capability, the Assault Breaker system consists of several sub-programs:

• The Joint Surveillance and Target Attack Radar System (JSTARS) will look several hundred miles behind the enemy forward line of troops for command posts, airfields, armor, and surface-to-air missile sites.

• The Joint Tactical Missile System (JTACMS) fields a missile capable of delivering smart, maneuverable submunitions which may be launched from mobile ground platforms or by fighter or bomber aircraft.

• The Joint Tactical Fusion Program (JTFP) provides the capability to receive multiple sensor data, fuse it with other intelligence, and assign enemy targets. If this capability can be moved into space, it will provide commanders a broader battlefield view, more effective and timely firepower, and enhanced terrestrial strategic mobility incident to the prepositioning of space-based surveillance platforms.[21]

Two additional systems, the Position Locating Reporting System and the NAVSTAR Global Positioning System, will provide commanders extremely accurate three-dimensional location data, and worldwide, real-time information. The integration of these systems will provide commanders the capability to control maneuvers, to inflict damage on enemy targets with pinpoint accuracy, to logistically sustain ground operations notwithstanding the vicissitudes of battle, and to drop bombs with the accuracy of smart munitions. Ingress and egress routing as well as passive operations will also be made more flexible, thus improving survivability.[22]

Satellites that might be developed in the near term will possess advanced signal processing and switching capability. As a consequence, these satellites will likely be employed as remote signal centers, arguably permitting a reduction in the number and vulnerability of ground-based command, control, and communication nodes. Further, space-based real-time target acquisition radar capable of detecting and tracking enemy aircraft will substantially improve fire support and air defense capability.[23]

In the longer term—20 to 30 years out—it is likely that space-based technology will serve as the bridge from today's AirLand Battle doctrine to an

"Army 21 Concept" for the prosecution of land warfare in a much more sophisticated technological environment. Such a concept postulates space-based, non-nuclear kinetic and directed-energy weaponry that will be effective against both time-sensitive targets (missiles and aircraft) and slow-moving targets when used in combination with advanced space-based surveillance, target-acquisition, and battlefield-management technology.[24]

The foregoing scenario suggests the demise of close combat as it is now known, since firepower delivered from space might well render large formations of men and armor more a liability than an asset. A smaller surface fleet could result for the same reason, particularly with regard to the larger surface combatants—battleships and aircraft carriers. In lieu of the larger combat formations that characterized the AirLand battlefield, one might expect that the "Air-Land-Space Battle" would be executed by much smaller, self-contained, autonomous active-component units employing the full spectrum of space-based technology, including robotics,[25] in support of continuous operations on land or in space.[26] Conventional forces as known today would likely survive in a smaller reserve component, employing Army of Excellence organizational principles.[27]

It is worth noting that this Army 21 view of the future is consistent with current American demographic trends. These project not only fewer service-eligible personnel but fewer such persons having the technical skills required by increasing numbers of military jobs.[28] Further, it offers cost efficiency in that it promises the United States more capability in the defense of national interests than it could purchase otherwise.[29] It projects a vital competitive strategy to offset Soviet numerical advantages in manpower and equipment.[30] It is consistent with the existing 1967 Outer Space Treaty "forbidding nuclear weapons or any other kinds of weapons of mass destruction in orbit around the Earth, installed on celestial bodies or stationed in outer space,"[31] and it can be implemented without abrogation of the ABM Treaty of 1972.[32] Since it suggests the possibility that deterrence might credibly be maintained on the basis of advanced non-nuclear weaponry in space, it offers the hope of a safer world, and, in the process, furthers the course of arms control by making it worthwhile for the Soviets to negotiate with the United States.[33]

For all the promise that space technology offers in support of land- or space-based warfare, there is also peril. There is potential that space might become a "technological Vietnam," a venture better suited to a command-controlled economy than to a free economy in a political democracy.[34] Ironically, there is danger from within the Army itself if the demands of developing and fielding space capability are seen as competing with present-day budget requirements.[35] Moreover, the argument can be made that a position in space is but a "barren crag"[36]—exposed, vulnerable, and logistically difficult to support. Others assert that space-based technology will be exceedingly complex and that an inverse relationship has been demonstrated between complexity and reliability,[37] or, more simply, that such technology will not work. There are those who justifiably worry that the future of mankind is too important to be consigned to the vagaries of computer programs which might malfunction or, once set in motion, might not be reversible. And last, there is the danger of an expanded arms race. While the attendant difficulties are real, they must be overcome: the steady advance of military technology is inevitable, and, as history has consistently demonstrated, in war no nation can be relied upon to limit itself to the weapons of the past.

America is left little choice by the specter of a space-capable Soviet Union, already so obviously clamoring for space-based military technology. Soviet ascendancy in space would consign the United States and the remainder of the Free World to military checkmate. With national survival at risk, it is essential that the US military make its case for space-based technology convincingly to the American people. Deterrence predicated on Mutual Assured Security will be no more credible than that based on Mutual Assured Destruction, absent the uncertainty imposed on America's adversaries by its capacity for flexible response by land, sea, and air forces supported from space or in space itself. More important to the American people and to mankind, though, is the reality that in space-enhanced warfighting capability there is the hope of freeing the world from the potential for nuclear holocaust and of motivating the Soviet Union to engage in genuine arms control.

Although it has been asserted that the Army's interests in space are best served by a "junior partnership" in the unified Space Command, such a proposition cannot be sustained. Prospective Army space missions in furtherance of deterrence or expanded warfighting capability—force enhancement, space support, and space control[38]—require a joint relationship with the other services based upon equality of interests.

Does the Army have a stake in space technology?—Was the advent of the airplane significant to the Army? Was "the bomb"? In the last analysis, space is no more than a place,[39] a vital extension of the Army's battlefields of the future, whether on earth or beyond.

NOTES

1. *Papers of Robert H. Goddard*, vol. III, p. 1311, cited by Arthur J. Downey, *The Emerging Role of the US Army in Space* (Washington: National Defense Univ. Press, 1985), p. 1.
2. Organization of the Joint Chiefs of Staff, *United States Military Posture Statement: FY 1988* (Washington: Department of Defense, 1988), p. 85.
3. Ibid.; Downey, p. 10; Ronald Reagan, *National Security Strategy of the United States* (Washington: The White House, 1987), p. 31.
4. Downey, p. 10.
5. Ibid.
6. See G. Harry Stine, *Confrontation In Space* (Englewood Cliffs, N.J.: Prentice-Hall, 1981), pp. 58, 178-87; see also Thomas Karas, *The New High Ground* (New York: Simon and Schuster, 1983), pp. 166-79.
7. John Noble Wilford, "Shades of Sputnik: Who's Ahead in Space?" *The New York Times*, 3 January 1988, sec. IV, p. 7.

8. Downey, p. 12.

9. Caspar W. Weinberger, *Soviet Military Power 1987* (Washington: Department of Defense, 1987), p. 53.

10. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton Univ. Press, 1976), p. 353.

11. Downey, p. 13.

12. "Mutual Assured Security" is deterrence predicated on strategic defense forces sufficient to prevent an aggressor's attack. Paul H. Nitze, "On the Road to A More Stable Peace," *Essays on Strategy and Diplomacy: The Strategic Defense Initiative*, No. 3 (Claremont, Calif.: Keck Center for International Strategic Studies, 1985), p. 36.

13. Reagan, p. 20.

14. See generally, "Superconductors," *Time*, 11 May 1987, p. 64; and Philip H. Hilts and Michael Specter, "Conductor Technology Advances," *The Washington Post*, 11 May 1987, p. A1.

15. US Department of the Army, Field Manual 100-5, *Operations* (Washington: GPO, May 1986), pp. 14-18.

16. Downey, p. 56.

17. The Army Space Initiatives Study Group, *The Army Space Initiatives Study (ASIS): Executive Summary*, classified (Fort Leavenworth, Kans., 13 December 1985), I, 1. (This page and those hereinafter cited are unclassified pages of the study.)

18. Ibid., II, II-8.

19. Linas A. Roe and Douglas H. Wise, "Space Power Is Land Power: The Army's Role In Space," *Military Review*, 66 (January 1986), 10.

20. Ibid., pp. 10-11.

21. Downey, p. 55.

22. Ibid., pp. 57-58.

23. Ibid., p. 57; Robert T. Herres, "The Military's Use of Space Based Systems," *Signal*, March 1986, pp. 42, 47.

24. Ibid.; Stine, p. 108.

25. Robotics promise reduced human risk, greater effectiveness, and improved efficiency in military operations. See generally, Kenneth H. Rose, "Soldier Robots of the Future," *The Retired Officer*, May 1987, p. 20.

26. Despite man's best efforts to demilitarize space, there may well be a continuing need to "occupy a designated terrain, stand on it, dig the enemy out of their holes, force them then and there to surrender or die." Clayton R. Newell, "The Army and Space," *Army*, September 1987, p. 61, citing Robert A. Heinlein, *Starship Troopers* (New York: G. P. Putnam's Sons, 1959), p. 87.

27. Downey, pp. 58-59.

28. Martin Binkin, *Military Technology and Defense Manpower* (Washington: Brookings Institution, 1986), pp. 69, 73-74, 130.

29. See Caspar W. Weinberger, *Annual Report to Congress: Fiscal Year 1987* (Washington: Department of Defense, 1986), p. 40; Donald C. Latham, "Competitive Strategies for Dealing with the Soviet Union," *Signal*, March 1987, p. 28.

30. Caspar W. Weinberger, "US Space Expectations," *Defense Science and Electronics*, July 1986, pp. 33-34.

31. US Congress, Office of Technology Assessment, *Ballistic Missile Defense Technologies*, OTA-ISC-254 (Washington: GPO, September 1985), p. 283. The words "weapons of mass destruction" refer to nuclear, chemical, and biological weapons only. See William A. Hill, Jr., "Permissible Scope of Military Activity in Outer Space," *The Air Force Law Review*, 24 (1984), 175; *ASIS: Technology Assessment*, III, J44; Downey, p. 16.

32. Treaty with the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems, May 26, 1972, 23 U.S.T. 3435, T.I.A.S. No. 7503 (effective 3 October 1972).

33. Richard M. Nixon and Henry A. Kissinger, "An Arms Agreement—On Two Conditions," *The Washington Post*, 26 April 1987, sec. D, p. 7.

34. Karas, p. 202.

35. *ASIS: Main Report*, II, I-1.

36. B. Bruce-Briggs, "The Army In Space: New High Ground or Hot Air Balloon," *Military Review*, 66 (December 1986), 44.

37. Binkin, p. 45.

38. Roe and Wise, p. 13.

39. Weinberger, "US Space Expectations," p. 31.