We will make our plans to suit our weapons, rather than our weapons to suit our plans.
—Robert P. Patterson, Undersecretary of War, October 1944
(quoted in Sherry, 1977, p. 150)

Futurology and the U.S. Military

Planning for the future has always been a crucial element in organized warfare. The title of the very first chapter of Sun Tzu's *The Art of War* can be translated as "Plans," or "Estimates," or "Reckoning," or even "Calculations" (Griffith, 1962, p. 63). It ends with a discussion of the importance of calculating the probable outcome of any war or battle. Sun Tzu even goes so far as to say, "with many calculations, one can win; with few one cannot." The Chinese character used for "calculations" represents "some sort of counting... device, possibly a primitive abacus," according to the translator, Col. Samuel B. Griffith. This shows just how far back the urge to quantify war goes. Griffith thinks that at least two separate logistical calculations were made, one national and one strategic (p. 71).

But with postmodern war the concern for planning the future has, in many ways, become more important than fighting wars in the present. This is certainly true of imaginary and unthinkable war involving superweapons, a war that by necessity consists of only planning and never any fighting, until... But even midintensity and low-intensity conflicts are planned, and gamed, and simulated to a degree that would surprise Gen. John J. Pershing as much as Sun Tzu.

This is because postmodern war is predicated on constant technological change involving the continual evolution of new doctrines. As both friendly and enemy forces are changing their weapons, strategy, and tactics all the time, it is necessary to institutionalize the process of worrying about future
battles. Gen. Gordon R. Sullivan, Army Chief of Staff, has cleverly suggested that each doctrinal iteration be given software numbers—so that Force XXI, for example, would be 11.0; interim versions would be 11.1, 11.2, and so on until a new release entered the market (1995, p. 14). Planning innovation has to be institutionalized and systematized to accommodate the military bureaucracy.

Modern systematic planning seems to have started with the German General Staff in the nineteenth century. Soon, all the industrial powers had mobilization and strategic plans for potential wars. But they didn’t look very far ahead. Officially, there was no planning for new types of wars until the middle of World War II.

Michael Sherry (1977), in his book Preparing for the Next War, on U.S. future war plans made during World War II, argues that an ideology of preparedness came to dominate U.S. military planning. At it heart was a certain “technological imperative.” As Sherry explains, the position of the preparedness spokesmen was that war now “moved too swiftly to permit scientific research to wait until after the first shot was fired.” Because of the rapid growth of technoscience, “invention was shrinking space and collapsing time so abruptly that it imperiled conventional notions of preparedness.” Permanent mobilization seemed the only answer (p. 130).

For some, preparedness became a crusade. Consider the position of Edward Bowles, scientific adviser to Secretary of War Henry L. Stimson, on uniting science, industry, the universities, and the military:

We must not wait for the exigencies of war to drive us to forge these elements into some sort of machine. . . . [Their integration] must transcend being merely doctrine; it must become a state of mind so firmly imbedded in our souls as to become an invincible philosophy. (quoted in Sherry, 1977, p. 133)

The long-range planning during World War II was also significant in that the planners “ignored tradition” and refused “to name a probable adversary.” Instead, they argued one of the core ideas of preparedness ideology—that “the primary danger to American security arose from fundamental changes in the conduct of war and international relations, not from the transient threat posed by a particular nation” (p. 159).

Sherry points out that more than mere ideology motivated the preparedness movement:

Preparedness would help nourish the scientific infrastructure needed for economic expansion, strengthen ties between the corporate and political elites, and defend access to the markets and materials deemed necessary for continued economic growth. And preparedness could stimulate gross
The Future

investment at a time when other forms of government spending were anathema to powerful interests. (p. 236)

Knud Larsen (1986) calls this kind of practically grounded moral absolutism a “ritualized ideology.” He stresses the social and psychological factors behind the arms race specifically and military technology generally. Larsen's analysis demonstrates that, like much of postmodern war, preparedness ideology is overdetermined. It fills many functions institutionally, personally, and culturally.

Unsurprisingly, it was the U.S. Army Air Force that led the way in institutionalizing preparedness ideology and in imagining future conflicts, and the issue was inevitably framed in terms of technoscience and war. At the tail end of World War II, Gen. Hap Arnold, father of the U.S. Air Force, told his scientific adviser, Dr. Theodor von Kármán, that the alliance between the military and science was both political and strategic. Michael Sherry describes Arnold's analysis and quotes from Arnold's communications with von Kármán:

The strategic danger to the United States lay largely in the unfolding technological revolution: the United States would face enemies and the possibility of “global war” waged by offensive weapons of great sophistication. But the American response would be shaped by considerations of domestic politics. The United States had to reverse “the mistakes of unpreparedness” prior to World War II, “particularly the failure to harness civilian science to military needs.” And technological development would respond to “a fundamental principle of democracy that personnel casualties are distasteful. We will continue to fight mechanical rather than manpower wars.” (pp. 186–187)

Starting in 1945 with Toward New Horizons, the U.S. military initiated a number of studies aimed at understanding future war in terms of future technologies. To do so they have brought together futurists, scientists, science fiction writers, military officers, and civilian technobureaucrats in a series of conferences. The U.S. Air Force's Toward New Horizons was followed with the Woods Hole Summer Studies of 1957 and 1958 and then Project Forecast in 1963. That was followed in turn by New Horizons II in 1975 and by Forecast II in 1985 and then by Innovation Task Force 2025 (Gorn, 1988, p. v).

The other services have had almost as many studies. The approaching millennium has also encouraged a number of new speculations about war in the next century, including AirLand Battle 2000, Army 21, Air Force 2000, Marine Corps 2000, Navy 21, and Focus 21 (a joint Army and Air Force product). Studies of the growing importance of Space War culminated in the formation of a Unified Space Command. Together with reports from elite ad hoc groups, such as President Reagan's Commission on Integrated Long-
Term Strategy, these constitute the future war policy of the United States. Some of the details are quite startling.

**AirLand Battle 2000: The Twenty-First-Century Army**

The twenty-first century is less than one procurement cycle away, as Capt. Ralph Peters, U.S. Army has written in “The Army of the Future” (1987, p. 36). Most of today’s junior officers will serve more of their careers in the twenty-first century than this one, noted a retired general back in 1980 (Sarkesian, 1980, p. vi).

Produced in 1982, *AirLand Battle 2000* was a “jointly developed concept agreed to by the [U.S.] Army and the German Army.” It has since been distilled into the official U.S. Army plans for war in Europe and also recycled as Army 21. Even as the possibility of general war in Europe grows more remote, AirLand Battle (ALB) is still important because it represents the model for any conflict the U.S. might fight with a well-armed enemy. It was the strategic doctrine used for Desert Storm.

ALB assumes that future battles will be three dimensional, requiring intimate coordination between land and air-space forces. ALB doctrine is based on maneuver and aggression in the context of a hyperlethal chaotic “battlefield” (battlespace?) of hundreds of cubic miles. NATO plans were for deep counterattacks in the rear of the attacking Warsaw Pact armies immediately after, or perhaps immediately before, an invasion of Europe. Preemptive strikes are an integral part of ALB plans, which rely heavily on air and space power. Despite the miniscule chances of a Soviet attack on NATO, the ALB supplied the pretext for a whole set of new doctrines (of multiarm coordination) and a new suite of weapons (especially remote-controlled and autonomous drones, computer networks, and sensors) that have already been used in Grenada, Nicaragua, Panama, and other LICs (M. Miller, 1988, pp. 18–21), as well as the midintensity war in Kuwait and Iraq.

*AirLand Battle 2000* puts forward technological solutions to the problems expected to result from the mind-rending impact of high-tech weapons in continuous combat lasting days at a time. Many units will be obliterated; others, merely broken. All evidence suggests that most soldiers will not be able to fight with much effectiveness under these conditions (Hunt and Blair, 1985). To deal with this battlespace, *AirLand Battle 2000* advocates improved support services (medical, logistical, and even such marginal aids as video chaplains, talking expert systems to give legal advice, and computer war games for “recreation and stress reduction”) and stronger measures that will help to integrate the individual soldiers into parts of a complex fighting unit.

See-through eye armor and other “personal bionic attachments to improve human capabilities” are planned to go along with artificial bones,
artificial blood, and spray-on skin for the wounded. For those with major wounds, WHIMPER (Wound-Healing Injection Mandating Partial Early Recovery) shots would allow their evacuation or even their quick return to combat. Universal antiviral, antibacterial, and anti-VD vaccines are to be developed along with mycotoxin antidotes. A universal insoluble insect repellent will supposedly save time and reduce aggravation, as will chemicals to stunt hair growth, retard body functions, and keep teeth clean without brushing for six months at a time.

Miniature sensors will warn soldiers of chemical, biological, or radiological threats. Miniature data discs will hold each soldier's records. Other "automated devices" will judge his or her "physical and psychological fitness" and decide who must keep fighting.

The Strategic Computing Program (SCP) worked on an expert system battlemanager to advise ALB commanders on the corp level. It was to predict enemy activity, track and filter the extraordinary amount of information that battle now generates, advise the humans, and even issue their orders. It is expected that satellites in near space will direct individual artillery rounds, send messages between commands, and pinpoint every single friendly soldier and machine. Such is the Army's dream for managing postmodern war: total information about every logistical or fighting machine, human, and system.

The U.S. Air Force has gone further than the Army in differentiating various roles for machines, humans, and cyborgs: machines are for the mindless brute work; humans are still needed for some of the management, maintenance, and manipulation of weapon systems; cyborgs (human–machine weapons systems) are for fighting. In the future the Air Force plans to take this approach to the technoscientific limits, as can be seen in its own blueprint for the next century.

**Project Forecast II: The Twenty-First-Century Air Force**

Problems never have final or universal solutions, and only a constant inquisitive attitude toward science and a ceaseless and swift adaptation to new developments can maintain the security of this nation.

—Theodor von Kármán, 1945 (quoted in Gorn, 1988, p. 37)

Michael Gorn has written a history for the U.S. Air Force of its science and technology forecasting (1988). In it he discerns a number of important trends. The most significant is that over the course of the major Air Force futurology projects the role of independent civilians has continually declined, while the importance of military personnel with science degrees and of scientists working directly for the DoD has increased proportionately.
Of all the services the Air Force has had the greatest interest in predicting the technological future because it sees air power as being integrally linked to science. So it was out of the first futurology study, *Toward New Horizons*, that the USAF Scientific Advisory Board came. The same man who led *Toward New Horizons*, Dr. Theodor von Kármán, also chaired the first Advisory Board and directed the *Woods Hole Summer Studies*. His first futurological analysis for the Air Force was a wartime study of German and Japanese technologies, *Where We Stand*, which included certain recommendations for future research. It was published as one of the 12 *New Horizon* volumes. Volume 1 of the series was entitled, *Science, the Key to Air Supremacy* (pp. 30–50). Gorn points out that, despite von Kármán's desire to keep independent outside scientists in control of predictions and scientific advice, there has been a continual erosion in both these areas. Control of futurology studies has been shifted from the Scientific Advisory Board to various Air Force bureaucracies, such as the Air Research and Development Command and the Air Force Systems Command. Meanwhile, the Scientific Advisory Board has shrunk and lost most of its civilian participants, while its mandate has become the analysis of specific immediate technical problems on an ad hoc basis.

This militarization of Air Force official futurology has had several effects including a weakening of technical skepticism, since all projections come not from practicing scientists but from active weapons engineers and developers. As Gorn notes, "One element was lacking in enlisting Air Force officers for long-range R&D reports: True disinterestedness toward the subject matter." Consideration of "the relationship between proposed technologies and their place in the general defense landscape" has also disappeared (pp. 185–186). Finally, Gorn quotes Gen. Hap Arnold, who told von Kármán that only independent scientists could solve the military's most difficult technical problems: "the technical genius which could find answers . . . was not cooped up in military or civilian bureaucracy but was to be found in universities and in the people at large" (p. 268).

The Air Force has led the way in institutionalizing postmodern war, especially the role of science and the innovation of innovation. In their very first study of technology and future war, von Kármán and his associates successfully advocated a number of reforms to establish science throughout the Air Force by:

- Setting up a Scientific Advisory Board and science offices in commands such as intelligence and headquarters
- Funding a large R&D program with connections to university and industrial laboratories
- Founding new Air Force research labs
- Training significant numbers of officers in technical and scientific disciplines
Other proposals that were either immediately accepted or eventually implemented included the development of electronically assisted and purely automated weapons (bombs, missiles) and platforms (planes) (pp. 37-40).

Still, much bureaucratic infighting was necessary to keep scientific and technical innovation in a leading role within the Air Force. In 1947, for example, one of von Kármán’s aides and friends, Maj. Teddy Walkowicz, had to appeal to von Kármán for help in keeping the Scientific Advisory Board from eclipse. In a letter he wrote to von Kármán he warned, “If the pilots reign supreme in peace time as they do in war time the whole cause will be lost . . . and the . . . tragic course of any future war will be decided long before the first shot is fired” (p. 47). Over time such struggles faded as many institutions within the Air Force and outside it became dependent on continual technoscientific innovation, although independent civilian scientific input has continued to fade, as Gorn’s book chronicles.

Later Air Force studies continued with such proposals and also began to focus more and more on sophisticated communication systems for improved command and control, including space systems, and for goodies such as digitalized, worldwide cartography. The most recent full study by the U.S. Air Force (1986), Project Forecast II, is the best example of where these projects have been heading.

Project Forecast II was generated by a large collection of experts: 175 civilian and military researchers divided into 18 technology, mission, and analysis panels. Indeed, Gen. Lawrence Skantze, Commander, Air Force Systems Command, makes a convincing case in his briefing at Aerospace ‘87 that Project Forecast II has shaped current Air Force R&D to a great extent (U.S. Air Force, 1987). He claims that in 1987 the project’s suggestions absorbed over 10 percent of the $1.6 billion Air Force Laboratories’ budget (his command), with a similar level of expenditure being planned up through 1993. The Air Force as a whole kicked in another $150 million for 1988. In 1987, a group of 24 key aerospace companies ponied up $866 million of their own for the Project Forecast II proposals, 44 percent of their $2 billion of internal R&D. This “private” research on military proposals doesn’t officially count as military work, although it is along military lines, with military specifications, aimed at winning military contracts, and only possible because of the profits from earlier military work.

Easily over $1 billion in fiscal year 1987 was spent on R&D on the proposals from this conference, with $1.2 billion or more slated for 1988. Clearly, “The United States Air Force is committed to implementing the results of Project Forecast II,” as the executive summary proclaims on p. 1. What are these results—or, more precisely, what’s on this wish list?

Here’s a sampling. New materials are proposed. The use of photons in place of electrons in computers is advocated to speed them up and make them harder to disrupt electromagnetically. There is the dream of
“optical kill mechanisms”—lethal lasers to blind and kill sensors and people on the battleground. Many of the proposals are to help fulfill the Air Force's desire for "rapid, reliable, and affordable access to space." Others are members of "a family of weapons which autonomously acquire, track, and guide to a broad spectrum of air and surface targets in all environments." Specific examples include low-cost drones for surveillance, homing in on radar sites, or carrying their own "smart" antiarmor weapons with a "fire 'n' forget terminal maneuvering" capability. "Smart skins," combining sensors, new materials, and computers in a system capable, they hope, of a "total situational awareness," will be used to cover both independent brilliant weapons and piloted aircraft.

Continual support for the virtual cockpit and the pilot's associate are also strongly advocated. One area of current interest that is somewhat slighted is LIC. The same cannot be said for the other high-tech service and its relatively low-tech junior partner. Both the Navy and the Marines have made future LICs their primary concern.

_Navy 21 and Marines 2000: Force Projection in the Twenty-First Century_

There won't be any noncombat areas in the world. It will all be a potential combat zone.

—Navy 21 study (U.S. Navy, 1988)

Navies have often been the long-arm of empire. It is a tradition that seems likely to last into the twenty-first century. As the former Chief of Naval Operations put it, with some standard stereotypical assumptions,

You can tell these people in the Middle East or Africa that there are eight or ten men sitting in a silo in Montana. They don't give a damn about that. They can't see anything. They don't know where Montana is. But if you say, "Look at that big ship, out there," it has an impact. (Adm. C. R. James, quoted in Fraser, 1988, p. 53)

By the late 1980s, many in the U.S. Navy understood that as the Soviet Union weakened, the United States would be playing a more aggressive role in the Third World. "The next naval battle we fight likely will occur in the Persian Gulf, Mediterranean, or Caribbean," one officer accurately predicted in 1988 (Morgan, 1988, p. 58). But despite the low quality of the likely opponents, high-tech weapons such as Tomahawk cruise missiles are crucial because this is "an era when the loss of even one aircraft in an offensive strike may be politically unacceptable" (Fraser, 1988, p. 54).
So nervous is the Navy about the growing importance of LIC that it has converted one of the new *Seawolf* class of fast-attack nuclear submarines (SSNs) into the most expensive covert operations vehicles ever. The main mission of attack subs has been to destroy Soviet submarines, but with the decline of that threat the need for SSNs has rapidly diminished. In a 1988 article, Lt. Cmdr. Marcus Urioste advocated using SSNs for landing special forces, land attack with cruise missiles, direct surveillance of harbors and coastlines, and delivering robotic vehicles and remotely piloted vehicles and sensors for covert intelligence gathering. He even argued that they are a powerful "psychological" threat in midintensity conflicts as well. The commander left the Navy to work for General Electric's submarine program. By 1995 many of his recommendations had been carried out. Obviously, the real danger to him is a cutback of strategic submarines, so other missions must be found. Otherwise, as he admits, they "may be pressed to justify the modern SSNs' costs for use solely in a superpower confrontation" (Urioste, 1988, pp. 109–112).

The U.S. Marines, obviously, have less to worry about from a shift to low- and midintensity conflicts than does the nuclear submarine force. While the Marines have traditionally been the least high-tech of the armed services, lately they too have been seduced by the promises of microelectronics and other fruits of technoscience. Their over-the-horizon amphibious strategy depends on hovercraft and tilt-rotor aircraft—and, of course, accurate battlefield intelligence. Col. Lawrence Karch, in an article on "The Corps in 2001," is gushing by the end of his piece that, "advanced microelectronics" are "the key technology of precision weapons" which will have "science fiction-like capabilities." He concludes by calling for increased innovation in the Marine Corp. It "must," he proclaims, "continue to evolve and not ossify in its thinking." It also must dispense "with the obsolete," retain "the useful," and "acquire the necessary," while "knowing the differences." Clearly, the key component of war, even for the Marines, is information (Karch, 1988, pp. 40–44).

Cmdr. Thomas Keithly, U.S. Navy, sees a central role for information and information processing. He cites "experts" who "expect at least a 1,000 percent increase in the rate of information exchange." He himself predicts future ships will have rapid computers, fiber-optic networks, optical processors, photonics, and neural networks "to handle data much faster by means of parallel and adaptive processing by using light in place of electrons." And for the "basic problem" of how to handle the data, there will be "data integration, and tactical decision aids" that use artificial intelligence (AI). He even claims that improvements in "command and control will result ultimately in mastery of the radio-electronic spectrum" (Keithly, 1988, pp. 52–54).

The new Aegis destroyers, the *Arleigh Burke* class, are highly computerized. Not only do they have the Aegis system and computer-controlled
engines, but these systems, are linked by a five-path data-multiplex system that ties together the six stand-alone microcomputers that make up the control system, which in turn “monitors and controls the status, health, and commands to just about everything below the main deck” (Preisel, 1988, pp. 121-123). The Arleigh Burke class destroyers also are the first fully pressurized U.S. Navy surface combatants. The hope is that this will help keep nuclear and chemical contaminants out (Morgan, 1988).

As Cmdr. J. Preisel Jr., describes it,

> Everyone in the ship is talking in terms of bits, bytes, and multiplexing systems. Digital logic, with its “and/or” gates, is discussed over chow. This is the engineering department of a naval warship, but it sounds like we have slipped on board the Starship Enterprise. Computers have arrived full force in the engineering departments of today’s surface navy. (1988, p. 123)

It also sounds a lot like today’s Air Force. The Navy is pursuing the idea of stealth ships with a low profile and radar-absorbing coverings. The number of crew needed per ship has been falling for 20 years, and it will fall still further, maybe even to zero a few optimists claim. Drone and semiautomated ships would make it possible for the Navy to have 1,200 ships instead of the 600 planned for the twenty-first century (Keen, 1988, p. 97). Realistically, while there will probably be an increase in the use of air and sea drones, autonomous weapons on ships, AI data sifters, intelligent mines, and so on, crewless ships are hardly likely. But drastic changes do seem in store. One Admiral has proclaimed, “I want the bridge of the next surface combatant—if it has a bridge!—to resemble the cockpit of a 747 aircraft . . . with room for no more than one or two people!” (quoted in Truver, 1988, p. 72) There is even a study group for a paperless ship that would do away with all the manuals and memos that today make up the lifeblood of the Navy. This whole process of reconceptualizing the Navy in terms of new technologies and the old imperial mission is a tremendously complicated bureaucratic dance, which is described in excruciating detail in several articles (Keithly, 1988; Nyquist, 1988; Truver, 1988). But again, what it all comes down to is information.

The Navy 21 study, done by the Naval Studies Board in 1988, argued quite directly that future war is “information war.” One crucial key to winning information war is space, especially space-based surveillance, navigation, communications, and weather satellites. It concluded that the “Navy must control space if it hopes to command the sea.” This led to advocating putting antisatellite weapons (asats) and small satellites (lightsats) on submarines and surface ships as well as giving all ships direct satellite downlink capabilities. One of the report’s major conclusions is that space is as important to the
Navy as ship modernization (Military Space Staff, 1989a, p. 3). But it isn't just the Navy that is enamored with space. For all of the armed services, and the spy agencies as well, space is the place to achieve military superiority.

**Space Command**

It is possible that the first—and perhaps the only—battle waged in the next war will be one of information, and this battle may unfold over access to space.

—*Vice Adm. Jean Chabuab, French Navy*

I'm unabashedly optimistic about the future of military space.

—*Gen. Thomas Moorman, Air Force Space Command*

A military role in space is not just some future plan. NASA's space program is incredibly militarized. For example, in the ten years between 1978 and 1988, of the 99 astronauts 64 were active-duty military officers and 9 were retired officers. The active-duty personnel return to their parent service after seven years or two to three flights. The space shuttle has been committed to numerous military missions. Twelve of the 50 shuttle flights taken by 1991 were totally military and all have some military missions. Besides the many military payload specialists who go up to launch milsats and do military experiments, the services have some special plans as well. The Air Force wants to send up a weather expert. The Army wants to send a geologist and a battlefield observer. The Navy plans for oceanographers and communications specialists. All of NASA's projects have been helpful to the military to some extent, but the rush for military space has made the shuttle program the most militarized NASA project by far (Cassott, 1988, pp. 6–8).

Official military space expenditures already take up 5 percent of the DoD budget, and that percentage is expected to double in the next ten years. The goal of this expenditure is "space control." While there hasn't been any fighting in space just yet, space has been part of terrestrial warfare for a number of years now, not just in terms of the satellites and ICBMs of nuclear war but also because of the role of satellites for reconnaissance and communication in smaller scale conflicts. The DoD has claimed that satellites "leverage" U.S. forces by a factor of 4 or 5. This means, in plain English, that they claim that satellites make U.S. soldiers four or five times more effective. This certainly remains to be proven, and the evidence from Grenada and Panama is that it just isn't true (Military Space Staff, 1990b, p. 1).

Only with the Panama invasion did space become integral to actual U.S. military operations. Even more space systems were used in the Gulf War of 1991. All in all more than 50 satellites played a part in Desert Storm. The visual satellites, code-named KH-11 but also known as Keyhole spacecraft,
are able to see a glove in the desert but can’t count the fingers. A radar-imaging satellite called Lacrosse took “pictures” at night and through cloud cover. Other satellites scanned Iraq with infrared, eavesdropped on electronic communications (Magnum and Vortex satellites), watched the oceans (Parcae satellites), and supplied the UN allies with communications channels and positioning information (Frederick, 1991, pp. 2-3).

This war showed how the military space establishment has grown into quite a large creature. At its head is the Defense Space Council, which gives military input to the National Space Council. The top civilian administrator of military space is the Air Force’s assistant secretary for space systems, who also heads the National Reconnaissance Office, which directs classified space intelligence programs run with the CIA and NSA. Next in the chain of command comes Unified Space Command and then the various services’ space commands. Also there are the Naval Warfare Command, the Air Force’s Space Systems Command, which does R&D and the Army’s Strategic Defense Command, which under SDI is developing ground-based space weapons. Space research and operational centers have proliferated.

The Air Force’s Space Command, for example, directly controls the Cheyenne Mountain Early Warning Center, Patrick AFB, Cape Canaveral, and Onizuka AFB as well as many of the launch sites at Vandenberg AFB. The Air Force’s Space Systems Division controls parts of these institutions and the Onizuka Consolidated Space Test Center and the rest of Vandenberg AFB.

Along with all the military satellites and research centers (which includes DARPA facilities and labs of the other services’ research arms), the military has a large stake in NASA projects, most notably the shuttle as mentioned above, the Space Station, and perhaps someday the Space Exploration Initiative (SEI) of the Bush administration, which aims to get humans back on the Moon by 2000 and to Mars by 2019. What the military hopes to get from this is help in financing and developing its Advanced Launch System and also some vague role in guaranteeing “Freedom of Space” beyond Earth’s orbit.

Closer to home the military has begun to seriously worry about the proliferation of missile capability to Third World nations. The CIA has estimated that by the year 2000 six developing countries will have ICBMs and nine others will have intermediate-range missiles. This threat has become a major justification for continuing SDI (Military Space Staff, 1990b, p. 3). The Pentagon has set up a Proliferation Counters Group to worry about this, and they admit that the spread of missile technology will seriously affect “our strategy for intervention in [Third World] areas” (Military Space Staff, 1990c, p. 3).

Perhaps the Pentagon’s most important futurology study was the report of the Commission on Integrated Long-Term Strategy, described in detail
below. One of its cochairs, Albert Wohlstetter, a key adviser to then Vice President Dan Quayle, has stressed that a very important conclusion of the commission is that space must be totally militarized. "Space will be no sanctuary," he promises, "but will be an important determinant of the outcome of the war." The Commission strongly came out in favor of asats, lightsats (but not cheapats), better tacsats, and more fatsats, if they are survivable. ("Sats" is short for satellites; "a" means anti; "tac" means tactical; "light" means small; "fat" means big; "com" means communications; "mil" means military.) It even argued for possibly staking claim to hunks of space in arcs of up to 15 degrees around key space weapons and making them free-fire zones (Military Space Staff, 1989b, p. 3).

The commission's Regional Conflict Working Group called for communications and spy satellites to fight the drug wars and even to control unmanned vehicles for eradicating fields of illegal substances. They also advocated an increased role for space technology in all LICs. All these recommendations the commission included in its final report (Military Space Staff, 1988d, p. 8).

Space is the high ground. For the Army little more needs to be said, although the idea is taking awhile to sink in. In the Air Force, despite the resistance of the pilots, it is clear that a commitment to "aerospace power" is behind their serious investment in militarized space. Even the Navy is more and more coming around as various analysts argue that space power is connected to sea power. Usually, space power is seen as a way of preserving sea power, but for some the equation is better if reversed. Adu Karema, a civilian scientist working on naval space systems, claims unconvincingly that "Control of the sea will be more important than ever since such control is necessary to guarantee our access to space or deny access to our enemies" (Military Space Staff, 1988c, p. 8).

What all this adds up to is lots of satellites. A congressional report in 1988 said that the Pentagon planned to have 150 satellites in orbit by the year 2015, not counting the 10,000 or so needed for SDI. As Space Command is already having trouble controlling its satellites, this seems a very ambitious program (S. Johnson, 1988, pp. B1, B4).

So space is the final war frontier for all the services. But what is the overall plan for twenty-first century war? President Reagan appointed a commission to determine just that. It "integrated" the various Pentagon and intelligence proposals for future war.

**Integrated Long-Term Strategy**

In one sense U.S. military strategy, at least as far as technoscience is concerned, is a wild grasping at any new possible weapon. Whenever a scientific discovery is made or even predicted, the Pentagon is there seeking
ways of turning it into new weapons. In computing, this can be seen with the massive support for neuro- and parallel computing research, both heavily financed by the DoD. Danny Hillis, the inventor of the connection machine, even claims that "The military is paying for the development of all the interesting parallel computers" (Brand, 1987, p. 193).

But this faith in technoscience extends beyond computing to almost every traditional science fiction weapon including force fields and death rays (S. Johnson, 1986, pp. A1, A17). Superconductors, the military hopes, will allow for all sorts of killing rays and spy beams. After the superconducting discoveries in 1987, military spending on superconductivity in the United States jumped immediately from $5 million to $12.5 million, and it was predicted to hit $150 million within a few years (S. Johnson, 1987, pp. A1, A24).

Yet this technophilia is not mindless. Whatever new technologies seem to come out of these spending frenzies are put to work in a much more important arena than actual war; they are deployed in justifying war. It is a sign of the maturity of AI research, and its centrality to military discourse, that it supplies the basic rationale for structuring and justifying U.S. military policy into the twenty-first century.

In 1988, a very important report was made on what the long-term strategy of the United States should be. The cochairs were the recently retired undersecretary of defense, Fred Ikle, and Albert Wohlstetter, the one-time RAND analyst whose military consulting has made a him millionaire. The panel also included a former secretary of state, Henry Kissinger, a former national security adviser, Zbignew Brzezinski, a former chairman of the Joint Chiefs, Gen. John Vessey, a former NATO commander, Gen. Andrew Goodpaster, the hard-line academic Samuel Huntington, and others only slightly less famous.

The main thrust of their report, entitled Discriminate Deterrence, is that new weapons must be developed to enable the implementation of a new doctrine of "discriminate" nuclear war. These new weapons would be "smart" conventional and nuclear missiles. Why is such a doctrine needed? The surface argument is that massive deterrence is not credible. Would the United States destroy Europe, maybe even the world, if Russia invaded Norway? So instead of a general nuclear war, the report calls for a conventional and limited nuclear response using thousands of smart weapons. But actually there are other factors besides a fear of a Russian invasion of Norway that shape the reports' recommendations.

First, there is politics. Wohlstetter admitted during an interview that "It became politically possible to say these things, because it was politically necessary" (Stewart, 1988, p. 1). The political necessity came from the growing irrelevance of NATO in the face of the collapse of the Soviet empire. The report deemphasizes NATO to an amazing degree, especially for 1988.
The second important factor is the recognition that the hegemony of the United States and the (former) USSR is weakening. The future will be "a far more complicated environment than the familiar bipolar competition with the Soviet Union," the report warns. It also predicts that in the twenty-first century over 40 countries will be able to build their own advanced weapons, including chemical, biological, atomic, and missile delivery systems. Along with this threat the United States will face "a broader range of challenges in the Third World" that will require highly mobile forces and a downgrading of the European theater. Since the Cold War with the Soviets has ended, it is not surprising that the "wise men" who wrote the report advocate terming LICs a form of "protracted war." When possible, these threats should be met with U.S.-financed, -trained, and -armed proxy forces, supported from afar with long-range precision-guided weapons.

Finally, the third rationale behind this worldwide version of Vietnami- zation is the claim that "a microelectronic revolution" makes conventional weapons as effective as nuclear weapons in many cases:

The much greater precision, range and destructiveness of weapons could extend war across a much wider geographic area, make war much more rapid and intense, and require entirely new modes of operation. (from the report *Discriminate Deterrence*, quoted in Weiner, 1987, p. A1)

Basically, the report is a call for the relegitimation of warfare. LICs are to be rehabilitated as "protracted war" and fought with high-tech computer weapons. Even limited nuclear war is to be considered a viable option, officially only in Europe, but obviously with any of the potential 40 or so middle-ranking powers as well. There must be wars, the report seems to say in many different ways, and computers will allow us to have them without destroying the world or domestic support for empire. Info/cyber/netwars are just the latest flourish of this year's revolution in military affairs.

Just how far this thinking can go is shown by the Pentagon's planning for World War IV. Starting in 1981, shortly after Ronald Reagan took office, the DoD began planning on how to fight and win a six-month global war and still be ready to fight another one, mainly by using computers:

Long after the White House and Pentagon are reduced to rubble and much of civilization is destroyed, the strategy calls for computers to run a war no human mind could control, orchestrating space satellites and nuclear weapons over a global battlefield. (Weiner, 1990)

The plans for World War IV depend on a number of systems: Milstar satellites, command tractor trailers, a nationwide network of 500 radio stations, and a working army of robots "that can gallop like horses and walk
like men, carrying out computerized orders as they roam the radioactive battlefront." These robots will take orders but, in DARPA's words, they will "not generate discourse." Almost all of this World War (III and IV) planning is top secret, hidden away in secret budgets. But what can't be hidden is the incredible commitment to war that such plans demonstrate. Even after a nuclear holocaust, in the face of almost all scientific and humanistic thinking, most military professionals think that there still must be war—but not all of them do. Some are beginning to think that there must be an end to war, as we shall see in the next chapter.