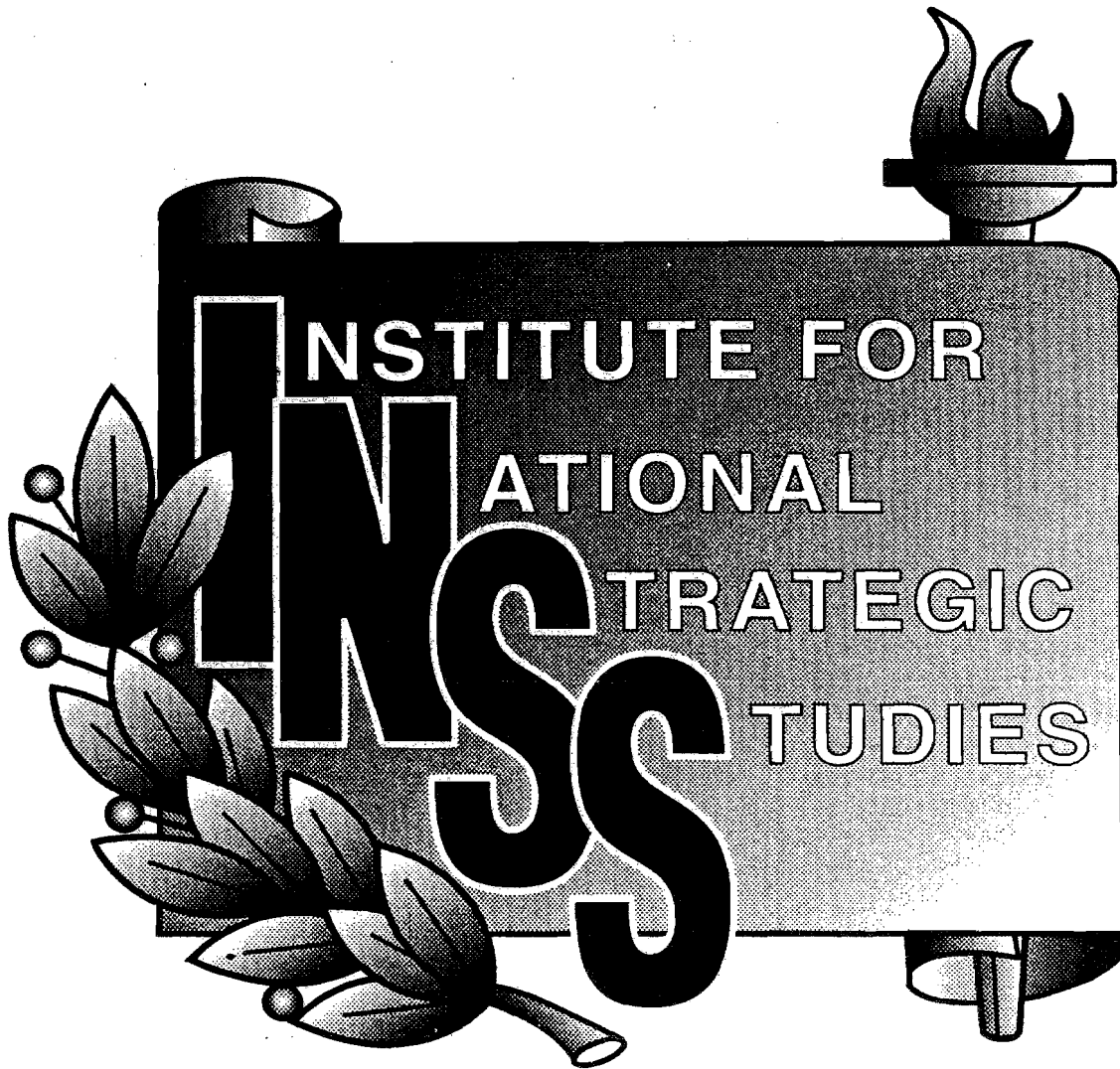


# PROJECT 2025



**INSTITUTE FOR NATIONAL STRATEGIC STUDIES  
NATIONAL DEFENSE UNIVERSITY**

# PROJECT 2025

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## PROJECT 2025

### INTRODUCTION

*How the Great Democracies Triumphed, and Were Able to Resume  
the Follies Which Had so Nearly Cost Them Their Life.*

*--Winston Churchill*

It is an endearing but unfortunate American characteristic to conclude a war by saying, "It's over, we've won, let's bring our troops home." We paid a bitter price for such shortsightedness in 1941 and again in 1950. Yet surely the prospects for peace in 1919 and 1945 looked as promising as they do today. We were lucky that the Cold War of the last 40 years did not result in a cataclysmic hot war that civilization could not have survived. American will, strength, and sacrifice produced our third strategic victory of the 20th century. It would be an unforgivable delusion, however, to behave as though we are now ineluctably entering an age of universal and endless peace and harmony. In the short term we can certainly afford to reduce our defense expenditures as the immediate threat to our security recedes. We cannot, however, allow ourselves, over the long term, to become weak and risk being unprepared for the unseen danger that may lie hidden in the future, as we have done twice in the past.

The immediate challenge to national security planners is to preserve the minimum force structure essential to maintaining strategic deterrence and supporting U.S. political and economic objectives abroad for the foreseeable future. Even in the absence of a major threat to global security, U.S. conventional military capabilities must still be sufficiently robust and credible to deter regional adventurism in areas crucial to the national interest. While our military planners reduce the size of our armed forces, they must also, with an eye on long-term contingencies, craft both research and development, and procurement strategies. These strategies should be designed to allow the United States to maintain its technological battlefield superiority, on the one hand, and a mobilization capability sufficient to deter or deal with the reemergence of a regional or even a global threat, on the other.

Accordingly, military planners must try to anticipate the kinds of trends, or shocks, that could transform the global security environment over the course of the next generation. Forecasting them lies at the heart of Project 2025. The Project itself was conceived by the current Vice Chairman of the Joint Chiefs of Staff as a means for injecting long-term strategic vision into U.S. military planning during a time of profound international upheaval, when the shape of the battlefield of the future is not yet entirely clear because of the still unfolding revolution in military technologies, a revolution that promises to be as profound as those brought about by, first, the entry of the air-tank team and by, next, the invention of thermonuclear weapons.

Analysts were asked to consider the future, unconstrained by traditional military thinking. In Phase I of the study, three independent, private analytical

organizations and the Defense Intelligence Agency set forth 13 different versions of what the world might be like in the year 2025. They assessed salient long-term geopolitical, economic, demographic, technological, sociological, and ecological trends. The results of the Phase I analyses are summarized in Appendix B. They ranged from the dire to the utopian. On the violent side of the ledger, SRS Technologies envisaged a radical, more or less united pan-Islamic bloc waging a disruptive and deadly holy war against the West. In an entirely different vein, a group of earnest academics from the University of Houston-Clear Lake created a "green" scenario in which the United States sets aside its arsenal altogether and devotes its energies exclusively to saving the planet from the enormous ecological damage it has suffered.

The fruits of these organizations' efforts were suggestive, not only of the bewildering variety of circumstances that may occur in the future, but also of the need to approach long-term planning with a method that is neither arbitrary nor inappropriately "scientific."

In Phase II of the project, the National Defense University's Institute for National Strategic Studies (INSS) trimmed off the improbable versions it had examined, retained scenarios and some of the specific observations within them that seemed both plausible and relevant for U.S. security planning, and then engaged in some "futuristics" of our own.

In looking a generation into the future, we experimented with two diametrically opposed assumptions: continuity and dislocation. We first looked to the preceding generation and noticed the remarkable continuity that has characterized both the international and the strategic environments. Since 1956, thermonuclear weapons delivered by long-range ballistic missiles and bombers comprised the dominant strategic forces; aircraft carriers and submarines were the capital ships of the world's great navies; and artillery and main battle tanks dominated the land battlefield. The leading world powers were the United States and the Soviet Union. George Kennan had identified the United States, the United Kingdom, Germany, the Soviet Union, and Japan as the five centers of military-industrial power. By 1991, the technology and the political environment have changed, but in more or less linear fashion. Both the technological and political factors that were dominant in 1956 have indeed evolved, but they are still recognizable and, even with an ailing Soviet Union, are still dominant. The world in which today's leaders grew up has been relatively predictable.

It is useful to remind ourselves, however, that the security environment has not always charted so linear a course. The time from 1916 to 1951 is also 35 years. In 1916, battleships were the capital ships of the world's great navies, artillery and infantry shaped the land battlefield, and aircraft were used primarily for reconnaissance. The world's dominant political competitors were Great Britain and Germany, while Asia and Africa were parts of the empires controlled by the great powers of Europe. The United States was isolationist and determined to stay out of any European war. By 1951, of course, the overseas colonial empires were dead or in their death throes, the United States was committed by treaty to the defense of Western Europe and had deployed troops to Asia, Africa, and Latin America, and major ideological revolutions were occurring, or had already occurred, in what had been Europe's stagnating empires. The military world had seen not one but two major technological revolutions. The first had been created by the introduction of the internal combustion engine, radio, and combat aircraft; the second, by development of nuclear and thermonuclear weapons and long-range missiles.

In considering the possible discontinuities that may characterize the next 35 years, U.S. military planners should consider the fact that the world seems to be on the brink of an era of dynamic political transition, and that technology has already crossed the threshold into an era of new and qualitatively different developments that could cause the world to change at least as radically as it did between 1916 and 1951.

Simply reducing the size of the U.S. armed forces would be appropriate for a world in which the only change in the strategic environment was the diminution of the Soviet conventional threat. It would fail, however, to prepare us for the profound changes the coming decades may have in store. This report attempts to sketch a more complex future, which could include a number of dramatic shocks to the security environment caused both by substantial military-technological advances and by changes in the economic and political balances of power. It does not predict these shocks will occur. Rather, it has tried to employ informed and disciplined imagination as its method, and plausibility as its criterion, to envisage events that could lead to a radically altered future. Such events will be described not because they are necessarily likely (how predictable was Hitler in the early 1920s?) but because they have some degree of plausibility and because, should they occur, they would have enormous implications for those who must plan for the future security environment. The first four chapters describe plausible technological and politico-military trends and shocks, and identify key issues for U.S. national security and force structure planners. The next two chapters derive the kinds of missions the future security environment is likely to produce, and examine how technologies within our grasp, or just over the horizon, may affect our ability to carry out such missions. The penultimate chapter puts forward a long-range procurement strategy that might be implemented now and that is designed to deter trends inimical to the national interest and to prepare U.S. armed forces to counter those trends should such deterrence fail.

## 1. THE DEVELOPING WORLD

By the year 2025, the range of variation among the developing countries is likely to have become even wider than it is today. Some of those countries will have emerged as major economic and possibly military powers, with substantially expanded industrial production capabilities, increasing per capita incomes, and, perhaps, sophisticated armed forces. Many more will remain weak and mired in poverty, barely able to feed their rapidly growing populations. Even now it is hardly appropriate to lump all these countries into a single category. It will be less so in the future. For the purposes of this Project, then, the terms "Third World" and "developing world" will simply designate geographical areas: the countries of Latin America, Africa, the Middle East, and parts of Asia.

The next 35 years may see three broad trends that could threaten U.S. interests and conceivably require a military response. The first and most likely stems from the chaos that will continue to characterize certain parts of the developing world. This chaos will prevail because many developing states will continue to be extremely weak internally. In some cases the collapse of a particular regime or the impending disintegration of an entire nation may cause concern to the United States as instability in one country threatens to spill over into local or even regional conflicts.

Second, by the year 2025 a handful of states in the Third World will almost certainly emerge as major military powers, equipped with weapons of considerable technological sophistication and great destructive power. Such states could pose significant threats to U.S. citizens abroad and to our regional allies and interests; they could conceivably have capabilities sufficiently lethal to menace the United States itself. It is hardly unimaginable that some of the sophisticated weapons technology that the United States deployed against Iraq in the recent Gulf War could someday be deployed against U.S. forces.

Finally, while in the past the United States has usually had to confront only one hostile Third World power at a time, in the future there may be alliances among Third World states that could pursue objectives inimical to U.S. interests. Future conflicts could turn the pattern of DESERT STORM on its head. Instead of leading a global coalition against some single Third World nation in an expansive mood, the United States might find itself standing alone against a substantial alliance of Third World countries.

### CONTINUING CHAOS

#### The Roots of Instability

First World nations usually possess four stabilizing features that many developing countries (especially those in Africa, the Middle East, and parts of South Asia) lack: cultural cohesion; leaders whose authority is accepted by their countries' citizenry; leadership with a sense of responsibility to citizens; and effective bureaucratic structures for governing.

It took centuries for the nations of modern Europe to acquire the legitimacy and develop the institutions that make them what they are today. The great majority of nations in the developing world received independence only after World War II. Even

with the model of the First World to guide them, they have not had the time to evolve into cohesive nation-states in the mold of, for example, European states. That the governments of the developing world are so often weak makes the problem of creating cohesion all the more difficult.

Contributing to the problem is the artificiality of many developing countries, born from the legacy of colonialism. The great majority were, until recently, colonies. The imperial powers created them by drawing lines on a map where none had previously existed. Although the degree to which the newly formed boundaries coincided with the boundaries of indigenous societies varies -- high, for example, in Southeast Asia; virtually nonexistent in Africa and the Middle East -- in all cases, formal divisions replaced what had been highly fluid regions of ethnic predominance. Because of the arbitrariness of their borders, many developing states began as and remain synthetic constructs rather than coherent entities with a sense of a common cultural identity. Even in Latin America, where the impact of colonialism is more remote, the crippling legacy of Spanish and Portuguese rule have inhibited the development of stable, cohesive countries.

Colonialism's legacy has made it exceptionally difficult for many developing states to achieve national consciousness. Their ethnic composition results from decisions made by their colonial masters -- decisions not always designed to promote internal stability or cohesiveness. Multiethnic nations have been created, many with governments lacking the power to impose their authority on the disparate ethnic groups that now comprise them. Dividing ethnic groups by arbitrary borders (as in the case of the Kurds) or denying statehood to ethnic groups not living within fixed borders (as in the case of the Ibos in Nigeria) has written instability permanently into regions where such divisions have occurred.

This artificiality has meant that the groups concerned often do not owe their allegiance to the governing regime and act for reasons other than national interest. Instead of identifying with the state, individuals identify with ethnic, religious, or regional groupings. This condition perpetuates instability by preventing the formation of a national consciousness. With anticolonial sentiment dissipating, identification with the subnational group is actually becoming stronger in many places. Accordingly, the prognosis for the development of state consciousness is depressingly bleak. Rather than overcoming the differences among these groups, the state is simply the representative of that group that holds power in the capital. In such a situation, the state's formal leadership becomes just another contender in a struggle for power that sometimes exhibits few constraints.

Leaders in the developing world typically enjoy less legitimacy than leaders elsewhere. Regimes that have been created through force are narrowly based and depend upon suppression to remain in power. Because they lack legitimacy, they face continual threats to their rule. Moreover, developing states often lack effective institutions for mediating political disputes. The result is a "praetorian society" in which groups take direct political action to achieve their goals, with the strongest group, usually the army, prevailing.

Third World regimes are distinctive in that they control a much greater share of wealth and power than other groups in society. Seizing control of the state is often the only means for the ambitious to satisfy their wants. Hence, any given group of leaders must continually fend off the many other groups and individuals who are excluded from power and participation. At the same time, those in power will resist mightily attempts to displace them, since the loss of power will often mean loss of



their lives. Understandably, then, Third World leaders often act more ruthlessly than other leaders to maintain their position.

Many Third World states have authoritarian governments. Although this is in part a legacy of a colonial past, cultural factors (such as religion, general illiteracy, and prevailing ethnic and tribal codes) reinforce its persistence. Accordingly, active political participation by the populace in most Third World countries remains the exception. Decisions, especially about foreign policy, are usually made by a single individual and the narrow elite that surrounds him. Although that elite does not have complete flexibility in making policy, it typically has less need to be responsive to national or institutional concerns than elsewhere. Public opinion usually carries little weight, and institutional structures are often a sham, playing only a minor role in the making of foreign policy. The concentration of so much power in so few hands increases the tendencies toward instability and repression in many parts of the developing world.

Not all Third World countries will share these characteristics equally. Different states have varying strengths and weaknesses. What justifies considering the Third World as an analytic category is that whatever combination of factors may exist in particular Third World states, their cumulative impact makes virtually all of those states less stable and more vulnerable, especially to internal threats, than states elsewhere. While a forcible change in regime by coup or insurgency is imaginable almost anywhere in the developing world, such an event is virtually unthinkable among the states traditionally referred to as belonging to the First World.

### Why Instability Will Persist to 2025

Not everyone will accept this portrait of a developing world in which large numbers of states are endemically unstable. Many Third World states have developed or may soon develop to the point where internal threats and other forms of instability will no longer dominate. Even if some Third World countries manage to develop out of their "Third Worldness," however, the majority show no signs of doing so. Nor is it clear that even the more politically advanced Third World states are developing to the extent that they can be considered to have left the Third World. States enjoying prolonged periods of stability, seeming to have eliminated the prospect of internal threat, have reverted suddenly to instability. Insurgency in the Philippines, drug wars in Colombia, rebellion in Sri Lanka, and the recent coup in Haiti have all challenged the notion that the new democracies need no longer fear serious domestic unrest nor require outside assistance to deal with internal threats. Even Third World countries such as India, which have not experienced coups, have to struggle against separatist forces within the body politic. The prospect of civil war in the People's Republic of China that emerged in the wake of the 1989 Tiananmen Square massacre illustrates how the drive to modernity and stability might not be as inexorable and smooth as once hoped.

The factors that tend to make large parts of the Third World unstable today are likely to persist well into the 21st century. Adding to existing problems is the enormous growth in population that will probably occur over the next several decades. Even today the West comprises a small and decreasing portion of the world's inhabitants: western industrial democracies currently represent a mere 12.7 percent of world population, and -- always barring the unforeseen -- that proportion will fall to 11 percent by 2000 and 8.6 percent by 2025 (percentages calculated by the World

Bank, *World Development Report 1990* (Oxford, 1990), pp. 229, 244). The population of the Third World is doubling every 25 years. In contrast, Europe's population, which is about 600 million, will remain virtually constant throughout the same period.

There are a few signs that the developing world will be able to cope with this explosive growth, particularly the recent discrediting among a large part of the developing world's elite of socialism as an economic ideal and Marxism-Leninism as a basis for building a polity. In part lacking viable alternatives and in part buoyed by the advances made by several Third World states, a number of nations in the developing world have begun to adopt market-based economies and have moved to liberalize their political systems. To a large extent, the critical variable in determining future development (or lack thereof) in the Third World will be whether this trend sustains itself or becomes a mere historical anomaly. Unfortunately, political interests and long-standing cultural factors suggest that the latter is more likely to be the case.

Accordingly, competition over increasingly scarce resources will weaken much of the Third World. Already hard-pressed governments will be fortunate if they can prevent the deterioration of the current dismal state of affairs. We can anticipate a Third World in 2025 even more conflict ridden, fractious, and poverty stricken than it is today.

#### Implications of a Chaotic Developing World

Chaos in the Third World will create a landscape dominated by conflict well beyond the year 2025. As is the case with the contemporary Third World, internal threats (coups, rebellions, civil wars) will be the principal challenge to Third World leaders' hold on power. Only a handful of Third World leaders (Uganda's Idi Amin, Cambodia's Pol Pot, Panama's Manuel Noriega) have fallen because of outside invasions. Hundreds of Third World leaders have been overthrown from the inside. Since 1945, wars within states have outnumbered wars between states. Coups d'etat alone have accounted for nearly 200 regime changes in the Third World, making coups the Third World's most common form of coercive regime change. Third World leaders understandably will have to continue to pay attention to retaining their hold on power in the face of domestic challenges.

Internal instability will produce external consequences. At the very least, it may induce leaders to attempt to offset problems at home with a bellicose foreign policy. Some will seek to protect themselves from the spillover of conflict -- an especially acute concern in the developing world where ethnic groups often straddle political frontiers. Other states may seek to expand their interests by attempting to determine the leadership of neighboring countries. Since most developing countries will likely continue to lack the capability for protracted conflict beyond their borders, assisting a neighbor's internal threats may well be seen as an inexpensive, deniable, and effective means to extend one's influence. Granting of requests for help from either insurgents or those in power by outside states will consequently be a likely feature of the developing world in 2025.

The involvement of outside states in internal conflicts means that the developing world will continue to be beset by interstate conflict. We live in an age in which wars between and within states outside the developing world have virtually ceased. The reasons -- fear of nuclear war, economic entanglement, the desire to

avoid another World War II, and a growing acceptance of western liberal democracy -- do not apply to the developing world.

Continuing instability will ensure that many countries of the developing world will be unable to deal with the related problems of overpopulation and low quality of life that plague these countries today. Two implications stem from this stark observation. First, attempts at emigration to the developed world will likely intensify as the gap between the "haves" and "have nots" continues to widen. Second, the human misery in the developing world from starvation, disease, and vulnerability to natural disasters (some 40,000 children die in these countries each day from mostly preventable causes) will likely worsen in 2025.

### Threats to U.S. Interests

Why should the United States care if the developing world is in a deplorable, chaotic condition by 2025? Why not simply isolate the United States from the developing world and its problems? Although tempting, this course is not one the United States and other advanced industrialized states will be able to follow. Instead, the developing world in 2025 could continue to threaten U.S. (and other states') interests as it does now. This can be seen by examining the challenges to U.S. strategic, economic, and ideological interests that the developing world is likely to mount in the year 2025.

*Strategic Interests.* The developing world will probably pose the greatest threat to U.S. interests in the military-strategic realm. If the Soviet threat should reemerge by 2025 or if another major competitor were to appear on the scene, the developing world could once again become a major arena of competition between great powers. Access to military facilities, the securing of bases and allies, and the protection of sea-lanes of communication might once again become of great concern to U.S. strategists. Developing states such as Panama, Cuba, the Philippines, and Somalia could again assume geostrategic importance.

In the event that the Soviet Union (or another major power) does not compete with the United States for influence, the developing world may still pose a significant autonomous threat to U.S. security interests. The principal threats will stem from the comparative handful of strong developing states that gain possession of nuclear weapons and other means of mass destruction. Other threats, however, will also warrant serious U.S. consideration. Even the weakest of Third World states will continue to be able to threaten U.S. interests by endangering the lives of U.S. citizens traveling or living abroad. Terrorism will likely remain a source of concern in 2025.

The developing world may threaten U.S. interests in ways not usually thought of in terms of security. It is questionable whether the massive drug trafficking to the United States (most of which originates in the Third World) will seriously abate in the next 35 years. Demographic pressures will create demands by the peoples of the developing world to enter the United States and other western advanced industrial countries. The prospect of internal instability afflicting Mexico, although it is less probable now than it was a decade ago, would nonetheless make the problem of emigration especially acute. The United States can always try to close its borders, but only at significant moral and financial cost. The Third World will also affect U.S. security through its impact on the global environment. If it is true that the burning of tropical forests contributes to the greenhouse effect and that the greenhouse effect

will worsen over the next several decades, this issue should be especially salient by 2025.

*Economic Interests.* The Third World has consistently accounted for about one-third of U.S. imports and exports. There is no indication that this share will drop in the next 35 years. If Third World chaos interferes with this trade, the U.S. economy will suffer. Accordingly, the United States will have to be concerned about instability affecting its major developing world trading partners, which today are Taiwan, Hong Kong, South Korea, Singapore, and Mexico. Mexico is of particular importance because it is subject to many of the problems that plague the developing world and because it is so important to the U.S. economy. At present, Mexico buys more exports from the United States than does any European country (it ranks third in the world behind Canada and Japan) and is a greater source of imports to the United States than any European country except Germany (it ranks fifth behind Japan, Canada, Germany, and Taiwan). By the year 2025, India's GNP may be equal to that of France, and Brazil's may be as large as Great Britain's, making at least some Third World countries major economic actors and presumably of concern to the United States.

In 2025, the United States and its allies could be even more dependent on foreign oil than they are today. At present, imports meet half of U.S. oil requirements, more than 60 percent of Western Europe's, and virtually all of Japan's. With no new oil explorations on the horizon, with production in the United States and the Soviet Union declining, and with efforts at conservation reducing consumption only at the margins, all indications are that, barring some breakthrough in the development of an alternative energy source, the amount of oil that the United States and its allies will have to import will increase substantially. The existing excess production capacity of ten million barrels per day will almost certainly have vanished by 2025. A major portion of the shortfall will have to be made up by the Persian Gulf states, which possess two-thirds of the world's current excess production capacity and known reserves. Consequently, U.S. dependence on Persian Gulf oil is almost certain to increase in the next decade.

In addition to oil, the United States currently imports more than 90 percent of its manganese (needed to manufacture steel), chromium (necessary for jet engine parts), cobalt (required for high-strength steel alloys), and platinum (used for refining and communication equipment). The United States depends on a handful of states in southern Africa for these minerals. Although stockpiling and synthetic substitutes might help, they would not eliminate entirely the damage a long-term disruption of the supply of these metals would do to the U.S. economy.

The United States will not be able to rely totally on the economic self-interest of all developing nations to ensure access to the raw materials it will need in 2025. Religious fundamentalists may refuse to trade with the United States for any price. The chaos that could characterize large parts of the developing world in 2025 could also disrupt vulnerable transportation and extractive facilities, creating shortfalls regardless of the wishes of any state. The prospect of continuing instability is especially alarming in the Persian Gulf, where powerful internal threats like the Shiite communities and radical Palestinians may prove especially difficult to deal with. The United States cannot assume it will have easy access to critical raw materials during the next generation.

*Political-Ideological Interests.* The United States may also become involved in the Third World in order to extend democracy. The Third World, as we have seen, will encompass a far greater portion of the world's population in 2025 than it does today. With Western Europe and Japan democratic and Eastern Europe democratizing, the Third World will be the last frontier where the extension of democracy can take place. Because democratic states rarely go to war with each other, there will be a practical purpose in promoting democracy globally.

The United States will also be concerned about the Third World for humanitarian reasons. The weak states will be unable to cope with exploding populations, ethnic conflicts, and declining resources. In an age of mass media and instant communications, graphic images of Third World suffering will be transmitted to the United States, making inaction all but impossible. Just as television pictures of the Ethiopian famine and the plight of the Kurds forced the United States to act, so may the even greater horrors of the Third World in 2025 impel Washington to action. The temptation will no doubt exist to ignore the troublesome Third World. If history is any guide, however, domestic pressure may not in all cases allow us the luxury of nonintervention.

## NEW MILITARY "SUPERPOWERS"

Any discussion of the possible future emergence of Third World military superpowers must begin with some consideration of the fate of the most recent state with such expansionist ambitions. In the aftermath of the war with Iraq, there has been an understandable tendency to concentrate on the lessons that the United States ought to have learned from the experience. Equally important, however, is the question of what other countries will learn and, in particular, how the spectacle of Iraq's defeat may influence the behavior of other Third World states with expansive military and political aims.

### The Third World's Lessons Learned from the Gulf War

It would be nice to think that, having witnessed a deeply impressive display of U.S. technological and operational prowess, potential enemies would simply throw up their hands and abandon any hope of ever being able successfully to confront the United States. What seems more likely is that other countries will study the Gulf War in an attempt to learn how they might better counter, match, or trump the capabilities of a more advanced military power.

Less sophisticated states may be able to reduce or nullify an opponent's advantages through the daring or ingenious use of their own capabilities. Saddam hoped to offset the U.S. technological edge by forcing the United States to fight an old-fashioned, high-casualty ground war in which he would enjoy the position of defender. This strategy failed miserably and it seems unlikely that any future opponent will think it can defeat or deter the United States simply by digging in behind static defenses. Third World students of Saddam's disastrous campaign may also conclude, however, that his biggest mistake lay in not being sufficiently audacious. The Gulf War demonstrated the United States' awesome logistical capabilities, but it also provided ample illustration of the difficulties involved in transporting and equipping vast forces over enormous distances. Saddam gave the United States more than five months without harassment in which to assemble its military might on his frontiers, and he then compounded his error by allowing the

enemy to strike the first blow. If his only hope of winning lay in imposing high casualties, he would have been better advised to seize the initiative and to hold it for as long as possible. This may be one operational lesson that Third World analysts will learn from the Gulf War.

Throughout history, the display of superior military technology by one state has tended to encourage others to seek similar capabilities. Having seen what cruise missiles can do, those Third World countries with military ambitions may now redouble their efforts to acquire them. Doing so may not be easy but, as will be discussed more fully below, neither is it impossible. No Third World state will be able to match the full range of capabilities that the United States could bring to bear against it, but some may have hopes of narrowing certain gaps or at least of preventing them from growing wider. Among other things, the war demonstrated the absolutely critical importance of intelligence and, in particular, the value of overhead reconnaissance. Where Saddam was blind and deaf, the United States and its allies could see and hear virtually everything that his forces did or tried to do. We should expect ambitious Third World states to look for ways of evening the odds by doing what they can to acquire similar kinds of information.

Before the Gulf conflict many observers anticipated that, if he could not match or counter U. S. and allied forces in actual combat, Saddam might be able to trump them through the threatened or actual use of various kinds of unconventional weapons. The way in which the war unfolded may teach different lessons about the political and military utility of each of the types of weapons. Chemical and biological weapons, once touted as "the poor man's atomic bombs," did not turn out to be of much use to the Iraqis. The threat that they would be employed did not deter a coalition attack, intimidate the local states on whom the United States relied for logistical support, or help to draw Israel into the conflict. Whether they chose not to employ them or were actually physically incapable of doing so once the war got underway, Iraqi forces did not use chemical or biological agents to try to break up the allied assault. Third World observers may conclude that such weapons are of use only against less sophisticated and less well equipped opponents. Ballistic missiles, by contrast, gave the Iraqis their only real moments of political, if not military, satisfaction. The televised spectacle of Iraqi SCUDs raining death and destruction (even if only in limited doses) on Israel and Saudi Arabia cannot have escaped the notice of Third World military analysts. The ability of mobile launchers to evade, for a time, even a massive search by U. S. and allied forces must also have been impressive. A larger and more capable missile fleet could at least have raised the costs of the war to Iraq's enemies. Where the perceived value of chemical and biological weapons may have fallen as a result of the war, that of ballistic missiles has probably risen.

The ultimate Iraqi trump card would, of course, have been a working atomic weapon. An unintended but extremely important lesson of the Gulf War may well be that, if they are to have any hope of deterring or coercing the United States, Third World states will need first to acquire some kind of nuclear capability. Saddam's ability to conceal even a fairly large nuclear program from outside scrutiny has now been amply demonstrated. In retrospect, his greatest failing may appear to have been simply a lack of patience in waiting for that program to come to fruition. Other regional powers may not make the same mistake. Some evidence for this kind of thinking can be found in recent remarks by a former high-ranking Indian military officer. If they want to be able to stand up to the "big powers," this officer observed in the wake of the Gulf War, Third World states must take steps to make themselves "big and ugly." "To qualify as being ugly enough," he continued, "it would be

necessary to be a nuclear weapon power. A small nuclear power is good enough. Ability to reach big power home territory with one's weapons is not mandatory." Although it is troubling to think that recent U.S. successes in the Gulf War might end up providing a spur to nuclear proliferation, this possibility cannot be ignored.

### The Diffusion of Military Capabilities

By 2025 a number of Third World countries will be able to deploy military systems equal to and perhaps even superior to those the United States currently deploys. Assuming that the United States continues to modernize its forces, some gap will be preserved between us and our would-be antagonists in the Third World. Nevertheless, that gap may become intimidatingly narrow in the years ahead.

The Third World countries that have acquired the most impressive military capabilities over the past 35 years have had one or more of the following attributes: money, a foreign sponsor, and indigenous production capabilities. The simplest way of getting sophisticated weaponry is, of course, to buy it. Countries with the most money have been oil exporters like Saudi Arabia, Iran, and Iraq. Even countries that cannot afford to pay for all the arms they import (Vietnam, Israel, Egypt, and Syria) have been able to equip themselves with the help of friendly foreign donors. Such assistance has generally been extended by one of the superpowers (and occasionally by third parties like China). Relatively small countries that have advanced scientific and technical resources (Israel and South Africa) have been able to develop some sophisticated capabilities on their own or with limited external assistance. A handful of large and comparatively poor countries (China and India) have achieved similar results by mobilizing some substantial fraction of their enormous human and raw economic resources for the purpose.

What role will each of these three mechanisms play over the next 35 years? If alternative sources of energy do not become available, diminishing petroleum reserves could lead to rising prices and even greater buying power for the handful of oil exporters. Unless the course of worldwide economic development creates an explosion in the demand for some other scarce and geographically concentrated raw material, it may become increasingly difficult for industrial midgets to become military giants. Nevertheless, barring global arms control efforts far more successful than anything we have thus far seen, the same countries that have been using oil exports to pay for arms will continue to do so for the next generation.

Depending on what happens inside the Soviet Union, the next 35 years could see a sharp diminution in the willingness of the superpowers to provide arms to friendly countries. If the Soviets desist, the United States will probably be inclined to follow suit. This tendency could be reversed, however, by a change of direction in Moscow, or by a renewal or intensifying of power-political competition in the Middle East-Persian Gulf and Northeast Asian areas, where even a non-communist Russian regime might feel that it had interests that conflicted with those of the United States. Finally, as with German scientists after the Second World War, so Soviet scientists with the requisite knowledge and skills might emigrate and sell those skills to the highest Third World bidder.

Moreover, with little else to export, both the Soviets (Russians) and some of their former East European allies may continue to sell arms to earn the hard currency needed to finance imports from the industrialized nations. The constriction of defense budgets in the West could similarly lead to continued exports from the U.S.

and West European arms industries. Even in the absence of renewed ideological-geopolitical competition, the flow of arms from North to South is likely to continue for some time. The main difference will be that now paying customers will take precedence over surrogates and kindred spirits.

It is conceivable that new forms of global rivalry will lead to a renewal of politically motivated arms transfers. Intensified competition between Japan and China, for example, could stimulate the diffusion of military capabilities, much as the U. S.-Soviet antagonism did during the second half of the 20th century. A renewed clash between the countries of the Islamic world and the West could lead to transfers of arms (including nuclear weapons) from Pakistan to Algeria, for example, to aid it in some future confrontation with the Christian nations of southern Europe, or from Iran to Syria, to strengthen its hand against Israel.

Over the next 35 years, an increase in indigenous production potential will probably be the most important means whereby Third World states will gain access to military power. This trend is already evident. The 20 years from the mid-1960s to the mid-1980s saw a substantial expansion in the number of states capable of manufacturing fighter aircraft (from one to eight), helicopters (from one to six), tanks (from one to six), and tactical missiles (from none to seven) (*The Future Security Environment* (Washington, D.C.: Commission on Integrated Long-Term Strategy, 1988, p. 49)). Over the next three decades, both the number of countries with such manufacturing capabilities and the range of weapons that they are capable of producing will continue to grow.

Purely indigenous production will be augmented by international cooperative arrangements. States could collaborate in the development of new weapons or the upgrading of old ones. In the 1980s Argentina, Libya, and Iraq appear to have contributed, respectively, technological expertise, money, and a mix of both to the development of extended-range ballistic missiles. In the future, multinational consortia (India and Brazil? Israel and South Africa?) could form to pursue projects of mutual interest such as the launching of intelligence-gathering satellites or the development of cruise missiles. Consortia of this kind would reduce costs and allow the participants to pool their technological, industrial, and financial resources.

Deliberate, state-to-state cooperation may also be supplemented by transnational collaboration between firms or between Third World governments and foreign companies. Electronics companies in Japan and Indonesia, for example, might cooperate in the manufacture of supercomputers, which the Indonesian government could then use to help it design atomic weapons. Third World governments could also seek access to key technologies through surreptitious means, using dummy companies to buy products (such as chemical processing plants) for military purposes. In general, the increasing importance for weapons development of "dual-use" technologies and the increased availability of such technologies on world markets will help speed the diffusion of military capabilities.

The list of Third World countries that could be significant military powers by 2025 includes China, India, Brazil, Argentina, Iran, a reunified Korea, Pakistan, South Africa, Israel, and Iraq. Three-and-a-half decades is a long time, however, and it is conceivable that other candidates might emerge in that period (Nigeria and Malaysia, for example). It was in the 35-year interval between 1868 and 1905 that Japan emerged from underdevelopment and acquired the strength that allowed it to defeat one of the major military powers of Europe, and the pace of technological change is much greater today.



## Future Third World Arsenals

Today's regional superpowers deploy forces equipped with weapons that are at least one and usually several generations behind those available to the United States. This is because arms and military equipment have tended to trickle down from North to South. If the nations of the Third World continue to arm themselves primarily with imports, this pattern will persist. This is certainly the most optimistic scenario, but it still may mean that in 35 years some developing states will have access to weapons more sophisticated than any currently deployed in the West. Extremely stealthy aircraft, tactical directed energy weapons, and sophisticated ballistic missile defenses could all be found in the arsenals of the best equipped regional powers. Although U. S. forces will presumably be more capable than their less developed counterparts, future wars against Third World powers to protect regional allies and interests may be calculated to be more costly in blood and treasure than the United States will be willing to pay.

Instead of continuing to lag behind, it is also conceivable that Third World states will find ways to close the gap in military technology that now separates them from the United States. Intense competition among the world's arms exporters could lead them to sell ever more sophisticated products. This tendency could be accelerated by the entry of new producers (such as Japan) into the world arms market. Further progress in the development of indigenous high-tech industries, the ready availability of sophisticated dual-use products, and the various possibilities for collaboration sketched above could all contribute to raise the relative technological level of Third World armed forces.

Rather than deploying balanced forces along the lines of their more developed rivals, Third World states could also seek shortcuts to enhance their military stature. The most obvious ways of doing this would be through the development of unconventional weapons or weapons of mass destruction. Thus, instead of trying to build an air force with expensive planes, skilled mechanics, and highly trained aircrews, they could choose to concentrate on acquiring ballistic missiles with highly destructive warheads. Advanced chemical and biological weapons would be more intimidating to opponents than conventional armies and navies. Developing states might also resort to approaches considered and then abandoned by the superpowers during the early stages of their competition, including development of orbiting nuclear weapons and very high-yield nuclear bombs.

The major Third World military powers of the future will probably deploy a mix of different kinds of forces. Unconventional weapons may provide a last-resort deterrent to back up ground forces (equipped with precision-guided munitions, night-vision devices, attack helicopters, tanks with sophisticated armor, long-range artillery, and tactical surface-to-surface missiles), air forces (including stealthy fighter-bombers, airborne warning and control aircraft, and advanced ground-based air defense networks), and naval forces (including cruise and ballistic missile-launching submarines and, in some cases (India), aircraft carriers). These elements will be tied together by secure communications systems and provided with intelligence by space-based reconnaissance systems. The question is not so much whether certain countries will possess some or all of these capabilities, as whether they will be able to integrate and use them effectively in wartime.

## Motives for Arming

These developments are not inevitable nor, if they occur, will they necessarily be directed primarily at the United States. In the future, as in the past, the principal reason for Third World states to acquire advanced military capabilities will be to provide security or prepare for aggression against regional rivals.

In the near term, the Middle East-Persian Gulf region will continue to be the leading site of military competition. A lack of resources and external threats could keep Africa and Latin America relatively quiescent. In the long run, given both the concentration of technological-industrial power and the array of existing rivalries and suspicions, Asia is the most likely cockpit for future military competition and conflict. Local arms races are already underway at both the southwestern and northeastern ends of the region (between India and Pakistan, and North and South Korea, respectively). The relationships among the core countries of the region are in flux and will no doubt change considerably over the next 35 years. Renewed hostility between China and India, Japan and China, China and Russia, or Japan and Russia are all possible. Each of these countries could find itself threatened from a variety of directions, leading to regional alliances and competitive armaments programs. The United States may wish to be more an observer than an active participant, but its interests and military planning efforts will surely be directly affected.

## The Threat to U.S. Interests

There are essentially five ways in which the diffusion of military capabilities could affect U.S. interests.

The most obvious is that, in 35 years time, an increased number of countries will be able to strike directly at U. S. territory. This raises the possibility of threats to intimidate the U.S. people and perhaps to discourage United States intervention in regional conflicts. Even if the threat were not entirely credible, the knowledge that Libya could launch nuclear ballistic missiles against the United States would have to affect decisionmakers contemplating a 1986-style retaliatory attack or a 1973-style operation to resupply Israel. The proliferation of long-range strike systems, coupled with weapons of mass destruction, will make it harder for the United States to act in the Third World with the assurance of impunity that it has thus far enjoyed. This situation may lead ultimately to U. S. disengagement from entire regions of the world.

Second, as such capabilities grow, Third World states will also be able to pose a more effective threat to U. S. forces operating in their region. Maintaining a local military presence or conducting operations will become far more dangerous. If Iraq had possessed an atomic bomb, more capable antiship missiles, and ballistic missiles with chemical warheads, Operation DESERT STORM might have required a substantially different operational strategy. Certainly, the Gulf states would have been far less disposed to allow U. S. forces to deploy to their countries.

Third, states with increasingly deadly arsenals will be able to pose greater threats to U.S. friends and allies in various parts of the world. This development could lead to more urgent demands for advanced arms transfers and security assistance to offset enemy capabilities, as well as to pressure for strengthened security guarantees or the basing of U. S. forces in troubled regions. This pattern is already evident in the Middle East. These trends will also alter the perceptions and

needs of the nations of southern and central Europe. Intensifying rivalries and expanding capabilities in Asia could also force the United States into new alignments in that region.

Fourth, aside from attacking U.S. friends and allies, Third World states with sophisticated military capabilities could take a range of actions that would impinge less directly on U. S. interests. A nation armed with submarines, mines, and antiship cruise missiles could cut nearby sea-lanes, either as part of an actual conflict with a regional enemy or in an effort to gain revenues by extracting tolls from international users. Similar motives might impel a country to use either ground- or space-based weapons to destroy or threaten earth-orbiting satellites.

Finally, even if the United States is not aligned with any of the belligerents, future wars in the Third World could arouse U.S. concerns on humanitarian and ecological grounds. A nuclear war between India and China or Pakistan and India, for example, might kill millions of people, produce extensive radioactive fallout across the globe, and force a U.S. response in its wake.

### THIRD WORLD COALITIONS

The United States has been accustomed to dealing either with individual Third World countries or with loose groupings of weak states. In the future, U.S. military planners may have to consider the possibility of confrontations with more potent alliances.

Such alliances could be forged for a variety of reasons. Two countries in the same region (Korea and Indonesia?) might join together to oppose a third that both regard as threatening their interests (Japan?). Alternatively, as with Germany and Japan before the Second World War, widely separated states might make common cause so as to better enable each to pursue its regional ambitions. Alliances of convenience between countries like Brazil and India are not unthinkable. Shared religion might provide another basis for alignment. An anti-western, pan-Islamic coalition stretching from South Asia across the Middle East to North Africa may be unlikely because of the divergent concerns and longstanding hostilities that will continue to divide many of these countries from one another. But smaller sub-groupings could form, drawn together by religion and a common worldview, as well as by common interests. Finally, it is at least possible that a new universal ideology could emerge to replace communism in the next three decades. No such unifying body of ideas is now visible, but an ideology of shared resentment that would explain the problems of the poorer nations in terms of the sins of the rich might guide a global campaign of low-level, resentful violence designed to redress existing disparities of wealth and status.

Coalitions of Third World states could pose threats to U. S. interests different from those presented either by individual countries or by simple chaos. The comparative advantages of a small and rich nation collaborating with a populous and poor one, for example, could make the potential military power of an alliance greater than the sum of its parts. In the event of a confrontation with a hostile Third World coalition, the United States might have to deal with overt and covert threats arising at widely separated points. This could greatly complicate its logistical and military planning problems. In the worst case, U. S. actions against any member of a broad grouping of poorer states could trigger terrorist attacks against U.S. interests across the Third World as well as closer to home. This was the nightmare that Iraq

threatened to unleash before the recent Gulf War, but which, thanks to its virtual isolation, it was unable to carry out. By the year 2025, a true Third World coalition might be more inclined and better able to implement such a policy, both to deter attacks against its members and to coerce concessions.

## IMPLICATIONS FOR FORCE PLANNING

Of all the recent uses of U.S. military power, the one with the greatest number of lessons for the future may be neither DESERT STORM nor JUST CAUSE but EARNEST WILL, the escort of neutral shipping in the Persian Gulf during the last stage of the Iran-Iraq war. The great lesson that many of the developing states may learn from the first two of these operations is, "don't tangle with the United States." But that does not mean that they will refrain from tangling with one another, and from this fact will emerge an important mission for the U.S. armed forces.

A war between Iran and Iraq 40 years ago would have been confined to border skirmishes; in the late 1980s it spilled over the length and breadth of the Persian Gulf. Modern military technology (high-performance jet aircraft, cruise missiles, tactical ballistic missiles, conventional submarines) makes it likely that warfare between countries of even moderate size and sophistication will spill over beyond their borders. The United States, as foremost guardian of basic norms of international behavior, will have a powerful interest in containing such conflicts and preventing their geographical spread (e.g., to the sea-lanes) or their intensification (e.g., through the introduction of nerve agents or nuclear weapons). The United States may desire not to throw its weight onto either side of a conflict, but rather to create a firebreak around it, so that it can burn itself out without spreading. As EARNEST WILL revealed, the firebreak mission places special strains on our forces, which may have to operate in dangerous environments, under restrictive rules of engagement, and for long periods of time.

There may also be a leverage mission for U.S. forces in those cases where we do not intend to engage fully in combat but do wish to tip the balance to one side or the other. We might, for example, wish to prevent one belligerent state from using its small nuclear stockpile, and so need the ability to disable that portion of its armory, much as the Israelis acted during the Iran-Iraq war to destroy the Osirak reactor, or by more technologically sophisticated means, as we shall see. Or we might wish to provide selective aid (tactical ballistic missile defense, mine clearing, improved defense against armored attack) without, again, engaging fully in combat. For this reason, the U.S. military will need to study carefully wars in which it is not engaged, with a view to understanding how, if we wished, we could exercise the greatest influence over the conflict's outcome at minimum risk to ourselves.

## Coping with Chaos

*Countering Coups.* In 2025, Third World states will continually be plagued by coups d'etat. Being able to defend friendly regimes from coups should be an important component of U.S. strategy. Such defense must emphasize speed. It is far better to be able to send a few hundred troops in a matter of hours than a division in a month. Since a coup, by definition, involves a threat by a small group, it is clearly possible to suppress the threat with a relatively small force. Emphasis needs to be placed on rapid airlift, specially trained forces, and good intelligence.

*Promoting Coups.* Just as the United States will seek to defend friendly leaders from coups, there may be times when it will have to topple -- which is not the same as assassinating -- an unfriendly leader. This is especially true in the Third World, where so much of a country's policy results from the actions of the head of state. Our inability to promote coups against Libya's Khadaffi, Panama's Noriega, and Iraq's Saddam all demonstrate the need for this capability as well as the considerable cost of not having it. Promoting coups would require a detailed knowledge of political processes and intricate intelligence on the military organizations in the Third World.

*Defeating Other Low-Level Threats.* Terrorism and threats against U.S. citizens living and traveling abroad will require that the United States respond. The ability to act quickly against appropriate targets will be essential. We will need specially trained forces that can do this job quickly. How to determine the origin of attacks, especially when there is a sponsoring state, will be a problem requiring serious study.

*Refocusing Intelligence.* Moving from a world with one major threat to one in which there are many will require that we restructure the ways we collect and analyze intelligence. Much more emphasis will need to be placed on understanding diverse cultures and divining intentions. This will require more and better human intelligence and the training of analysts sensitive to the nuances of Third World cultures and politics.

*Providing Military Assistance.* Most U.S. efforts to deal with chaos in the Third World of 2025 should not involve the direct use of U.S. forces. The United States will have to think seriously about using others to protect U.S. interests. We need to continue to improve our means of providing security assistance to friendly Third World regimes, so that leaders can support U.S. interests without sacrificing their security. Development of proxy forces and regional allies must be emphasized. We shall consider alternative methods, as well, in the section dealing with new technologies and the uses to which they might be put in the new post-Cold War strategic environment.

## Dealing with Third World Superpowers and Coalitions

*Maintaining the Qualitative Edge.* We cannot simply assume that the United States armed forces will continue to have a significant technological advantage over all potential Third World opponents in every relevant category of military capability. This advantage will be especially difficult to maintain as (1) dual-use technologies continue to proliferate, (2) the most advanced countries get more deeply into the business of making and exporting arms, (3) indigenous Third World capabilities continue to expand, and (4) the United States cuts back sharply on defense R&D.

If, in the year 2025, the United States wants to enjoy an operational advantage similar to the one it enjoys now, it will have to begin to pace itself against a world standard of technological sophistication rather than simply against the achievements of the Soviet Union. For the time being, the United States stands alone at the pinnacle of military technical capability, but that position is not permanently assured and maintaining it may take more concentrated effort in the future than it has in the past. If historical patterns hold, the weapons that the United States has available to it in 2025 will be those that it first began to develop in the early years of the 21st century. Given the coming constriction in resources, there is no element in the overall U. S. defense effort more important than an energetic and well-focused research and development program.

*Designing Interventionary Forces.* The United States may well need two very different kinds of capabilities for dealing with future Third World contingencies. At one end of the spectrum will be small, light, and mobile forces suitable for rescue missions, humanitarian interventions, and "low-intensity conflicts." In addition, if it wishes to retain the option of confronting regional "superpowers," the United States will require forces that are readily transportable across great distances, but which retain sufficient fighting power to cope with numerous and heavily armed opponents.

*Countering Weapons of Mass Destruction.* U. S. military planners need to begin now to think seriously about the coming proliferation of weapons of mass destruction in the Third World. Efforts, overt and covert, to slow that spread deserve serious attention, but it must be assumed at the outset that they will only be partly successful. Similarly, more attention needs to be paid to the questions of how best to deter Third World leaders from using weapons of mass destruction once they acquire them. Here too, however, it is only safe to assume that somewhere, somehow deterrence will fail, and to plan accordingly.

In order to block particularly dangerous states from acquiring highly destructive weapons or, in a crisis, to prevent their use, the United States will need to have the option of launching preemptive strikes (or be able to disrupt an opponent's launch sequences). Since such attacks may have to be carried out at great distances, they will almost certainly have to be conducted using nonnuclear warheads, and, given the risk, they will have to be thorough and extremely reliable, even against weapons that are mobile, hardened, or otherwise defended.

Countering weapons of mass destruction will require defensive as well as offensive capabilities. Although the direct threat to the continental United States is limited at present, it can be expected to grow considerably over the next 35 years. In addition to acquiring some capacity for defending its own territory from attack, the United States may also need to develop tactical defensive capabilities against shorter-range weapons and ballistic missiles. These defenses will have to be portable so they can be deployed with U.S. forces operating in distant theaters or, in some situations, offered to provide protection to U. S. friends and allies.

## 2. THE WESTERN HEMISPHERE

The range of possible security concerns facing the United States in this hemisphere is far smaller than what it might otherwise be as a result of the U.S. relationship with Canada. History offers few, if any, examples of two militarily significant powers that share so extensive a border and yet have had so few reasons to fear each other. Although in the past there have been the occasional concerns about those on either side of the border allowing a conflict to spill over to the other, relations between these former British colonies have been remarkably stable since the signing of the Rush-Bagot Agreement in 1817. In fact, U.S.-Canada relations have improved steadily for most of the 20th century and have been bonded by allied union in two world wars. As a result, the friendship between the United States and Canada is now taken largely for granted. Nevertheless, it should not be ignored. Although the relationship remains rock solid, and thus attracts far less attention than the host of contentious bilateral concerns with other nations, it constitutes a strategic asset of the first order for the United States.

As a consequence, and precisely because this relationship is on such solid footing, future U.S. security concerns for this hemisphere will largely focus on the remaining nations south of the border. This area (minus parts of the Caribbean) is known collectively as Latin America.

How much attention Latin America will (or should) receive has been and remains a subject of considerable debate within the U.S. policy development community. At best, U.S. security interest in Latin America has been episodic. In the 20th century, U.S. interest in the region has been tied principally to efforts to frustrate and forestall possible penetration into Latin America first by Nazi Germany and later by the Soviet Union. With the defeat of the former and the collapse of the latter, it has been suggested that U.S. security interests in the region will decline rather precipitously -- indeed, so much so that Washington might now, and for some time to come, turn its back on any conceivable security threat from Latin America.

This opinion is reinforced by the remarkable transformation of Latin America in the past decade from a region in which the political climate in most nations was predominantly authoritarian to one in which democracy has become paramount. Combining this change with a decided turn against state-controlled economies, the overall political health of Latin America has rarely been better. In sum, the kind of chaos that heightened U.S. concerns for the region, and sometimes led to U.S. intervention in the area, has substantially declined.

Taken together, the lack of an external threat to the region and the generally improved economic and political conditions within the majority of nations in the region have led many policymakers and commentators in the United States to argue for a U.S. security policy for the area that might be described as one of "calculated benign neglect."

If history is any guide to the future, however, such a policy perspective might prove to be a mistake. Latin America's economic and political advances may not take hold over the long run. The 1960s saw similar, if somewhat less sweeping, developments in the region. They did not last. Indeed, by the 1970s, Latin America

was again an area characterized by incipient revolutions, economic stagnation, and, in several instances, return to authoritarian regimes.

Further, the end of the Cold War does not mean the end to U.S. concerns about a possible rival power making inroads into the region. Well before the advent of totalitarian regimes, Washington aimed to prevent any outside power from exploiting the area's seemingly endemic instability. The Monroe Doctrine and the Roosevelt Corollary are policy testaments to that longstanding, core strategic concern. Unless a specific competitor emerges in the future, the United States will find itself engaged in developing diplomatic and military strategies to counter yet undetermined but similar threats.

Whatever its motives (and they have been many and mixed), the United States has not easily tolerated threats, whether foreign or local, that undermined the safe and quiescent order that most of us believe should characterize Latin America. The kinds of instability or power vacuums that might be tolerated in Africa, Asia, or large parts of the Middle East have been unacceptable in Latin America for the simple and still relevant reason that this region is in our hemisphere. Unlike most areas of the developing world, what happens in Latin America has a potential impact on the United States beyond what it might otherwise have by virtue of its proximity. For that reason, while Latin American states may (in actual number) present fewer instances of concern than they have at certain times in the past, they may (in practice) occasion more situations that provoke a reaction. In short, geopolitical issues, even in this age of global communications, still matter and will continue to matter, even beyond 2025.

## ISSUES FOR U.S. POLICYMAKERS

### Uncertainties of Development

Compared to many countries in other regions of the Third World, the states of Latin America are generally distinguished by a long separation from their colonial past, strong cultural and linguistic integrity, and a relatively well educated business and governmental elite. In addition, should a substantial number of states in the region turn to democracy and decide to promote and expand free trade zones in the hemisphere, Latin America could undergo a virtual domestic renaissance in the immediate future. At a minimum, such trends suggest that the kind of chaos which might arise in much of the rest of the developing world is less likely to be of the same magnitude or severity in Latin America.

Nevertheless, compared to the countries of Europe and English-speaking North America, the region is one of appalling poverty, suffering from the effects of explosive population growth and endemic violence and corruption. Moreover, much of the progress that has been made in the few success cases has come only in the wake of, and as a necessary response to, disastrous economic conditions (Argentina, Chile, Brazil) or a threatening insurgency (Colombia, Bolivia, Guatemala). As a result, there is considerable doubt about how deep and how wide the commitment to reforms is in these nations. The question remains whether, once the pressure of events passes, the elite and the military will continue to support a course of reform. Adding to this uncertainty is the fact that a substantial percentage of Latin America's population has undergone a revolution of sorts in the ethical and moral precepts by which it is governed. Liberation theology (whose roots are not simply Marxist and will, therefore, likely outlast the demise of the Stalinist states), Evangelical Protestantism, and populist free-market ideology have all gained numerous



adherents over the past decade. Whether each will continue to grow in popularity, at what rate they will grow, in what countries, and to what effect with respect to the reform process, are questions to which no clear answers exist at present.

Predicting even the broad condition of Latin America in the year 2025, then, is a difficult exercise. Things could, from the U.S. perspective, look surprisingly good in the future; or the situation could become rather bleak. More than likely, it will be a mixed picture -- with some remarkable success stories to be told, combined with a few nations whose internal states have markedly deteriorated. What is important, however, is that it does not take a general state of chaos within the region for there to be a direct and substantial effect on U.S. interests. Again, given Latin America's proximity to the United States, political or economic upheaval even in a relatively small country could result in a chain of events that would adversely affect the United States or one of its neighboring states.

### Centrality of Mexico

Although it is impossible to predict the future of Latin America as a whole with any confidence, it is safe to suggest that Mexico's development (or lack thereof) will have the most direct impact on U.S. interests in the decades ahead. By 2025, Mexico will either have transformed itself into a politically stable and increasingly prosperous nation or it will -- under the pressure of its enormous population growth, poverty, and political and regional differences -- have begun to disintegrate as a viable, sovereign entity. Mass migration and possibly widespread terrorism across the southern U.S. border would result if the latter were to come to pass, requiring a major commitment of men and arms to seal and protect the border. In the worst case, it is not impossible to imagine the United States having to intervene militarily in the border region in order to establish a modicum of order and stability. On the other hand, if Mexico, under its current president and his immediate successors, continues to move along the path to political and economic reform, the chances of Mexico becoming a major problem for U.S. security interests will greatly diminish.

### Fragility of the New Democracies

Mexico aside, it needs to be understood that even when a nation adopts and consolidates needed reforms, such efforts may result in a situation where we continue to share pressing security concerns. Drugs and other forms of illicit trade do not depend, as recent history has shown, on the protection of authoritarian regimes. Given the weakness in many democratic regimes in Latin America, for example, the possibility of a private "mafia" or a system of "warlords" acting outside the control of the government is a real one. In light of the proliferation of sophisticated security and weapons technology in the international arms market, it is quite possible that any number of private armies in the future could be powerful enough to preclude a state's challenging them without the aid or backing of a larger power like the United States.

### Role of the United States

However, the ability of the United States to assist Latin America in the future will be both more limited and, in an important respect, more conditional. On the whole, political and economic development will have to be an internal matter. The United States can make various forms of security assistance available (in areas such

as special operations, intelligence, and, if need be, low-intensity warfare) in return for assurances of political plurality and economic reform. The long-term viability and health of Latin American states, however, will depend largely on their own decisions to reform their economic and political institutions. In the absence of a global rival that might ignite Washington's concerns about a possible competitor in this hemisphere, U.S. and Latin American policymakers may (unless otherwise instructed) revert to the traditional and time-honored principle of "benign neglect."

Yet, in terms of Latin America's political and economic development, U.S. policymakers should recognize that "benign neglect" is in many respects not desirable, nor even possible. Geographic and historical ties make it unlikely that the United States can remain aloof from the major political and economic problems of the region. The lack of a global rival for the foreseeable future also ensures that military nonintervention will increasingly become an attractive security policy option. The implications of this new regional reality are that the United States will not find itself so easily caught in the uncomfortable dilemma of supporting an existing dictatorial regime out of fear that its challengers are in league with a U.S. competitor. In sum, the United States should not use this respite in superpower competition to disengage from Latin America. Quite the contrary: this change in the international security environment affords the United States an opportunity to push the reform process now underway in the region with a steady, if not heavy, hand.

### Cuba's Future

For the present, the greatest threat to U.S. security interests in this hemisphere remains the authoritarian Marxist-Leninist regime in Cuba. Not unreasonably, it is assumed that with Castro's demise, natural or not, this threat will dramatically lessen and eventually disappear. Indeed, given the state of the Cuban economy and the signs of growing discontent among both the military and the population as a whole, the transition from foe to friend might in fact be surprisingly rapid. However, the ease of the transition, or its swiftness, is not safe to forecast. Presumably, one of the lessons learned by those who might follow Castro into power from recent events in Eastern Europe is that there is probably no such thing as "a little reform." Once the door is even slightly ajar to liberalization, a generation of pent-up frustrations and passions will likely burst through. This situation will be complicated by the pressures that will almost certainly be added by the Cuban-American community in Miami. As native Cubans demonstrate their pent-up expectations by clamoring for more political and economic liberalization, expatriate Cubans may press a separate agenda. Many of these expatriates will demand restitution for property lost in the 1960s and some will agitate for a rapid return to political pluralism. In either case, social instability will almost certainly be compounded in what will already be a revolutionary process, which could lead to the intensification of civil unrest. If those who follow Castro are willing to be sufficiently ruthless, it is possible that the military problem posed by Cuba will intensify more rapidly than the United States might hope or expect. If outright civil war erupts, the United States will be under strong international and domestic pressure to intervene in some capacity (preferably under the auspices of the OAS or the UN). Regardless, given Cuba's severe economic problems and its dependence on a collapsing ally, a more active U.S. role in Cuban affairs looms in the post-Castro era.

### Other Problems in Latin America

As the long-term Cuban military threat disappears, however, the United States will not be free of hemispheric powers that could potentially be a concern in the

future, especially by the year 2025. Argentina, Chile, and especially Brazil are each capable of becoming significant second tier powers. At a minimum, each, during this period, will gain the wherewithal (more quickly if done in cooperation with a second, technologically sophisticated party) to develop nuclear and ballistic missile capabilities. It is not a question of whether they could develop the capability to put the United States at risk but, rather, whether U.S. policies, or internal political dynamics in the region, produce the circumstances that would make doing so worth their while.

Although either Argentina or Chile could conceivably emerge as a purely regional problem for the United States, Brazil is clearly the most likely candidate for the status of regional "superpower." While Brazil has enormous problems -- population, poverty, illiteracy, etc. -- its domestic difficulties are no greater than those found, for example, in India. And, like India, relative success in assuaging these development problems does not necessarily mean that Brazil will adopt a pacific attitude toward its neighbors or the region as a whole. Success, combined with a new nationalist spirit (built perhaps on a resentment of the United States) and an existing arms industry, could well lead to the rise of a Brazil willing to challenge U.S. leadership in Latin America. In time, Brazil (again, like India) might decide that its authority should extend over its neighboring sea-lanes, sea-lanes which, of course, are of no small importance to the United States. Any state with Brazil's potential must be taken seriously and, for planning purposes, paid attention to. By the year 2025, Brazil will not be in any position to confront the United States directly; however, it might well have developed to the point that it could (especially in alliance with some third power) significantly complicate U.S. defense planning in its immediate region.

#### REQUIREMENTS FOR THE FUTURE

Although it might be more intellectually interesting to forecast a national security environment for this hemisphere that departs (either for the good or the bad) dramatically from what has happened in the past, the likely trends are more mundane. Over the past hundred years, the United States has sent troops into combat in Latin America and the Caribbean a dozen times, eight involving a significant number of troops and requiring occupations of varying duration. Of course, not all these interventions were necessary, and none was required to repel a force from outside the region. The lesson is clear: the United States will inevitably, even if reluctantly, find itself involved in Latin America's affairs, and that involvement will not exclude military force.

Nor is this a lesson invalidated by the end of the Cold War. Neither the U.S. invasion of Panama nor Great Britain's war with Argentina over the Falklands/Malvinas was an event dictated by superpower rivalry. The absence of a global competitor, then, will not end the need to take seriously the military capabilities of neighboring states. Further, as these events and the invasion of Grenada show, such crises can surface with little warning and come to a head virtually overnight as local leaders misjudge U. S. willingness to use military force to resolve other nations' internal disputes. Planning for the use of such force well in advance is problematic, made more so today and for the future by the fact that even lesser powers have begun to acquire military capabilities that require a major military effort to confront them.

In the future, two factors will provide reasons for the United States to pay increasing attention to, and to become more, not less involved in, political and

economic events in Latin America. As the Hispanic population in the United States grows, and becomes the largest minority group (surpassing Blacks as a percentage of the total population in 2010), domestic interest will grow in events in those areas from which these citizens have come. Secondly, as the United States itself becomes one of the largest Hispanic countries in the world, pressures will exist for the United States to change its role vis-à-vis Latin America. The United States will be seen not as an imperialist power bent on exploitation, but rather as the moral, physical, and cultural Godfather to this "Latino" community of nations. As such, the likelihood increases that active measures (political, economic, or military) will be applied. The question is not whether U.S. interests in Latin America will be as great as those in Europe or Japan. With the notable exception of Mexico, they probably will not. But we should recognize the interests and ties we have in Latin America and be prepared to protect them.

Like the developing world as a whole, Latin America will require that we retain certain capabilities. To aid friends, we will want to have countercoup forces, counterinsurgency teams, and diverse intelligence-gathering capabilities. To limit our enemies, we will want to be able, if necessary, to help promote life-saving coups and support insurgents fighting for their freedom. For Latin America, in particular, military assistance for the foreseeable future will be needed to fight drug trafficking and assist in dealing with large, well-armed private armies. It is a virtual certainty that U.S. forces will have to become increasingly involved in helping control and monitor the U.S. borders.

In addition to planning for these special operation and low-intensity conflict scenarios, the United States will still need to keep a capability for short-notice, medium-scale military interventions. Complicating these plans, of course, will be the proliferation into the Third World of increasingly sophisticated weapon systems and, potentially, the willingness of a regional "superpower" to raise the cost of a U.S. intervention by siding or threatening to side with the target state. In general, while the need to plan militarily for various contingencies in Latin America will probably decrease in the years ahead, the cost of doing so will in all likelihood go up.

### 3. REEMERGENCE OF A PEER COMPETITOR

Following the outbreak of the Cold War, Americans were able to think about strategic competition with a peer power in a straightforward way. Our planners knew who the enemy was and where we might fight him. During the course of that struggle, they developed certain patterns of strategic thought and certain rules of thumb, like stressing capabilities over intentions, that served us well. The strategic problem of engaging the Soviet Union and its Chinese ally was conceptually relatively simple, even if, at times, it proved complex in terms of execution.

#### THE CONCEPTUAL PROBLEM

At other times in our history, however, matters were less clear. In the decades between the two world wars, we could not be sure what major power might emerge as our enemies. However, U.S. military planners knew that war was possible and that the United States might find itself confronting an opponent as militarily sophisticated as itself. The U.S. armed forces dealt with this uncertainty by considering the problems of strategic competition with a number of hypothetical opponents, including some, such as Britain, with whom they were unlikely to go to war. U.S. planners did not enjoy the luxury of creating forces specifically tailored for conflict with a particular enemy. Nonetheless, such general planning helped to develop technologies, force structures, and strategic skills that proved invaluable in the Second World War and the early years of the Cold War.

The legacy of U.S. military planning in the interwar and pre-Cold War periods can be summarized as follows:

- 1) There can be no single scenario for conflict. In fact, there cannot even be an identifiable opponent.
- 2) Planners cannot look only at current or easily foreseeable capabilities. Instead, they must look at a range of potential capabilities and possible, even if unformed, intentions.
- 3) Planners must think about new kinds of competition. They must look beyond concepts formed by experiences in past conflicts and consider all eventualities.

U.S. military planners face a similar challenge today. The near collapse of Soviet power has left the United States as the world's single superpower. It is difficult to conceive of any country emerging as a threat to U.S. preeminence in the near future. After all, only U.S. allies -- namely the West Europeans and the Japanese -- possess the resources and technological prowess to match our military capabilities. But there seems no sensible reason why they should challenge the United States militarily. A few other nations -- China, India, possibly a dynamic Brazil or a resurgent Russia -- might offer something of a challenge in two or three decades. But it seems unlikely that any one of those four countries could seriously challenge U.S. military power by 2025.

Thus, discussion of the concept of a major military threat to the United States over the next generation can be objected to on three grounds. The first objection is that such discussions can seem like a case of "searching for enemies," converting a present friend into a hypothetical future foe or blowing out of proportion the threat

that a large developing country might offer. The second charge is that of implausibility, that is, a scenario resting on a series of "what ifs" that lead to the idea of a hostile Japan or an aggressive, united Europe. And third, by positing the notion that the Soviet Union might re-emerge under a different name and a slightly different form, one can be accused of refusing to relinquish a Cold War mentality or preparing to fight the last war over again.

It is necessary to state these objections at the outset in order to make clear what the idea of a major military opponent of the United States in the 2025 period would really mean. On the one hand, it seems unlikely that any of the states mentioned would seek war with the United States over the next 30 or 40 years, or that they would take any action that we would construe as a direct threat to our vital interests. However, competition between countries seems certain to remain the basic fact of international relations. The hypothetical foes named above are likely to be involved in an intense competition over markets, raw materials, access to technology, control of strategic areas, and regional or global influence over the next half-century. Competition inevitably leads to some degree of hostility, and military power will remain one of the primary tools for struggle between states.

Even if the United States has little reason to fear direct conflict with a military equal over the next several decades, however, we may still find ourselves adversely affected by a peer's use of military power. Implied or actual threats of force, the transfer of arms or military technology, proxy wars between the client states of great powers, a Cold War-type struggle with an ideological rival, a war between two of the other major powers -- all offer cases in which the United States could suffer from a rivalry with a major military power.

In brief, the United States needs to anticipate what may never happen -- just as "thinking about the unthinkable" played a role in preventing the actual use of nuclear weapons during the Cold War era. Put even more bluntly, a clash -- direct or indirect -- with a country possessing equivalent or even superior military technology may seem implausible, but such an eventuality would offer a threat so dire that we cannot afford to dismiss the possibility out of hand. Based on that notion, this study offers two hypothetical world situations, which may never exist but which, if they did, would present a set of very serious strategic problems. At the outset, it is important to stress that no predictions are being made nor a desire expressed for such situations to actually occur. Instead, in the first scenario, two major competitors, one a maritime power, the other continental, are described as engaged in rivalry for global predominance with the United States in 2025. These purely fictitious powers are given real names. They are an economically aggressive Japan and a revived Russia, allied to an India in an Imperial mood. In the second scenario, Eurasia is described as divided into two coalitions. Each seeks hegemony over the Eastern Hemisphere.

## FIRST SCENARIO

### Part I: Japan as a Strategic Competitor

As long as the United States and Japan manage their security relationship carefully, Japan should see little value in rearming in the post-Cold War international climate. Nonetheless, given the likely reduction of armaments among the other industrialized powers in the last decade of the 20th century and the continued growth in the Japanese economy, Japanese defense spending could make

Japan a military superpower by the early 21st century. Japan could find itself a strategic peer of the United States, especially since the U.S. military draw-down will allow us to meet them half-way.

By the decade 2010-20, Japan could gain an unmistakable technological and economic advantage over the United States. Japan would probably have only about half the population of the United States, but the average Japanese would enjoy a higher standard of living than the average American. True, the cost of food and housing would remain higher in Japan than in the United States and Japanese taxes would also be higher. On the other hand, Japanese advances in technology might bring Japan to world leadership in that area. As a result, the comfort and security in which the Japanese lived would have no equal -- and the United States might feel more than a little resentment at a country that had outmatched us in economic competition.

But the shape of Japanese military procurement and force structure could give Japan a strong suit of armor yet only a very short sword. In fact, the Japanese might never modify the defense clauses of the constitution that they received from General Douglas MacArthur. Despite their ever-increasing lethality and sophistication, Japanese ground and air units might still comprise what objective observers would rightly describe as self-defense forces. The Japanese might still refuse to build the means to project ground forces abroad. The Japanese Air Self-Defense Force might never acquire strategic bombers, let alone ICBMs.

On the other hand, the Japanese navy could enjoy steady growth and become the second-largest naval force in the world by the third decade of the 21st century. Although the Japanese might never develop large aircraft carriers or cruisers, their attack submarines, sea control vessels, and destroyers could come to dominate the western Pacific. Thousands of cruise missiles loaded aboard its ocean-going ships could give Japan the ability to launch devastating strikes deep into any area of the globe.

But the most significant Japanese military development might be the construction of an antimissile defense system. A nuclear conflict in Asia might trigger such an event. After all, such a Japanese system would exist only to defend Japan against attack, could not be used in an offensive manner, and would not be stationed on Japanese soil. Japan might become, if not impervious to strategic nuclear attack, at least largely sheltered from it. Combined with its navy and powerful, though short-ranged, air and ground forces, Japan could look on its military posture in relation to the armed forces of the rest of the world with some confidence. Furthermore, Japan's superiority in many areas of civilian technology might allow it to develop novel weapons (high-energy, information-based, biotechnological) that would render older ones (tanks, aircraft carriers, etc.) if not obsolete, much less important than heretofore.

Few might fault the Japanese for their acquisition of new weapons systems if they were ostensibly defensive in nature. After all, by the second decade of the 21st century, 20 to 30 nations might have acquired nuclear or thermonuclear weapons. Even more might hold chemical weapons of frightening efficacy. And by itself, such a steady improvement in Japanese defensive rearmament might not greatly trouble the U.S. government. But if such capabilities were added to an ever-worsening state of Japanese-U.S. relations as a result of long-standing economic conflicts and new friction over Japanese policies toward the Pacific and Latin America, the implications of a "Japanese SDI" could disturb Washington

leaders considerably. Furthermore, alarm over Japanese sales of super-high-technology weapons to potential adversaries of the United States could cause more than a little resentment.

How might Japan take advantage of such economic and military power, especially when confronted with hostility from the United States? One Japanese response might be an effort to secure natural resources, food, and physical security by promoting a Tokyo-led coalition in Southeast Asia and the Pacific. Australia and New Zealand might or might not join. But it seems more likely that they would react with initial trepidation, seeking protection from the United States. If the United States responded positively to pleas from Australia and New Zealand, the entire Pacific region would be divided into two rival blocs. Given their tiny populations and resources, the small Pacific island nations would be hard-pressed to be neutral and would be forced into one or the other camp. Other Asian states might find even "soft hegemony" by Japan intolerable, and react by developing nuclear weapons, appealing to the United States for help, or pursuing policies designed to scare off a Japan still believed to be deeply reluctant actually to use force.

A growing sphere of Japanese strategic dominance in the Pacific would isolate China geostrategically and could lead either to struggle or to its engulfment by Japan and two of the hypothetical great powers in this projected future, a reconstituted Russia and an expanded India. Japan's motives might well be primarily economic and defensive. But the United States would find it hard to accept Japanese domination in one of the three great centers of global economic activity.

Meanwhile, Japan could create other problems for the United States in its own hemisphere. Japanese interest in Latin America has increased markedly over the last decade. To Japan, this area offers a large and growing market, as well as a source of raw materials. At the same time, a number of Latin American nations have indicated interest in shaking off U.S. dominance by creating closer ties to Japan. Brazil, in particular, has shown considerable desire for Japanese capital and technology. If Japan reciprocated, Japanese-Brazilian cooperation might provide the basis for accelerated Brazilian growth, perhaps further exacerbating Japanese relations with the United States. Still, even this outcome might benefit the Japanese. Having created such a distraction for the United States, Tokyo might gain even more freedom of action in the Pacific and Southeast Asia.

What might motivate Japan to follow this hypothetical course of action? It might very well be the defensive reaction of a nation at once proud of its achievements and deeply aware of its vulnerability to disturbances in international trade. It might also tap resentment of the United States, as the generation of Japanese who recognize that the U.S. occupation policies created the preconditions for their extraordinary national resurgence after World War II is replaced by succeeding generations. The fact is that democracy, liberal economics, and antimilitarism were forced on Japan between 1945 and 1952. Japanese hostile to the United States could conceive of this as a strategy of the kind advocated by Sun Tzu: defeating one's enemy without fighting and turning his own strategy against him.

On a more practical level, the Japanese would obviously want to remain the richest nation and grow richer still. They would not desire to destroy the United States. After all, the North American Common Market would include over 500 million people by the third decade of the 21st century. Even Mexico might have become quite prosperous. North America would represent an extremely lucrative



emporium for Japanese goods and services. But the United States might have been either unwilling or unable to take advantage of the huge economic potential of the Pacific and South America. The Japanese could seize the opportunities that had been wasted by the United States. Japan might reject the status of protege and client that it has had since World War II and insist that the United States not interfere in Japan's Asian backyard. Meanwhile, the United States would watch Japan's steadily, if slowly, developing military potential with alarm.

## Part II: The Rise and Fall of Russian Power

Let us assume that at the same time, the Soviet Union continues its plunge into a major depression and fragmentation into its constituent parts. Both phenomena will be accompanied by the decline of Soviet military power. It seems certain that the worst is yet to come for the Russians. But the final fate of the Russian Republic is impossible to predict.

Several of the non-Russian republics surely will regain their independence. Even massive assistance from the West may not avert hunger and, eventually, some form of civil war over the issue of the ethnic Russians who reside in seceding republics. Russia has survived terrible national disasters in its history, however, several times in the 20th century alone. The great Russian nation will not simply disappear. Over the course of the next 35 years, it is possible that such a mass of 150 million talented human beings, in possession of the great resources of European Russia and Siberia, could bring about a resurgence of Russian power. Just how much and over how long a period of time remains to be seen. For the sake of this study, one hypothetical future will be outlined.

Let us posit a decade or so of misery for the Russian people. At some point, nonetheless, the bottom will be reached. How might a Russian state be recreated on firmer foundations? There might not be a warm welcome into Europe for Ukraine and Byelorussia. European reluctance to rehabilitate such huge areas -- or accept their refugees -- might leave them outside the Common Market or some future European federation. The presence of so many Russians in those two republics and their common Slavic and Orthodox heritage might prompt some form of reunion with Russia. The lack of alternatives for the Central Asians might result in their adherence to the same partnership.

Given Russian history, such a reborn state might emerge as authoritarian or, at the very least, conservative internally. Given its weakness, it would almost certainly follow a nonbelligerent foreign policy -- at least initially. One can assume, however, that it would adopt a free enterprise economic system. With luck, hard work, and willingness to give capitalism a chance, Russia might begin to enjoy impressive rates of growth by the second decade of the 21st century, even as it did in the years shortly before World War I, when it had one of the fastest-growing economies in the world.

But the Russian state would probably face a hard choice. During its difficult rebirth and infancy, it could not hope to defend itself against a hostile or opportunistic Europe and China. It would have to ensure security along at least one of its vulnerable land frontiers. A weak Russia might invite Chinese attempts to win back the territories taken by the Tzars in the "Unequal Treaties" of the 17th, 18th, and 19th centuries. Yet Russian hope for the future would lie in retaining the riches of Siberia. It would be more likely, then, for Russia to seek accommodation with the Europeans, especially in hopes of foreign investments, and adopt a more adversarial

stance toward China. Russia might buy such European assistance by a demilitarization of its European border areas and the withdrawal of most or all of its naval forces from the Baltic, Barents, and Black Seas. The Russians could then concentrate what remained of their armed forces in Central Asia, Siberia, and the North Pacific.

It seems likely that a weak Russia and a China that continues to grow economically might reach a rough balance of power sometime in the early 21st century. In keeping with its historical sense of insecurity, Russia would undoubtedly continue to spend on arms. In fact, an aggressive China might make such expenditures imperative. This might be the recipe for a major war in Central Asia. In such a conflict, given the equality of the two sides, the position taken by India could prove crucial. In the 1990s, the elite of the subcontinent face some very bleak prospects. Ethnic and religious violence threaten to tear India apart. Religious fundamentalists may pull down the ruling classes in Pakistan, India, and Bangladesh and possibly establish inward-looking theocracies. Economic stagnation has made millions in those countries desperate, thus ready for dire alternatives.

What may be more immediately fearsome, however, is that India and Pakistan attack each other with their small but growing nuclear arsenals. The crisis of South Asia could have a number of outcomes, but one that bears thinking about is effective unification of the subcontinent in the first or second decade of the 21st century under control of India, which, with all of its troubles, still has far more power than the other states of the region. Such a development could seem a rational return to the unified India of previous historical periods. If this did occur, three states of roughly equivalent power -- an enlarged India, Russia, and China -- might face each other in Central Asia early in the 21st century. More likely than not, in such a case, Russia and India would have reasons to ally against China. Any number of reasons would exist for the outbreak of conflict among these three states. Each state, recently reconstituted after radical political and economic reconstruction, might seek validation through a victorious war. Russia and India on the one side, China on the other, bear many mutual grudges. Misperceptions of weakness on one side or strength on the other might encourage preemptive war or the seizure of what would appear to be the opportunity for aggrandizement. The forbidding high plateau of Central Asia might assume far more importance with the depletion of resources elsewhere and their availability there.

The lack of population centers and the empty vastness of the likely battlefields in such a war would increase the possibility that one side or the other would be tempted to use of nuclear weapons. (Such use might be the trigger for Japan to deploy its antimissile shield.) The outcome of such a conflict would probably favor the Russian-Indian coalition. Yet it seems highly unlikely that the victors would seek to occupy the populous regions of eastern China. But a weakened and humiliated China, a militarily resurgent Japan, and a triumphant Russia and India would create a complex and dangerous set of alternatives for the future of Eurasia.

One of the most dangerous eventualities would be a grand alliance among these Asian powers. Rather than seeking the destruction of China in a calamitous war, Russia, India, and Japan might seek to envelop China in an economic and political coalition. The possibilities for mutual benefits might seem so great as to break down national resistance to such a plan. Nor could the Chinese easily resist their three great neighbors, even if they so desired. But if such an alliance developed, the United States would find itself confronted in the Eastern Hemisphere by a deeply troubling threat. Even if such a coalition were scrupulously to avoid injuring core U.S.

interests, the world balance of power would have tipped decisively against the United States.

#### Issues for U.S. Strategy

To a great extent, the hypothetical crisis described would need to be addressed by the United States more by diplomatic and economic than by military means. War between great powers in a world teeming with weapons of mass destruction would hardly be advisable, unless as a last resort. Given the probable destructiveness of even conventional weapons in 2025, any war would likely wreak terrible damage on both victor and vanquished. But even a nonviolent solution to the problems that the United States would face in such a scenario would require an extremely sophisticated coordination of foreign and military policy, of intelligence gathering and analysis, of economic public policy and private corporate and banking policy to a degree unprecedented in peacetime.

Even if the United States faced such threats, it would still enjoy many advantages. Appearance to the contrary, the United States could most likely solve its problems without recourse to war, but its policy would require the backing of a powerful military to succor allies and threaten potential opponents. During the Cold War, calculations of the nuclear balance cast a perceptible shadow over the U.S.-Soviet relationship: so in the future might the conventional balance on an even larger scale.

A Russian-Indian-Japanese encirclement and domination of China would, it must be stressed, be intolerable to the United States. If that occurred, the vast majority of Eurasia might be united into a huge coalition of seven billion people -- and almost from the beginning of the Republic, the United States has understood the need to prevent the emergence of an overwhelming power on the Eurasian land mass. In both World Wars we acted accordingly. Such a conglomeration of population, resources, wealth, and military power would either dominate the world or, if it disintegrated, come apart in a war of the most drastic type, which would affect us in ways we simply could not ignore.

#### SECOND SCENARIO

Russia and the ex-Soviet Central Asian republics might slowly and painfully evolve into a Eurasian confederated democratic state with a free enterprise economy. During a decade of uncertainty, before this new system became stable and acquired a degree of prosperity, the Europeans would offer the Eurasians only emergency aid and encouragement. Meanwhile, Eastern Europe, the Baltics, the Caucasus nations, and Ukraine would gravitate economically toward Western Europe. Poland, Czechoslovakia, Hungary, and the Baltics would gain associate status in the European Community in the mid-1990s, followed eventually though not immediately by full membership. Sometime after 2000, the Europeans would offer the same progressive membership to the Balkan countries, the Caucasus nations, Byelorussia, and Ukraine. Five years or so later, the Russians and Central Asians would follow the same path, leading to their full membership in the European Community by about 2020.

The advantage for the former members of the Soviet empire of complete integration in the European Community would be obvious: access to technical expertise and capital, security on their western borders, and allies to help safeguard

Siberia against the Chinese. For the Europeans, especially the Germans, this arrangement would bring access to the vast resources of the old Soviet empire, especially Siberia, and a way to lock in and stabilize the ever-restive ethnic groups of Eastern Europe, Ukraine, and the Caucasus within a firm pan-European framework.

What would develop thereafter would be an ever more united "Europe," stretching from Limerick to Vladivostock. Given their large numbers, the German speakers and the Russian speakers would come to predominate within this federation of Europeans and Central Asians. (By 2025, it should number over one billion people.) But even the non-German and non-Russian Europeans would prefer this arrangement to the humiliation of being either America's junior partners or merely Germany's or Russia's satellites. Instead, the old dream of European unity would be realized and Europe itself would have become a competing world power.

On the other side of Eurasia, however, the implicit threat to Chinese and Japanese interest represented by a united Europe gradually would have driven the two great Asian powers together. This East Asian alliance would be cemented by full Russian membership in the European Community by 2020. Neither the leaders nor the peoples of China and Japan would have much love for each other. But each would see the Europeans as racial, economic, and political rivals for markets, resources, and supreme influence in the Eastern Hemisphere. For whoever would predominate in northern Eurasia would naturally come to control the Indian subcontinent, the Middle East, and Africa. The resources of Siberia, Central and Southern Asia, and Africa would be the prizes in a great contest for hegemony over the great "World Island" and 80 percent of the human race.

Neither of the rival coalitions would seek alliance with the United States, since that could restore the old U.S. influence in Eurasia. Neither the Europeans nor the Asians would wish the United States to play that role again, as it did in 1917-19, 1941-45, or between 1949 and the 1990s. In fact, the Europeans, Chinese and Japanese would have hailed the departure of U.S. troops and bases from the Eastern Hemisphere at the end of the 20th century. They would avoid doing anything to provoke a U.S. return. Mindful of the lessons of the Napoleonic and world wars, each alliance would avoid disrupting the freedom of the seas or interfering in Latin America or the Eastern Pacific.

In addition, each rival coalition would deliberately refrain from building navies of a type to challenge U.S. seapower in the Atlantic or Pacific. The Europeans and Asians would concentrate on building huge ground, air, and space forces for a possible armed struggle in the vast stretches of Siberia, Central Asia, and the Middle East. However, in the seas surrounding their territories in Eurasia, each coalition would erect a formidable network of active and passive maritime defenses. As a result, any U.S. naval effort to penetrate these barriers would be very costly. A major amphibious landing by U.S. forces would prove a huge undertaking of dubious result, and a U.S. attempt to fight a land war in Eurasia against either alliance would present problems of nightmarish proportions.

The strategic challenge for the United States would be to find the means to prevent either alliance from conquering the Eastern Hemisphere and, thus, dominating the planet. Brazil, Indonesia, India, or Nigeria could offer some assistance. But the United States would still face the problem of two potential enemies armed with the most advanced technology and controlling populations and resources of huge dimensions. Possible solutions to these problems have been

suggested in the section outlining responses to the first peer competitor scenario. But their implementation would involve a national effort of a difficulty unprecedented in the history of the United States.

## MILITARY FORCE REQUIREMENTS

The previous scenarios offer a dire picture of the consequences of the reappearance of a peer competitor for the United States. While not meant as predictions, they illustrate how serious a threat such a competitor could be to U. S. interests. Therefore, the primary objective of U.S. strategy over the next 35 years should be to prevent such a problem from developing.

After engaging successfully in two world wars in the course of less than 30 years, the United States entered a third and very costly global struggle over the next four decades. Again, the United States emerged victorious and gained many opportunities to exploit its success. Furthermore, the current relationships of the United States with all its potential strategic peers, if not ideal, are at least satisfactory. The major challenges for the future are to avoid another expensive arms race and to maintain or improve U.S. relations with potential peers. An appropriate strategy and force structure will greatly help us to meet those challenges.

Any potential peer must be convinced that the United States possesses effective deterrent strategic forces and that it is not possible to achieve strategic superiority over the United States. Reductions in U.S. strategic forces, decisions on the deployment of defensive systems, and arms control initiatives should be considered in terms of their influence on all potential strategic peers, not just the Soviet Union. Thus, a major force requirement will be the maintenance of a strategic core that both discourages strategic weapons development by potential peers and provides deterrence against all existing nuclear powers.

In order to maintain its present favorable peer relations, the United States needs forces, deployments, and strategies that will be considered supportive of mutual interests. That means maintenance of forward-deployed forces and reinforcement capability able to ensure such common interests as freedom of the seas and access to markets and resources. By emphasizing consultation and coordination, and by maintaining appropriate forces, the United States can both provide reassurance and discourage the development of competitive forces by potential peers. Doing so will require both forward-deployed and reserve conventional U.S. forces with a range of capabilities. Foremost among these would be capabilities for:

- 1) defusing conflicts before they reach the crisis stage;
- 2) containing or isolating conflicts; and
- 3) if necessary, intervening militarily.

Effective reassurance will require not only adequate force structure but also the visible forward presence of U.S. forces and the development of coordinated strategies with potential peers. These would provide tangible evidence of U.S. commitment to the defense of mutual interests.

The United States must avoid creating the perception that it seeks a hegemonic new world order, lest it encourages the development of one or more peer rivals. Force planners will thus have to select specific areas where the United States can maintain military superiority, without raising undue fears of U.S. hegemonic ambitions. In some cases, this may mean developing and demonstrating capabilities without deploying actual systems. In every case, it will mean that our active duty forces are structured in ways that avoid threats to the vital interests of any potential peer. Yet, the United States must possess forces capable of dissuasion. This delicate balance will be difficult to achieve and maintain, and it will not be an exclusively military responsibility.

If, despite our best efforts, a rival may nevertheless come forward, the same military forces that are sized to dissuade peer competition would provide the essential foundation upon which to build an effective U.S. military response to such a rival.

#### 4. FUTURE TECHNOLOGY AND NATIONAL SECURITY

There are logical limits to what can be predicted about technological change. Revolutionary advancements are by their very nature unforeseeable. That they will occur is a near certainty; what they will be, however, is far less certain. Changes in technology of a less-than-revolutionary nature are difficult to predict as well. Predicting what advancements will be made implies that one knows that existing obstacles to developing a technological capability can be overcome. This implies, paradoxically, that one somehow knows the solution to the relevant problems in advance of their actual solution.

Nevertheless, there are several factors that permit some useful predictions about the military-related technological environment in 2025. First, technologies that may eventually be deployed are foreshadowed by existing prototypes, technological developments, and research. Second, even if technological research were simply to stop, the application of current technologies (like fiber optics) would result in new uses (high-speed telecommunications). Third, new products tend to spread inexorably from the point of development to the rest of the world. Fourth, and perhaps most importantly, information technologies, having progressed at a rapid pace over the last 15 years, are likely to continue to do so for the next decade or two. In a sense, aspects of life in Madagascar 35 years hence may be seen in MIT's Media Lab today. Collectively, these factors indicate that key aspects of the technological future are indeed foreseeable.

##### BATTLEFIELDS OF THE FUTURE

Within the last few years, researchers from MIT have developed a kind of robot that may change the traditional concept of the species. Hitherto, robots were envisaged as complex objects that would, in every successive generation of development, come more and more to resemble man. The MIT robots are, metaphorically speaking, more akin to ants. Each exhibits certain limited aspects of intelligence: some specialize in avoiding shadows; others, in walking without stumbling; yet others, in staying away from each other. Smart ants are less powerful than smart robots, but they are small, light, cheap, versatile, easy to reprogram, and thus could be made available in great numbers.

Thirty-five years from now, analogous small, lethal, sensing, emitting, flying, crawling, exploding and thinking objects may make the battlefield highly lethal to humans in steel (or ceramic, or carbon-fiber) boxes. Specifically, the battlefield of the future will be dominated by precision-guided munitions; enormous quantities and varieties of sensors (some the size of bottle caps) will collect and disseminate a vast amount of tactical intelligence; and advanced automation (including robots) may increasingly reduce the number of people in harm's way. Further, with the advent of new power technologies and data processing capabilities, military operations in outer space and under the seas will become more common and less benign. Moreover, the proliferation of weapons of mass destruction as well as more discriminating technologies will make the world a more complex place for the military planner.

This interpretation of the effect of technology on the battlefield of the future is hardly confined to U.S. military planners. It is a central element in what the Soviets have in mind when they use the phrase, "the revolution in military affairs."

## Precision Guidance and Signature Control

Today's precision-guided munitions (PGMs) already mean that any object that can be located can be precisely targeted and, more often than not, destroyed. The continued refinement of such capabilities will affect not only fixed targets but mobile targets as well.

A great premium will continue to be placed on minimizing one's own weapons' signatures (e.g., stealth) and amplifying the enemy's (e.g., the data fusion capabilities of Aegis systems). The ultimate result, particularly in air-land combat, will probably be some form of "pop-up" warfare. Forces will be seen only while shooting (or perhaps fractionally earlier) or while moving over a terrain mined with sensors. They will have to be located and targeted that much more quickly. Victory will favor those forces that can most rapidly distinguish threats from decoys and friendlies, determine the threats' location and bearing, fire, and then disguise and eliminate their own signature.

Fixed and slow-moving targets will fare poorly on tomorrow's battlefield. Any object with a fixed latitude and longitude can be targeted (with low-cost, highly accurate aiming systems) and struck. New weapons will use a combination of improved gyroscopes and accelerometers, navigational devices, global position system (GPS) satellites, and local positioning signals from pre-positioned emitters. Coupling advances in how fast information can be processed, it will be possible to hear, integrate, and filter digital signals at speeds high enough to use in time to ensure a kill.

The defense of large, fixed, above-the-ground targets will not be impossible. In general, however, given the character of emerging technology, those attacking such targets will have the advantage over those attempting to defend them. Those on the offense shoot at larger targets; they have the advantage of shooting first; and they can succeed in the aggregate by overwhelming the defense with numbers. Therefore, large, fixed (or slow-moving), above-the-ground (or above-the-sea) targets have a limited future. They will have to be either dispersed, protected in very hard bunkers, or continuously and rapidly moved around. Accordingly, it will be difficult, for example, to protect runways and the planes that have to use them.

## Sensors, Emitters, and Mini-Projectiles

The proliferation of objects capable of acquiring signatures will be part of this "pop-up" battlefield: flying drones, loitering PGMs, autonomous land crawlers, semi-independent submersibles, and small satellites. It will probably be cost-effective to disperse sensors from planes or even cannon tubes. Many of these sensors have already appeared, albeit in rudimentary form. In the future, they will be cheaper, more sensitive, and capable of simultaneously receiving signals from the various parts of the electromagnetic spectrum. In addition, with advances in artificial intelligence (AI) and neural-net technologies, sensors will be able not only to sense simple data but also to recognize more sophisticated patterns on the battlefield.

It will also be possible to seed the battlefield with cheap, disposable emitters, which can generate confusing signatures, broadcast precise local positioning signals for precise targeting, and illuminate targets with reflected radio waves. All this will



be made possible by a combination of miniaturization, reduced costs, and the development of systems for coordinating emitter signals in large numbers.

It takes more than sensors and emitters, of course, to destroy targets. To take full advantage of the revolution in sensing technology, precision-guided munitions (made lighter and thinner with new materials, and smaller with more compact electronics) will become the staple of weapon inventories in the future. Other advances in weapons design will include explosively dispersed carbon fibers (toxic to certain types of electronics), superhard ceramic pellets travelling at hyper-velocity speeds, miniature shaped-charged explosives, and compact energy sources capable of generating directed-energy beams.

### Robotics and Artificial Intelligence

The proliferation of sensors and emitters is one more indication that the battlefield of the future will require fewer people to man it. Eliminating humans from the support and survival systems should decrease the overall cost of warfare. Robots, however, will need exceptional software and sensors (probably more sophisticated than can be developed in 35 years' time) to operate well in dense environments such as jungles or cities and, in general, where innocent civilians might inadvertently be harmed. Nevertheless, the ability to produce cheap robots will make it economical for armies to create decoy soldiers who will be authentic enough to waste the enemy's time and ordnance. The removal of humans is most likely to be possible in low-density environments (e.g., space, air, oceans, deserts, plains) with plenty of room to maneuver and where programming requirements are less taxing.

How sophisticated robots might become depends upon the pace with which advances are made in AI. The gains AI researchers have made have in large part been the result of lowering expectations and narrowing the problems they were trying to solve. As such, specialized robots are likely to appear on the battlefield well before androids.

The foot soldier, therefore, will probably remain irreplaceable throughout the next generation. Nevertheless, technology will serve his purposes as well. For example, he will be equipped with a helmet that houses a radio and potentially a computer that coordinates sensor input, generates tactical assessments of battlefield conditions, and sends and receives mapping information. It would be specific to the soldier (via a password or a biological marker) and come equipped with its own secure personal IFF (identify friend-or-foe) transmitter.

### Distributed Processing

Tomorrow's field-level computers, besides being very compact, will have much more processing power than today's supercomputers. Mission planning will be largely automated and less centralized. Operators will be able to set a goal (e.g., attack a given target or targets) and the system will automatically formulate the detailed instructions that lead to the result without the operators having to enumerate each step.

Limitations in communications, however, will restrict the military's ability to capitalize on this enormous increase in computing power. Fiber optics, although they promise virtually unlimited capacity for carrying information, will not solve the

problem entirely. They are not practical for mobile combat because fiber optics would require that the battlefield be pre-wired to carry information back from the sensors in the field to the computers behind the lines. Moreover, there are real limits to the amount of information that can be carried on radio waves. Some increases in capacity may result from focusing signals (as microwaves do now) to different receivers, or using extremely accurate lasers for line-of-sight communications. In general, however, the ability to send all information that could be collected back to a single headquarters to be analyzed is unlikely to be reached.

It is more probable that an increasing percentage of signal and data processing will have to move into the field at intermediate points. This is where AI can be used to maximum advantage. "Smart" nodes will collect information from sensors, compress it, analyze it, act on some of it, store some of it, and send the rest back (or across to other nodes).

Organizing and making sense of the data collected by this vast array of sensors, however, creates a difficult command-and-control problem. Considerable effort is now being devoted to problems of getting processors to work in parallel (that is, together as a team) rather than depending on one central processor. While it is uncertain precisely how efficient such a system of distributed processors can be made, in general, distributed systems should lead to more robust and survivable forces. Military doctrine has stressed the capture or destruction of a strategic core, which could, in turn, immobilize all other forces. In a system in which critical information flows to multiple nodes or centers, there is less vulnerability to a devastating *coup de main*. With sufficient computation power available at subordinate commands, essential pieces of command and control can then be scattered. Focusing operations against a nominal strategic core will be far less useful against forces that have taken advantage of the information revolution.

In turn, our current sophisticated capabilities to eavesdrop on communications will become decreasingly useful as a result of the use of coding algorithms such as public-key cryptography (public, because the listener gives out the encoder and keeps the decoder). Right now, all of America's supercomputers working together can barely crack one code. The next generation of codes will be longer and thus unbreakable by any combination of future supercomputers (given the low likelihood of breakthroughs in the mathematics of factoring numbers used in the cryptographic codes). By 2025, unbreakable data encryption and decryption chips will be so cheap they will be built into virtually all devices that could possibly carry sensitive information.

### Ocean Warfare

With respect to the oceans, the combination of new power technologies and superconducting motors could create unmanned undersea vehicles that could stay on station for times comparable to today's nuclear submarines. They could operate in areas normally used by manned submarines, acting as decoys or even antisubmarine platforms. Indeed, if the costs of manufacturing unmanned undersea vehicles can be reduced sufficiently, large areas of the oceans would be made uninhabitable for active manned surface or underwater naval systems.

The development of open-ocean platforms large enough to hold aircraft runways (i.e., 2000 meters by 200 meters) as well as power, transshipment, self-defense, and personnel support facilities would allow forward basing in areas where land rights are denied us. Key to this development is the underwater floating body (below the

reach of wave action) which uses slender columns to support a platform above the water surface. Commercial versions of these platforms are currently at the advanced design stage. Similar technology should also allow the creation of stable floating bridges capable of linking islands to land masses.

### Space and Strategic Systems

The successful flight of the Pegasus rocket launched into low earth orbit from a B-52 suggests that by 2025 most nations with access to a 747-class aircraft will also be able use space for reconnaissance. In time, a number of nations could well have a view of the battlefield comparable to what we enjoyed over Iraq in the Gulf War.

Low-earth-orbit satellites are, of course, vulnerable to attack. The United States has already developed an antisatellite system that can be launched from a jet within the atmosphere. Ground-based lasers will soon be able to disable satellites. By 2025 space-based lasers might also be strong enough to disable if not destroy satellites.

Proponents of the National Aerospace Plane (NASP) claim that the plane will reduce the cost of getting into low earth orbit by a factor of ten. If this assumption proves accurate, space weaponry may prove to be an alternative means of force projection. Weapons deployed from satellites need only generate a small amount of additional energy to rain thousands of small ceramic pellets down onto earth targets at Mach 25 speed. Even if the NASP projection proves too sanguine, the miniaturization of electronics will sharply reduce the cost of putting satellites into space for purposes of gathering intelligence, facilitating communications, and performing similar military support missions.

New strategic weapons and platforms over the next 35 years are likely to include nuclear weapons designed to have specifically tailored effects, and perhaps be capable of striking relocatable targets. Serious attempts will be made to develop technologies that will be able not only to defend against strategic weapons, but also to destroy them while they are still in boost-phase. Directed-energy (including laser) defense weapons, radio-frequency weapons for psychotropic effects, radiological antipersonnel weapons, and weapons capable of inducing cataclysmic geological events (e.g., earthquakes and cyclones) are all within the realm of possibility.

In the future, even less technologically advanced states will be able to lift satellites into orbit, and will thus be capable of lifting payloads that may contain nuclear or high-explosive conventional warheads. Granted, nuclear weapons proliferation over the last 25 years has been much slower than consensus forecasts. Nevertheless, it is conceivable that by 2025 the nuclear club will have substantially increased its membership, with more nations capable of holding this country at risk.

### Nonlethal Technologies

The development of nonlethal technologies -- weapons that can disable or stop large platforms or massed crowds without fatalities -- falls into three categories.

The first are weapons with conventional field-grade uses. The gradual replacement of dumb munitions with smart ones means that the chances of collateral damage in general can be reduced. Tomorrow's PGMs may even come with automatic safety devices that

can be activated when the target set no longer matches what the PGM expects to find. Specific nonlethal technologies such as intense lasers (for blinding sensors), nonnuclear electromagnetic pulse (EMP: for disabling solid-state electronics), and high-power microwaves (for disrupting communications) are all on the drawing board now. Many such technologies may allow the United States to intervene in third-party conflicts (e.g., where both sides are armed with nuclear weapons) to suppress the use of weapons that would produce large collateral destruction.

The second category are very small weapons that, among other things, allow their users to engage large platforms without needing the firepower to destroy them. Examples include super-caustics that can fog sensors and eat gaskets; liquid-metal embrittlement that can break platforms but not necessarily kill their occupants; anti-traction chemicals that so greatly reduce friction as to render vehicles immobile; polymer super-adhesives that gum up internal and external machinery; and carbon-fiber dispersants that short-circuit electronics and disable military structures and vehicles. One benefit of nonlethal technologies is that they can disable objects without requiring the gross mass that characterizes conventional explosives and projectiles.

A third category of nonlethal weapons are those capable of controlling mobs without creating casualties. Infrasound that could create obnoxious noises, isotropic munitions that emit temporarily blinding light flashes, and dispersed calmative agents which would lessen a crowd's propensity for violence would be useful for regimes that wish to maintain order in benign ways. One might envisage, for example, OPERATION DESERT ONE being carried out while the entire population of Tehran slept. The refinement of nonlethal firearms might also help western governments reduce the casualty rates arising from the use of lethal firearms in urban gang warfare.

### Communications and Psychological Warfare

President Bush employed television in a masterful manner to rally U.S. and world support against Saddam Hussein. Boris Yeltsin and his supporters defeated the tanks of the neo-Stalinist coup plotters with the same electronic tool. Both Bush and Yeltsin understood that public opinion has become a crucial center of gravity in modern conflicts. In the future, electronic technology will assume an ever-greater role in shaping perceptions. As a result, U.S. military leaders will need to consider television and other communications as means to defend or smash the will of entire populations.

Unlike contemporary television satellites, which require ground stations to relay their signals to individual television sets, the satellites of the future will be able to send programs directly to viewers. Jamming television signals from space will be quite difficult. Many foreign governments will have to choose between abandoning their own television broadcasts or allowing U.S. propaganda free access to their people. Since it will be possible soon to create fraudulent videos and recordings indistinguishable from reality, U.S. psychological warriors could wreak havoc in the minds of Third World audiences. Consider a U.S. video showing a future Saddam Hussein confessing his stupidity and cowardice to his command council.

Knowledge of the English language and American culture is spreading rapidly, even among non-elite non-western populations. As a result, U.S. news broadcasting may come to dominate world perceptions of events in peace or war. But this development creates a two-edged sword, also increasing the ability of foreign governments to craft effective propaganda for U.S. audiences. Given the

immutability of human nature, the classic rules of psychological warfare will remain valid, despite astonishing advances in telecommunications. But the need to create coherence among U.S. political goals, strategic plans, and military operations will intensify. Even apparent inconsistency between what we say and what we do might mean the difference between victory or defeat in some future conflict.

## RISKS OF ENVIRONMENTAL DISRUPTION

With every passing year, all societies become more vulnerable to incidental or deliberate environmental disruption. This is true, first, because man's own environment has become considerably more complex and interdependent. Second, much of man's progress has come at the expense of nature's buffering systems and thus the margin for error against any artificial process running amok is decreasing. Finally, the technologies of environmental mischief, particularly genetic manipulation, have grown increasingly more powerful.

Ironically, the increasing awareness of such vulnerabilities is more likely to limit western militaries (who are predisposed to be sensitive) than southern ones. In general, any military innovation (at least in western countries) that seeks to work by affecting the environment (e.g., weather manipulation) is likely to be strictly regulated by socially imposed consensus. Environmental concerns will result in an increasingly larger share of DOD and DOE expenditures both for facilities and for research and development being spent for environmental protection. The ability of western militaries to put new facilities anywhere will continue to diminish.

By contrast, the development of accurate long-range missiles makes it easier for even Third World countries to hold their neighbors' infrastructures at risk. Prime targets include dams, dikes, irrigation systems, bridges, natural gas pipelines, oil production platforms, refineries, power plants (especially nuclear ones), and telecommunications lines.

## Weather and Climate

Thirty years hence, more technology will be available to affect local weather patterns, though social resistance to the deployment of such technologies will probably inhibit their development among the democracies that are most likely to be able to develop the capabilities. Nevertheless, it will become theoretically possible to shift rainfall and monsoon patterns so as to create excessively wet or dry conditions for a hostile neighbor. Weather prediction will improve thanks to more powerful supercomputers, the deployment of more weather satellites, and the lower cost of weather sensors and transmitters. The reliability we assume for three-day forecasts should be available for five-day and maybe even seven-day predictions. The nature of the problem of predicting weather makes greater advances unlikely. Hence, wartime mission planning will be more reliable but uncertainties will persist.

The concentration of carbon dioxide in the air will also be higher; many models suggest that the globe will therefore be significantly warmer. Some agricultural areas will be less fertile if global warming ensues (e.g., Central Asia) and others may be more fertile (e.g., Canada). The expansion of desert regions might exacerbate tensions in certain areas (e.g., Africa, Southern Asia). If polar ice caps melt significantly, certain low-land areas will have to be heavily diked or be submerged. This may be disastrous for low-lying delta regions such as in Bangladesh, Egypt, and

parts of China, as well as for port cities in general. If the number of people at risk from a cataclysmic dike failure increases, dikes may become a major target for terrorism.

### Genetic Engineering

Man's ability to create and alter life forms through genetic engineering may prove as vexing to security planners as any military innovation. Biological weapons are not new but their battlefield applications have not figured prominently in the history of warfare for several reasons. Such weapons are notoriously hard to control, and may backfire as gas did when first used in World War I. Greater sophistication could lead to greater disaster. Anthrax, for instance, is very potent, but infected areas are uninhabitable to friend or foe for eons. Diseases that kill their host quickly do not spread quickly; those that kill slowly spread rapidly but their pace reduces the military advantage they offer on the battlefield. Finally, if new viruses do work, nuclear nations may decide their use justifies nuclear retaliation. Such threats could deter the development of biological agents and should not be discounted facilely.

Nevertheless, bacteria might be created that eat petrochemical-based products such as rubber gaskets, lubricants, electrical insulation, and other plastics. Such bacteria may be neutralized by the friendly side by doping their own plastics with toxic chemicals (such as halogens), so that the bacteria would only affect the enemy. A variant bacteria would convert gasoline to sludge or wax, thus stalling operating motors. Other engineered viruses might be developed to create nonlethal diseases (e.g., a 24-48 hour flu) that might be dispersed just before major battles. Techniques can be developed to hide the origin of these viruses, making it difficult both to identify a perpetrator and to cite grounds for retaliation.

A third variant could be genetically coded viruses that attack specific sub-species. A target might be the yams grown in one African country but not its neighbor. Another more sinister target may be soldiers from certain sub-populations who carry certain genetic traits not found in their opponents.

### Vulnerable Ecologies

The number of plant and animal species that survive until 2025 will be fewer than exist today. Moreover, with the elimination of their wild progenitors, many of today's farm plants will be more susceptible to new diseases that destroy crops more quickly than in the past. This will increase the chance of destabilizing shocks to the world's food stores like the sudden destruction of the world's corn crop. Today's crops are over-refined. Fortunately, this problem is widely recognized and efforts to collect the original genetically diverse rootstocks for food grains will provide some insurance. But the political implication of such a disaster are evident. It makes it easier for rogue governments to target specific strains of crops for genetic warfare.

The growing international consensus against the reduction of tropical forests may result in states pressuring states that possess rain-forests to curtail deforestation. Organizations from developed countries are already paying nations to preserve their forests. If such inducements fail, the temptation to resort to coercion will increase. Such encroachments on what is now considered a nation's sovereignty will not be limited to cases involving rain forests.

The continuing destruction of other types of flora in the developing countries is creating a growing energy crisis among poor peasants who have to range further and further for firewood. Deforestation in Haiti has led to serious erosion and has leached the soil of minerals and ruined the productivity of farmland. This may be a harbinger of agriculture shortages in large parts of the world. If so, the subsequent mass migrations to less affected areas might add to the destabilization already underway in parts of the developing world.

Technology may provide displaced farmers with a place to go. If remotely generated solar power becomes efficient (and a fivefold increase in solar efficiency is likely over the next thirty years), and if ocean desalinization can be made economical, vast areas of the Earth -- notably the Islamic belt from Mauritania to Mongolia -- could become quite fertile and heavily populated.

## CONCLUSIONS

The confluence of technological trends, our native strengths, and the world in which we can expect to live all point to the same conclusion: in defense systems, it is time to think of the small and the many rather than the large and the few.

The great naval contest between the United Kingdom and Germany, which centered on the construction of Dreadnought-class battleships, involved single digits. In the future, the means of warfare could well involve thousands (of space satellites), millions (of precision-guided munitions), and billions (of sensors, emitters, and mini-projectiles). Technology will change the nature of the battlefield. Tried-and-true concepts of large surface ships, heavy units, air bases, and C4I nodes will become increasingly obsolete. Indeed, the entire notion of organizing forces around major platforms is probably an idea whose time has come and gone. Instead, the future battlefield will require advanced lightweight sensors, compact power units (e.g., batteries), micromotors, pattern-recognition capabilities, robotics, and distributed C4I linkages.

Such requirements play to U.S. strengths. Even in the face of fierce international competition, the United States still dominates the software and systems integration industries -- together with those industries that they feed (e.g., aerospace, telecommunications). A battlefield whose major challenge is to integrate the data generated by millions of disparate sources, for instance, is one in which such skills can make the difference between victory and defeat. Forcing others to respond to such capabilities will extend our current advantages well into the future.

## 5. MISSIONS: A NEW LEXICON

The United States' national security planners need to develop a new lexicon to describe the strategic challenges that we will face in a multipolar world. In particular, they require new terms to describe accurately the roles and missions of the armed forces over the next generation.

In the new strategic environment, a more appropriate vocabulary should replace words like "containment," "MAD," "nation-building," "deterrence," "free-world alliances," "escalation dominance," or "forward deployment." These old terms carry a distracting Cold War legacy. To the extent that public support for the armed forces hinges on public acceptance of new roles and missions, we need to educate the public and members of the defense community to think in terms appropriate for the new realities. Based on our analyses, we suggest seven missions and accompanying nomenclature:

- core security
- reassurance
- leverage
- conflict containment
- punitive intrusion
- defending or liberating territory
- supporting humanitarian roles

This is a preliminary effort: the specific vocabulary is far less important than the concepts themselves.

### CORE SECURITY

As in the Cold War, the defense of the United States against weapons of mass destruction will remain the foundation of our core security. Strategic forces and defenses might face threats from one or more sources: a successor state to the Soviet Union armed with a large, diverse, and advanced long-range nuclear arsenal; a "second-rate" nuclear power with strategic forces resembling those now possessed by Britain, France, and China; or a developing state deploying a moderate number of ballistic missiles capable of hitting the United States. Ballistic warheads would not need nuclear weapons to inflict mass destruction on us. Chemical or biological warheads could also wreak great destruction. Between now and 2025, a number of smaller powers are likely to seek weapons of mass destruction to deter great powers. As a result, the United States should develop defenses, as well as forces, designed to neutralize or disarm such hostile capabilities. Otherwise, our foreign policy and our conventional forces could become hostage to blackmail by secondary powers armed with weapons of mass destruction.

### REASSURANCE

A second mission of the United States will be to reassure key allies, lest they translate their technological prowess into global military might. By demonstrating that we remain committed to safeguarding mutual interests, we can help inhibit the rise of future military superpowers among our present allies.



The United States must remain a stabilizing force in global affairs, particularly to deprive potentially hostile elements among our allies of two arguments: first, that they need to make major increases in defense spending to fill the vacuum created by U.S. retrenchment; second, that they need to rearm to escape dependence on an unreliable United States.

In addition, our military should continue to assure less powerful allies of U.S. commitment to a stable world. As in the Gulf War, we may have to demonstrate forcefully that we will assist such countries against aggression. In general, our reassurance would help stiffen their resistance to threats, and induce them to increase defense expenditures in common cause with us.

To this end, the United States should persuade its chief allies to build complementary, rather than comprehensive and competitive, force structures. We should retain military forces necessary to protect crucial lines of communication. We should reassure some allies of protection against nuclear attack with refinements in our ability to provide both strategic and theater anti-ballistic missile defenses. Finally, so far as domestic politics allows, we need to maintain a military presence overseas. More than anything else, overseas bases and forces assure allies that we have a robust capability to deploy power on their behalf. This entails some combination of permanently stationed forces and, increasingly more important, a proven ability to project power where needed. In addition, during future international crises, the formation of ad hoc coalitions may prove crucial. Such temporary alliances will help ensure that our potential peer rivals see their interests protected and their views solicited. Such an approach will also encourage burden-sharing, vital to maintaining domestic U.S. political support for our national security strategy.

#### LEVERAGE

A third mission for the U.S. armed forces will be to influence the outcome of a crisis or conflict without placing large numbers of U.S. servicemen in harm's way. Leverage might be exerted on aggressive regional states through indirect intervention. In that case, the U.S. military could seek immediate control of the air and command of the sea in the surrounding area. Our ability to maintain air superiority over allied areas would be crucial to our ability to effectively provide leverage to allies at a reasonable cost. On a less interventionist level, we could arm and provide intelligence to our allies. We should also be able to place a strategic, defensive umbrella over those countries we choose, in order to protect them from enemy missiles.

#### CONFLICT CONTAINMENT

A fourth mission will be to limit the escalation of conflict both geographically and qualitatively. This mission will become increasingly important as weapons of mass destruction proliferate.

Conflict containment requires four broad types of capabilities. We would need to be able to impose a quarantine or, conversely, to create safe transit zones, as we did in EARNEST WILL; to disarm selectively or neutralize a country's C4I, its weapons of mass destruction, and its high-performance conventional systems; to deploy rapidly interpositioning and monitoring forces; and to gather comprehensive intelligence about a broad range of countries, persons, and forces.

## PUNITIVE INTRUSION

The fifth mission involves measures to dissuade a potential aggressor or to punish an actual troublemaker. The essence of the punitive intrusion mission is brevity of duration, accuracy of targeting, and infliction of damage. This mission covers a broad range of operations, from our Libyan strike operations in 1986 and our removal of Noriega in 1989, to Israel's 1976 Entebbe hostage rescue operation or its strike against Iraq's Osirak reactor in 1981. As more countries develop increasingly sophisticated infrastructures, the vulnerability of rogue countries to such strikes will increase. This mission requires the ability to counter enemy C4I and secure our own, to gather intelligence, and to identify targets and destroy them accurately. Most important will be our ability to penetrate air defense systems.

## DEFENDING OR LIBERATING TERRITORY

The sixth mission is the classic use of force in pursuit of limited objectives, as in DESERT SHIELD and DESERT STORM. The fruits of that dual operation underscored the importance of this enduring mission. However, in the next century we are unlikely to have enough active forces for such a contingency. To begin with, the Defense Department cannot determine such force requirements in advance of knowing the size, sophistication, location, and nature of all future threats. Thus, the forces required for this mission may have to be raised by limited reconstitution, if we are dealing with a formidable Third World adversary, for example. Therefore, to fulfill this mission, our armed forces will require a program that can rebuild key technological, industrial, and personnel assets quickly.

## SUPPORTING HUMANITARIAN ROLES

More than ever before, the U.S. armed forces will have to assume responsibility for a number of nontraditional support roles. The armed forces have many capabilities beyond direct military intervention. Furthermore, in an era of fiscal austerity, comparable capabilities are unlikely to be created for new or old agencies. As a result, the military is likely to be called upon to perform a broad range of missions such as refugee protection, disaster relief, population evacuation, border control, drug interdiction, infrastructural assistance, and environmental protection. For such noncombat missions, the military generally will be able to respond with existing assets rather than requiring new platforms or systems. Requirements for such missions will include intelligence, surveillance, and monitoring capabilities; training and education cadres to assist in national development programs; and crisis emergency teams with adequate lift, personnel, and equipment.

## 6. THE EFFECT OF TECHNOLOGY ON MISSION SUCCESS

The coming changes in the world political and economic order will undoubtedly create new missions for our armed forces. Whether our armed forces will be able to meet those challenges is another matter. Dual revolutions in military technology will not only alter how the armed forces accomplish their missions. In a number of cases, these changes will influence government decisions to commit the armed forces in the first place. At the very least, the technological revolution will demand restructured forces. Furthermore, these developments will circumscribe the future of the major platforms -- the tank, the plane, and the ship -- with which warfare is now conducted.

For the sake of the argument that follows, we posit that these new technologies will be available to our potential foes as well. But the extent to which this actually occurs is problematic. In the recent past, the competition between the United States and the Soviet Union allowed the Soviets' weapons technology to spread to their various allies. These allies, in turn, often had independent notions of how, where, and when to use such weapons. With the end of the Cold War, Americans and Russians can cooperate more extensively on limiting the proliferation of such technology. Conversely, however, the new multinational defense contractors, under pressure to keep factories humming in the wake of the Cold War, may become a new force for technology proliferation. Moreover, the inevitable convergence of military and commercial technologies, particularly in electronics, means that access to the world's commercial market implies a growing level of access to militarily critical technologies as well.

More critically, while it may be possible to see ahead a few steps in the solution of a problem, later steps are harder to predict. For example, we know that radar technologies created problems that led to stealth technologies, which, when proven, propelled advances in data fusion technologies. Likewise, one can argue that the ability to put large brains in small objects would make it possible to proliferate sea denial assets and thus would make the seas dangerous for large platforms. Navies around the world would then be forced to counterinnovate. But whether they would do so successfully is harder to predict. With these caveats in mind, we have considered the possible influence of new technologies on the accomplishment of the missions outlined above. What follows examines how advances in certain technologies would make some military tasks more difficult and others easier.

### SEALIFT AND SEA CONTROL

If U.S. armed forces are to carry out *reassurance* missions, they will have to prove that they can maintain forward-deployed forces and project other significant forces across oceans. This will become increasingly difficult as our foreign basing structure shrinks and as most of the new technologies make power projection on or over the surface of the ocean more difficult. Thus, the most vexing problem facing military planners will come at the heaviest end: lift, especially sealift, and its concomitant, sea control.

Tomorrow's antiship and antisubmarine weapons will be a cross between mobile mines and sonobouys (sensing devices already being produced by the hundreds of thousands). They will have longer lives, perhaps being capable of

loitering for years before activation. Active models, in turn, may be powered by tethered photovoltaic collectors. They will have small, powerful sensors, on-board processing capabilities, and the ability to cooperate with other locally distributed sonobuoys, as well as micromotors capable of maneuvering them to where ships are most vulnerable. Fleets of active unmanned submersibles with internal power, able to chase and destroy ships and submarines, will support these "smart mines."

Naval defense will demand great advances to protect against this new threat. One defense might be a superior armor. This would not guarantee a ship's invulnerability but would substantially raise the required size -- and thus detectability -- of the explosive object necessary for penetration. Barring the development of efficient energy-beam systems for point defense, topside operations would be vulnerable to such attacks and might have to be limited to launching weapons popped out from under a thick shell. A more robust defense might include the development of "pilot fish" detectors that would swim around a vessel, detecting potential threats and attaching themselves to mines and torpedoes, so as to neutralize them. Autonomous grapefruit-sized objects, in turn, might be employed as remote mine-hunters. However, in the face of such naval weapons, we should expect that any future campaign in the Atlantic or Pacific would likely be an extended affair. The Navy would have to clear successive areas of myriad propagating sensors, emitters, and mini-projectiles.

One possible solution to the lift problem simply would be to need less of it. Lightening the loads needed for operations abroad would not only reduce the total number of shiploads required, but also allow airlift to increasingly substitute for sealift. One method would be to reduce the weight of ammunition and fuel required in the operational area. A great emphasis should be put on more efficient fuels, solar collectors, energy-beam receivers, and more effective energy storage technologies. This reasoning also strengthens the case for the use of few PGMs over many dumb rounds.

## AIR SUPERIORITY

Airlift will face the problems that will characterize the future operation of manned aircraft in most contexts. Gaining air superiority, indeed its correct definition, will be critical for our ability to carry out the *leverage* mission in distant conflicts.

Today's U.S. combat aircraft are designed, at great expense, to win duels against multiple enemy aircraft and antiaircraft ground units. But will a \$100 million aircraft win against \$100 million worth of loitering sensors, emitters, and mini-projectiles? Stealth technologies probably can protect aircraft over one, perhaps two, and possibly three decades. Yet, it is one thing to be shielded from a few fixed, ground-based radars and quite another thing to be shielded from potentially millions of enemy airborne detectors. Such objects would be variously capable of detecting an aircraft with radar, destroying its engines with carbon fibers and ceramic shards, and splattering it with substances to illuminate it for ground-based firing units and to reveal its position to micro-missiles, either concealed or loitering.

Granted, today's technology does not allow objects to loiter in the air very cheaply (balloons aside). But consider an object the size and weight of a handkerchief, coated on top with photovoltaic paint to generate power and girded with a semi-rigid skeleton, acting simultaneously as antenna and air-sail. Its fingernail-sized sensors and processors would allow it to sense wind movements and

configure itself to maneuver accordingly. When it would detect an approaching unfriendly aircraft, it would signal the approach to other fire-control units or loitering weapons. When it would sense friendly aircraft, it would transmit its accumulated intelligence and evade collision. It need not be stealthy. Deployed in the millions, such airborne sensors would be too numerous to eliminate totally. They could be launched in many ways: from missiles, from artillery, from aircraft, even from satellites.

Such technologies would limit the future of manned aircraft. We might never see a B-3 bomber. Still, decoys might provide one response. Future manned aircraft might fly escorted by flocks of emitters, each of which would light up the scope of an opponent's sensor system, as an aircraft might. Other approaches might include electronic countermeasures, jamming techniques, and the greater use of stand-off aircraft, particularly as motherships for the launch of unmanned missiles and drones. However, long-range, multi-purpose heavy transporters would still be needed. As such, they might become increasingly civilianized. This could force the enemy to knock down all suspicious aircraft, in order to destroy those actually relevant -- potentially creating a self-imposed blockade.

## SPACE EXPLOITATION

Over the next generation, the use of space as a fourth arena of warfare will become both easier and more difficult -- depending on what we seek to accomplish. The masterful exploitation of space will remain a critical feature of our national security strategy. It will be essential to our maintenance of selective dominance -- our need to maintain superiority in a domain of warfare that can, in effect, trump all or most other domains. The use of space also will provide great tactical and operational advantages, such as in surveillance (including target identification) and the management of battle. It will emerge as the crucial, commanding height of war.

Access to and control of space, for example, will be critical to establishing *core security* in both the realms of strategic surveillance and target illumination. Defensive systems will depend on space communications for tracking the location and bearing of every object large enough to contain weapons of mass destruction, once it enters the exosphere.

Within the next 10 to 20 years, it is virtually certain that the technology required to detect and destroy at least some ballistic missiles in flight will exist (if not necessarily be deployed). Indeed, in many ways, the "Brilliant Pebbles" concept is the forerunner of the (not so) small and the (not too) many taking on the large and the few. Advances in electronics would allow many nations to put up systems of highly redundant sensors, capable of tracking as many missiles and decoys as transit the exosphere. The means to destroy such missiles is expected to be more difficult, although we should have mastered it by 2025.

Dominance in space will depend on getting the most capability into orbit the fastest and keeping it there the longest against attack. As a result, there will be a premium on placing in orbit very light and cheap satellites. These will provide short-term tactical advantages at precisely the right moment.

At present, the United States relies on large, complex low-earth-orbiting satellites for surveillance, communications, and battle management functions. It is not clear that these platforms would survive against targeting by 2025. In the long run, satellites of this type will prove nearly impossible to hide because they are hard

to camouflage against an earth background. Look-down satellite hunters could take advantage of a low-earth-orbit satellite needing to cross the equator roughly 15 times a day, narrowing the adversary's search considerably. The advent of high-resolution optics, coupled with powerful on-board processing, would make a first sighting inevitable. Once a satellite is spotted, its future movement can be predicted with great accuracy. Under such circumstances, a spacecraft would be unlikely to get more than one or two passes over the battlefield before it would be targeted and destroyed.

If satellites were to become small and cheap enough, however, the difficulty of finding them would increase, as would the number that would have to be destroyed. Surveillance satellites might therefore survive better. Weapons satellites (if not forbidden by current treaties) might not -- due to the added size and weight of those platforms. The vulnerability of high-orbiting satellites would depend on a stealth and antistealth contest in space. In general, such platforms are likely to retain a high survival rate. However, they would maintain such a quality only by being much smaller and providing an inferior view of earth. Thus, new methods will have to be developed if the United States is to maintain the consistent lead it has enjoyed in the exploitation of space as an aid to *defending or liberating territory*.

#### DEEP STRIKE

Closely related to space exploitation is our ability either to destroy targets far removed from the battle zone or to carry out *punitive intrusion* missions. Technological developments are likely to make certain types of *punitive intrusion* missions easier to manage. The use of cruise missiles can already substitute for many of the missions now performed by manned bombers. Cruise missile capabilities are likely to increase. Although point defense systems are getting better, tomorrow's cruise missiles are likely to be stealthier.

The development of hyper-velocity systems is likely to make intrusion even harder to prevent. Even if space orbiters cannot be used as delivery platforms for mini-projectiles, propulsion technologies such as rail-guns or ballistic shots suggest the achievement of speeds in excess of Mach 10 for projectiles launched by those means. As projectiles can be propelled faster, they can be made smaller yet yield more destructive effect. There is little reason why an exo-atmospheric projectile cannot fracture itself into thousands of sharp, self-directed mini-projectiles as soon as it reaches terminal velocity. Such systems would be virtually impossible to defeat, other than, perhaps, with very fast and ultra-high-energy beams.

#### CORDON SANITAIRE

Perhaps the most important contribution of micro-technologies to warfare could be the creation of dispensable *cordon sanitaire* systems. Sensors, emitters, micro-robots, and mini-projectiles could be dispersed across a sensitive zone, rendering such an area impenetrable to opposing forces (a friendly force could IFF their way through). These security zones could be created in any number of ways: from air drops, artillery barrages, pre-positioning, progressive self-generated dispersion, or even space launches. After these area-denial systems fell into place, they would configure themselves into a single lethal network. Each piece would communicate its location to the others, and then would "negotiate" its own specialty, concentration, and field of view.

Microprocessors among the systems would coordinate the various inputs, and use combined field assessments for fire-control solutions against enemy assets.

Such *cordons sanitaire* could potentially accomplish a variety of missions. *Defending or liberating territory* clearly would be one -- for instance, against armored fighting vehicles. Consider the tank in the age of "fire-ant" warfare, as it would clank over a ground littered with millions of sensors and emitters, each the size of a soda bottle cap. Hidden, but ready, would be mini-projectiles the size of soda bottles. The tank would have one advantage over a plane under roughly the same circumstances: the tank would require a much larger round to stop it. By contrast, however, the sensors and emitters that would search for the armored vehicle could be both smaller and capable of lying in wait for years before being activated.

When a tank would pass by a sensor, it could be destroyed in several ways. A sensor might take a ride on a passing tank, much as a flea hops on a dog. It would then need to act quickly as a homing device for an antitank round, before the tank's smart skin detected and physically removed the sensor. Alternatively, the sensors could be trained to seek out a tank's vulnerable parts using micro-mechanical, cilia-like legs. Thus placed, it could stop the tank in one of several ways: by eating its way through gaskets, by fusing moveable parts (e.g., a powdered aluminum-magnesium burst), by befouling its air supply, by jamming its electronics, or by smearing its optics. Such weapons might very well be the culmination of today's research on non-lethal warfare. For the materials required to stop a tank without killing its crew might be far more compact and, thus, more efficient than explosives needed to penetrate or disintegrate the same vehicle.

Ironically, the best defenses against fire-ant warfare would be from low-technology sources. One defense might involve simply shovels and dirt: digging in to harden sites, or burrowing deep to survive PGM attacks. Another might be by making military movements appear identical to civilian ones, forcing opponents to destroy everything in order to eliminate opposing armies.

Such *cordons sanitaire* could also be used in *conflict containment* and conventional deterrence. Mass deployments of sensors, emitters, and micro-projectiles could create no-go zones. Transit would be virtually impossible except by vehicles to which we would provide safe-passage codes. One can imagine the deterrent effect of such technologies on some future Saddam Hussein. Would he dare invade his neighbor knowing that his immediate border area had been seeded by hundreds of thousands of sensors, revealing every movement and allowing for the pin-point targeting of all equipment?

*Supporting humanitarian roles* would also be affected by these technologies. Consider the task of evacuating civilian populations under fire. Such a task takes on importance now that we understand that the defense of a city's people -- the source of skills and knowledge -- is more important than defense of inanimate territory or buildings. A Hong Kong or a Singapore might arise anew after its population were moved to Western Australia or British Columbia. Fire-ant warfare could provide a *cordon sanitaire* for weeks, behind which larger successors to the 747 or C-5, working around the clock, could evacuate a hundred thousand people a day or more. A derivative version of the *cordon sanitaire* can also enhance *core security*. Third World countries, not daring to confront us directly, might attempt to covertly introduce nuclear, biological, or chemical weapons into our cities. To counter them, we might employ myriad sensors to track all incoming ships, aircraft, and trucks. Ant-sized

micro-robots might be able to search through containers and detect the presence of illicit materials before they reach our shores.

## INFORMATION WARFARE

The greatest impact on warfare of the dual technological revolutions could be the dramatic increase of ability to acquire, transmit, and analyze vast amounts of information.

Information warfare could be used in *conflict containment*. A surgical approach might make it difficult for belligerents to communicate certain kinds of messages. A nonnuclear electromagnetic pulse or microwave burst could prevent Third World rivals from using their communication systems to order nuclear strikes. Other techniques might flood communications channels to their capacity with useless information. A parallel approach would be to target the civilian communications infrastructure. We could force our messages into their systems, crafting transmissions that show video audiences highly negative images of their rulers or depict their military situation as hopeless. Thus, technology could allow psychological warfare to break our opponents' wills.

Information technology could also assist *leverage*. One technique -- rapid, cheap to employ, and surreptitious in delivery -- would be to transmit an enemy's order of battle and unit location information from satellites to allies. Similarly useful information could come from the delivery of battle management software so that neutrals could empower their own defensive grids.

Finally, information technology could make many other forms of *supporting humanitarian roles* possible. Tomorrow's denser data grids will make it easier for our armed services to undertake disaster relief. For example, we should be able to assess damage much more quickly and begin to coordinate relief efforts much more effectively. Where expert medical or engineering assistance would be needed, such knowledge could be made available almost instantaneously through a combination of deployable expert systems and live remote video hook-ups.

## COMMAND AND CONTROL

Accommodating the dual revolutions will entail two distinct changes in the architecture of command and control. "Pop-up" warfare will require far greater mobility or dispersion of military units than ever before. In particular, with the increasing accuracy of precision-guided munitions, rear-line soft facilities are increasingly vulnerable to attack. These include command posts as well as runways and logistics facilities. Command posts, as a result, will have to be highly mobile and frequently moved. Logistics depots will have to be more widely dispersed or be better camouflaged among seemingly innocuous backgrounds. Correspondingly, tomorrow's platforms will have to be considerably more autonomous than at present.

One might envision an armored engagement in which tank commanders communicate mostly not with headquarters but among themselves, taking advantage of each other's tactical intelligence. Powerful information processors in each vehicle would develop, suggest, and -- if confirmed -- execute battle plans on the basis of coordinated field assessments. Each would adjust to the circumstances faced by its colleagues over a radius of several miles on a continuing basis. Headquarters would generate the major direction for operations but the detailed battle plans would be left to on-site units.



Pop-up warfare, correctly executed, would end even the vestiges of the linear front, as well as the relevance of the correlation of forces in narrow areas. The rationale for such calculations was always that soft organs in the rear were vital to the hard shell that constituted the front line. A single breakthrough could immobilize the entire field. If, however, units are more autonomous in terms of command and control, as well as logistics, then the relationship between the soft innards and the tough shell is far less important. Opposing forces will not (panic aside) collapse when punctured; they will have to be destroyed piecemeal. Pop-up warfare, in general, would favor defenders. They need but sit quietly hidden until something moves on their screens -- which the offense, inevitably, must. At that point, the attacker would become much more vulnerable and risk a highly unfavorable exchange ratio.

In the age of "fire-ant" warfare, however, command and control would revert to an even more centralized structure than we know today. Gradually eliminating people from the battlefield suggests that eventually a single individual (or even a computer) might be capable of doing what previously required entire divisions. In theory, it might suffice for one person to command entire armies without human intervention whatsoever. On the other hand, the development, deployment, maintenance, and programming of such a force would be a gigantic task. As we advance through the next 35 years, armed forces are more likely to be composed of specialized, highly professionalized, and very mobile corps. They will travel globally to install, oversee, reprogram, or repair the massive automated systems that tomorrow's armed forces will become. Parts of the Army of tomorrow, may well resemble Bechtel's global construction firm of today.

## CONCLUSIONS

The message in the matching of means to missions is basically simple. MISSIONS THAT REQUIRE THE DELIVERY OF LIGHT OR WEIGHTLESS ASSETS WILL BE EASIER; THOSE THAT REQUIRE THE DELIVERY OF HEAVY ASSETS WILL BE HARDER. Together we will have to pursue a vigorous R&D agenda to keep the armed forces abreast of current technology and carry out an acquisition strategy that allows us to react effectively even to unforeseen events. It is to this area that we now turn.

## 7. IMPLICATIONS FOR RESEARCH, DEVELOPMENT, AND PROCUREMENT

Because the specific national security environment of 2025 cannot be known 35 years in advance, our response to the unknown should be a sound research and development agenda, backed by a balanced procurement strategy.

Recent events support this argument. The victory of DESERT STORM in 1991 was based on 1980s equipment, developed in the 1970s, based on technology conceptualized in the 1960s. Likewise, our defense systems of 2025 will have been purchased in the 21st century's second decade, based on development programs of a decade earlier, reifying technologies envisioned in the 1990s.

These realities are reinforced by political and psychological factors. As the Soviet reaction to SDI indicated, technological potential alone, even before it is transformed into actual weapons, can influence international correlations of power. Similarly, wariness regarding U.S. capability can discourage potential peer competitors from engaging us in an arms race. We must encourage the leaders of such states to believe that our lead gives them little chance of overcoming us in contests to develop critical defense-related technologies.

Finally, for the first time in a century and a half, we can no longer assume that we will continue to possess all the high-technology industries needed to support a comprehensive defense program. But if we know what key technologies we need to support a long-term research agenda, we will know which industries we have to nurture to preserve our national security in the 21st century.

### ELEMENTS OF A LONG-TERM RESEARCH AND DEVELOPMENT AGENDA

Although not impossible, it is unlikely that the United States will face a peer competitor in the next 10 years, perhaps in the next 20. Prediction beyond 2010, however, is more difficult. As noted, economic conflicts, evolving political alliances, and the rise of regional aggressors may each come to challenge us by 2025. It seems a prudent strategy to continue a vigorous advance in military research and development.

More specifically, given severe budget constraints, an emphasis on long-term research makes most sense. In the short and medium term, fairly modest efforts will suffice to maintain our lead in defense technologies. But over the longer term, a more coherent program is needed.

Second, as suggested, further work on weapons platforms, while necessary in the medium term, offers fewer long-term benefits. Instead, a long-term agenda should concentrate on developing defense systems composed of dense networks of sensors, emitters, micro-robots, and mini-projectiles. To do so, five technologies are vital: electronics, nanotechnologies, energy, software, and manufacturing.

*Electronics.* Many of the advances in electronics necessary to dominate tomorrow's battlefield can take place without Defense Department support. However, government encouragement would lead to faster, smaller, and more powerful microprocessors, memory devices, and digital signal processors much sooner than would otherwise be the case. Comparable progress in emitters and sensors (including

receivers) will need even more focused official attention, because immediate commercial uses for such products are hard to identify. Tomorrow's sensors are more likely to be useful to the military if they can be specialized. Some would respond to various radio waves, while others would pick up magnetic fields, chemicals, pressure changes, acoustics. Field-grade (as opposed to medical-grade) bio-sensors may be particularly valuable on the battlefields of the 21st century.

*Nanotechnologies.* We are beginning to see progress in development of highly miniaturized motors and gears, using technologies similar to those employed to produce dramatic progress in electronics. Tomorrow's "small but many" sensor and attack systems should be able to scurry almost unobservably around the battlefield like the ants they resemble. Moreover, these systems should be able to maneuver on the surface of enemy weapons platforms as well, in order to disable them. These "ants" may be capable of interacting with chemicals on the microscopic level as well, rendering hostile agents inert.

*Software.* Better software tools are needed for enhancing two capabilities: artificial intelligence and distributed processing. Artificial intelligence encompasses both logic processing and pattern recognition. Distributed processing includes the well-characterized problem of how to parse a complex problem for multiple processors. The battlefield of the future will also require substantial auto-reconfiguration capabilities. This means that all those sensors, emitters, micro-robots, and mini-projectiles -- distributed randomly in the confusion of battle -- will have to configure themselves so that each can receive information about the activities of the others and react accordingly. In essence, they must form themselves from generic components into a very powerful computer, but one capable of graceful degradation under extreme conditions.

*Energy.* New, more efficient, and more compact power sources are necessary for these distributed electronics to have the necessary longevity on land, on the sea, or in the air. Better batteries is one solution. The development of thin but efficient photo-sensitive surfaces offers another. A third power source possibility is the development of technologies capable of beaming energy from a platform to a remote device. Conversely, if high-energy lasers can be made capable of destroying incoming PGMs, an important advantage of precision-guided munitions may disappear in uncluttered environments. Thus, the future materials research agenda will continue to emphasize the search for higher-strength, lower-weight materials, with greater resistance to heat and, in some cases, greater penetration ability.

*Manufacturing.* Finally, if the battlefield of the future will be dominated by millions of very small devices, then we must be able to produce them with high quality, in great volume and at low cost. Unfortunately, Japan, not the United States, is the world's leader in such manufacturing. It is one thing to prototype systems built from Japanese components. It is quite another to so equip our forces. It is imperative for a successful national security strategy that U.S. manufacturers regain at least parity in this area of production. As a complement, we also need to improve the quality of our low-volume products. To this end, the Defense Department may wish to advance computer-integrated manufacturing technologies in general, and product definition standards in particular.

#### A HEDGING STRATEGY FOR PROCUREMENT

One can envision the capabilities needed to deter and defeat a present threat. It is much harder to determine how to deal with unknown or hypothetical threats. This

is particularly true when, as a consequence of facing no present threat, procurement budgets are severely constrained. Under such circumstances, what kind of procurement strategy should one use? This report concludes that we need a hedging strategy. Such a strategy would be based, first, on how companies with intelligent leadership operate under conditions of extreme uncertainty, and second, on the needs and options that technology creates.

The hedging strategy has five components: prototyping, simulation, reconstitution, core competencies, and cycle-time reduction.

Prototyping strategies divorce the development of prototypes from mass production and acquisition. In normal business, prototypes are developed and financed in the expectation that they will lead to a major procurement program. This limits the number of technologies that are taken to the prototype stage, where their technical and military effectiveness can be better evaluated. In a period in which technological and strategic uncertainties loom large, it may be better to design and finance many weapons prototypes but purchase only small numbers of each. While this will raise unit cost, it will broaden the range of military capabilities that the United States can explore, by reducing the total amount expended on procurement. If we are uncertain of future strategic requirements, we may ultimately benefit from having a wide range of weapons from which to choose. The prototype development strategy must be complemented by a surge production capability. This will ensure that large numbers of weapons can be fielded when, and if, a clear and imminent strategic threat emerges.

To understand how prototyping might work, consider the range of potential successors to fulfill the missions of the B-2. They might include space-based bombardment platforms, aerospace planes, or improved missiles launched from submarines. The United States will probably not be able to afford even small production of all these systems. We will have to make an educated guess about the best major delivery system for the future. Prototypes could be used to explore the potential of unmanned systems that could be delivered to a theater by various means. Similarly, prototypes of land-attack missiles, land mines, sea mines and autonomous anti-aircraft weapons could all be developed for evaluation. These weapons need not be procured in large numbers. But small numbers could be updated or completely replaced, either as technology advances or as strategic problems change. Plans for rapid mass production of these unmanned weapons could be developed as each new prototype is created.

Simulation will become more important in four contexts: strategic, system, operational, and training. Strategic simulations -- war games -- are useful, although not so much for predicting the future. Instead, war games can familiarize defense planners with a range of future problems and help them explore the use of alternative strategies as possible solutions.

System simulation is the increasingly important ability to predict the performance of defense systems (and the factories in which they are manufactured) before they are built. Good simulation allows designers to play "what-if" games on the cheap.

Tactical simulation is akin to testing systems under operational environments (such as is done at the NTC). Dense systems are likely to be terrain-sensitive. We simply cannot know how billions of such new weapons will function until we can evaluate a few thousand of them in trials against existing forces.

Finally, training simulation offers an inexpensive way to acquaint troops with the use and repair of complex equipment. Soon, L.C. Virtual-Reality technologies will lead to helmet-shaped devices and joysticks for the training of troops under conditions closely approaching those of an actual battle. In the future, individual systems could be integrated to interact with each other. These would permit multi-lateral "combat" of great psychological, if not physical, intensity. As capability increased and cost declined, these systems would allow large-scale, reliable tests of tactical and operational doctrine. They could also improve the training of combat reserve units without heavy outlays for equipment and training areas.

Reconstitution will be required in case of the emergence of a major threat to our security. This could mean the expansion of tomorrow's small cohorts to armed forces of Cold War size or even larger. Normally, we would prepare for this eventuality by ensuring that current military manufacturing lines had spare capacity to permit production surge. However, a prototyping strategy would mean few such active, correctly sized production facilities. Instead, we would have to rely on commercial industry. This requires planning to obtain components of tomorrow's defense systems from commercial production lines. Therefore, tomorrow's weapons have to be designed originally with commercial parts. Complementary acquisition reforms are needed to ensure that today's commercial producers cooperate with the Defense Department. Presently, many are reluctant to do so.

The Defense Department must focus on core competencies, forcing potential opponents to react to our military R&D agenda, rather than the reverse. This means identifying our particular competencies, then developing them to dominate key strategic functions. By way of illustration, consider how Honda used its competence in small gasoline motors to compete successfully not only the automobile market but in the small electrical generator and lawn mower markets as well. Likewise, in the military world, the U.S. Navy used the longstanding superiority of our attack submarines to develop the anti-bastion component of the Maritime Strategy. These examples point the way for our future core competency strategy.

The United States needs a research, development, and procurement strategy that will convince potential rivals that an arms race with us is unnecessary for their security but also unwinnable. Military requirements for such political-psychological dissuasion might be found in maintaining substantial leads in the R&D of sensor systems. We could push improvements in our ability to use space for intelligence-gathering or deploying weapons systems.

Cycle-time reduction -- accelerating concept-to-deployment speed -- would be another means to meet emergent threats quickly. Japan's car companies, for instance, made significant inroads into our markets by being able to field a new car in four years, against Detroit's six. Similarly, the Defense Department needs closer coordination with defense producers, to develop technologies and administrative procedures to cut cycle times substantially. Modular weapons systems would provide one means. At present, weapons integration to ensure that each component of a weapon fits all others takes years. While this integration goes on, component designs are frozen. Without a completely fresh start, the introduction of new technologies and requirements into current programs is virtually impossible. Using more self-contained modular components -- metaphorically, each fit to a standard socket-- would greatly reduce this time.

## BROADER IMPLICATIONS OF TECHNOLOGY

We need to consider how future battlefield technology may shape our overall strategy for waging war. The atomic bomb, for example, introduced more than a new type of explosive into warfare. Nuclear weapons fostered complex theories of deterrence, which, in turn, altered the entire edifice of military strategy.

*Defense and Deterrence.* Tomorrow's technologies will allow the United States and its peers to mount a fairly effective defense against ballistic missiles. Thus, the policy of deterrence will persist because it will be effective -- just as it helped keep the Cold War cold. But deterrence has never provided a particularly comfortable option. There has never been a truly satisfactory method proposed for using strategic nuclear weapons should deterrence fail.

The irony behind technological advances, however, is that they eventually provide our opponents means to injure the United States grievously. By 2025, many more nations than at present will be able to launch ballistic missiles. Gene-splicing machines are already inexpensive, and potentially capable, in the wrong hands, of causing considerable mischief. The growing dependence of advanced nations on inherently vulnerable communication, transportation, sanitation, and information networks creates other security concerns for us. Many foes will thus have the probable capacity of exercising leverage over us. Therefore, we must have ways of exercising leverage over them through deterrence.

Unfortunately, deterrence depends more on psychological-cultural than on technical factors. In retrospect, it was fortunate that we and the Soviets shared enough of the same thought processes to communicate clearly the reality of mutual deterrence. But we may not be able to send and receive such unambiguous messages to the increasing number of non-western countries and forces that might do us harm.

*Defense and Strategic Siege Warfare.* As argued above, forces armed with many small sensors, emitters, and micro-projectiles will eventually be able to defeat forces composed of large, vulnerable platforms. Such developments will grant the tactical and operational advantage in warfare to the defense, reversing the trend since 1918 that has flowed in favor of the offense. On the strategic level, however, improvements in ballistic and cruise missiles and, soon, hyper-kinetic projectiles will make easier the destruction of national infrastructures. But occupying enemy countries in the face of multi-layered arrays of defense is likely to become even more difficult.

This suggests that future wars between technological peers will resemble siege warfare -- perhaps mutual siege warfare. The same *cordon sanitaire* technology that can protect a state against invasion can be applied from the outside to place that same country under blockade. The ability to impose a siege, however, is far different from the ability to maintain a siege to the point of victory. In the 21st century, how long might technology allow a besieged party to endure a total blockade? Would modern polities have the patience or stomach to maintain sieges over years, while the besieged mounted electronic psychological operations to project pitiful images of the victims of the siege? Would technology permit the besieger to blockade such electronic communications or douse the besieged with messages of panic or despair? If such sieges prove impossible, what techniques would be available to contain aggressors one could not destroy?

*Defense and Humanitarian Warfare.* The use of technology in the service of national security has always had two aims: to defend the polity or its perceived interests, and to minimize the human costs to the polity of so doing. Nuclear war, at least in popular imagination, was the epitome of how technology might raise casualties in war to an unacceptable level for both sides. Although total human extinction, as a result of a global nuclear exchange, was probably never very plausible, the destruction of two-thirds of each side's population was a real possibility. But such horrendous casualty rates were not unknown in the past. Two-thirds of the population of Germany died in the Thirty Years' War -- when war was the province of small professional armies armed less well in the aggregate than today's American street gangs.

In fact, most of the factors that determine the casualty rates in war tend to be situational and cultural rather than technological. Such factors include the bloody-mindedness of the victors, the desperation of the losers, the extent of desire and ability to distinguish military assets from civilian ones, and the degree to which the enemy's infrastructure is at risk. Technology can play a role in casualty reduction only if such values lay behind the use or development of weapons systems. Thus, precision-guided munitions can reduce collateral damage.

But overwhelming superiority in technology can be used to spare bloodshed. One could destroy most of an enemy's equipment, leaving him facing such long odds that he would acknowledge defeat and cease hopeless resistance. But this requires mutual recognition of the same reality, as well as the ability to act on it. Recent history shows that this does not always occur. For example, despite obvious material inferiority, neither the Afghan Mujahadeen nor the Vietnamese Communists surrendered. Moreover, many Iraqis died in the Gulf War despite their desire to flee or surrender, since they lacked the means to do so.

Some new warfare technologies can also inflict great damage if they slip from their employers' control or are inherently beyond control once unleashed. Certain forms of biological warfare fall under this category. Viruses, for example, propagate without waiting for human permission. To a certain extent, "fire-ant" warfare, if badly engineered, holds such risks as well. In other words, despite our best efforts to avoid unnecessary casualties, even our use of the purely conventional weapons available in 2025 will often result in very heavy losses to our opponents. In fact, the distinction between the damage inflicted by weapons of mass destruction and by conventional weapons may not seem very obvious to those at the receiving end.

## 8. FINAL CONSIDERATIONS

The current strategic debate is overshadowed by the concern that the United States may revert to the errors of the 1920s and 1930s. Then, we shirked our global responsibilities only to find that, while we had turned inward, abhorrent new threats had emerged. In the interwar period, Americans assumed that other great powers, most notably France and Great Britain, would look after their own interests while maintaining order in most parts of the world. As a result, the American people, on the whole, had relatively little commercial, cultural, or political contact with the outside world. Furthermore, although we had engaged in and helped to win the First World War, we felt cheated of the promised fruits of peace. The Great War had not proved to be "the war to end all wars" or "the war to make the world safe for democracy" after all. Disillusioned, we retreated into isolation. We lived in a world that we believed to be apathetic about our values, when not actually hostile to democratic government.

Today, Americans know that their country is the world's only superpower and they feel tremendous pride in that reality. We have successfully concluded one of the greatest struggles in all history -- the Cold War. We have achieved a major victory at remarkably low cost in a small but sharp conflict in the Persian Gulf. We have come to understand that the welfare of our economy and our society are linked to those of the rest of the world. Liberal democracy, if not universally triumphant, is seen as the wave of the future.

But, after winning the Cold War, it seems likely that the U.S. people and their representatives will seek to focus more of their energies and treasure on dealing with domestic issues. The United States will not return to isolation, but neither will it continue to accept the large defense budgets of the Cold War, nor is it likely to be ready to venture into foreign quarrels that are not clearly linked to U.S. security or vital interests. Americans want their country to be powerful, vigilant, and ready to act. However, they will not provide unstinting resources or approve of open-ended military efforts in remote portions of the world. In addition, they are growing accustomed to relatively bloodless military efforts, as well as to unquestioned technological superiority over potential foes.

### STRATEGIC CHALLENGES

Having sketched a future security environment characterized by change in some respects, continuity in others, we see the following as this report's central points:

(1) The United States will enter the new international order in the 1990s with a strong suit -- military power. But most of the rest of our hand (particularly our economic and financial power) will be less impressive than in the decades immediately following World War II. The U.S. economy remains and will remain the largest in the world, but it is now only one of three great hubs of economic activity. Our cultural and political influence will vary, but probably will not be as great as it was when Europe and Japan were still recovering from the Second World War. It is in the strategic realm that the United States will most seem a superpower.



(2) For the foreseeable future, we will not have a rival like the Soviet Union or the Axis powers -- states gripped by totalitarian ideologies and equipped with large and sophisticated armed forces. In consequence, the United States will not need to be ready on short notice for an all-out conventional or nuclear conflict with such a formidable enemy.

(3) Even if a peer rival eventually emerges, it will pose a different sort of challenge and be animated by a different ideology than that which we have faced for the past 50 years. Still, if the United States need not protect itself against a peer competitor in the immediate future, it will need military power to shape the calculations of possible peer challengers in decades to come. Ideally, our strategy will lead potential rivals to conclude that an arms race with the United States is unnecessary, and unwinnable in any event.

(4) Turmoil -- from the diffusion of weapons of mass destruction to demographic pressures, religious and ethnic passions, and environmental constraints -- will continue to encroach upon and at times threaten our interests. Even older concerns (such as the unimpeded access to oil) are likely to be salient well into the next century.

(5) The technology-driven revolution in military affairs will accelerate, as radical improvements in a variety of areas -- data processing above all -- continue. If firepower, protection, and mobility were the three classic elements of a military system in the past, a fourth -- the ability to gather and process information while denying it to an opponent -- has now been added to the equation. On the whole, this should play to the United States' advantage, but it will pose problems as well. As technologies developed by the civilian sector continue to outpace those developed by the military, other countries may be able to match us in certain key areas. Furthermore, technology may transform warfare in ways that will challenge organizational arrangements -- especially in the area of command and control -- that our armed forces have employed to cope with the confusion of the battlefield for a long time.

(6) Finally, although the immediate survival of the United States will not be our dominant concern, we will still need to defend against and deter attacks by an increasing number of states (and possibly rogue military units) possessing nuclear, biological, chemical, and advanced conventional weapons.

The strategic challenges of the new world will not be as perilous as those at the height of the Soviet challenge, but they still will be serious and, in many ways, more varied. Our strategic concepts and habits of military thought, however, have a Cold War mentality impressed upon them. It would be easy -- and dangerous -- to think of new problems in terms of old concepts. Words like "warning time," "containment," and "coupling" no longer will mean what they did in the past. In consequence, we will confuse ourselves if we cling to terms that are familiar but increasingly detached from new strategic realities.

#### BALANCE AND HEDGES

Having matured within the certainties of the Cold War, the U.S. military planning community must now learn to grapple successfully with uncertainty. There is no adequate, let alone foolproof, methodology for determining tomorrow's threats. What we can do, however, is examine historical case studies in which militaries were faced with similar strategic uncertainties. Informing present decisionmakers about

the future by pondering the lessons of the past may well be the most effective course available for sharpening our judgments as we approach 2025.

It is important to underscore two broad caveats. First, we must be mindful of the limits of U.S. power, especially military power. For instance, from the vantage point of 1948, the United States essentially decided that it was not within U.S. ability to forcibly evict the Red Army from Eastern Europe. We could defend Western Europe, put up a good fight in Germany, but we would not force the USSR to relinquish its stranglehold on its satellites through a costly conventional war. Thus, there was a need for a long-range grand strategy that avoided direct military conflict. Largely because the United States wisely maintained its strength, was ready to use that strength, and generally selected other measures short of outright war, the United States persevered and emerged the victor from the Cold War.

Second, while foreseeable to some extent in periods of stability, the future remains fundamentally capricious. As recent events have illustrated, unexpected "shocks" can radically change the loci of power, threat, or opportunity. Technological break-throughs, economic depression, environmental and human disasters, or an incipient totalitarian ideology each could upset the comity of nations and lead to the temporary breakdown of the basic code of international conduct. These possibilities make it difficult to plan our strategy and force structure in a way that simultaneously addresses the relatively transparent threats and cushions us against the unexpected.

The kind of strategic thinking in which we must begin to engage may seem strange to us now. But that sense of abnormality is an artifact of this peculiar last half-century. For most of our national history, U.S. strategists (and, for that matter, their counterparts in other lands) have had to think about a world in which the character of the next opponent -- and especially his threats -- were relatively more ambiguous than has been the case for us in 1946-91. Hence, the absence of a single planning scenario has been the norm in history, not the exception. In many respects, therefore, the era ahead is ushering in a period of strategic normality. To the historian writing in 2025, it will be the frozen simplicities of the Cold War that will seem bizarre, not the strategic flux that characterized the periods before and after it.

A successful strategy must, therefore, constantly hedge against such shocks. National security for an uncertain future rests on a proper balance of investment in domestic strength, force structure, RDT&E, and intelligence. The end of the Cold War offers us great opportunities and promises a generation or more of peace to redirect our resources, in order to best preserve the long-term security of our Republic. To take advantage, we need a balanced approach. The government of the U.S. people must attend to all the sinews of power in the 21st century: the education of our citizens, the husbanding of our natural resources, focus on U.S. leadership in selected areas of technological competition, and maintenance of sufficient military force structure to provide our nation insurance at an acceptable premium.

## **Appendix A**

### **PROJECT 2025 BRIEFING FOR THE SECRETARY OF DEFENSE AND THE SERVICE CHIEFS**

#### **National Security Planning for an Uncertain Future**

##### **BACKGROUND OF PROJECT 2025**

*Good Afternoon Mr. Secretary:*

This afternoon I shall brief Project 2025, a study tasked by the Vice Chairman, to help think about and begin to plan now for what promises to be the vastly different security environment of the next generation.

PROJECT 2025 evolved in two phases. In the first, three independent, private analytical organizations and the Defense Intelligence Agency set forth 13 different versions of what the world might be like in the year 2025. They ranged from the dire to the utopian. On the violent side of the ledger, for example, SRS Technologies envisaged a virulent contest between the West and a radical, more or less united, pan-Islamic bloc waging a deadly holy war. In an entirely different vein, a group of earnest academics from the University of Houston created a "green" scenario in which the United States sets aside its arsenal altogether and devotes its energies exclusively to saving the planet.

The fruits of these organizations' efforts were suggestive, not only of the bewildering variety of circumstances that may lie hidden in an unseen future, but also of the need to approach long-term planning with a method that is neither arbitrary nor inappropriately "scientific." Accordingly, we trimmed off the improbable versions we had examined, retained those elements that seemed both plausible and relevant for U.S. security planning, and engaged in some "futuristics" of our own.

##### **CONTINUITY OR DISCONTINUITY**

In looking a generation into the future, we experimented with two diametrically opposed assumptions. We first looked to the preceding generation and noticed the remarkable continuity that has characterized both the international and the strategic environments over the past 35 years. Since 1956, thermonuclear weapons delivered by long-range ballistic missiles and bombers have remained the dominant strategic weapons; aircraft carriers and submarines, the capital ships of the world's great navies; and artillery and the main battle tank, the weapons of choice on the land battlefield. The great global powers throughout the period were the United States and the Soviet Union. Accordingly, we tried to project future

political and technological developments assuming they would be a rough continuation of the trends we currently saw.

We then reminded ourselves that 35 years also represents the time between 1916 and 1952. In 1916, battleships were the capital ships of the world's great navies, artillery and infantry shaped the land battlefield, and aircraft were primarily used for reconnaissance. The world's foremost political competitors were Great Britain and Germany. Accordingly, we also envisaged discontinuity and tried, with the aid of the materials presented to us from Phase I, to imagine a number of destabilizing but plausible shocks to the international security environment that could produce new political alignments and new technologies, and could give rise to formidable new military powers, or power blocs, striving for regional, conceivably even global hegemony.

In the end, we concluded that the current state of political flux and technological innovation meant we were standing at the brink of an era more likely akin to that of the closing years of World War I than to the last generation of the Cold War. This perception, and the fact that we believe that "whoever lacks an imagination for disaster is doomed to be disappointed by history," reminded us that it would be incautious, if not actually irresponsible, to assume that a clear security horizon today means that storm clouds cannot again gather quickly in the future. Optimists have been proved wrong twice in the past half-century, in 1941 and again in 1950, with catastrophic consequences. Future generations are unlikely to forgive us if we repeat the error a third time.

The work undertaken in Phase I was suggestive in at least one other important way. It demanded a national security strategy designed to encourage the brighter futures by adopting policies that would reduce the incentives for the emergence of the dire and disruptive, as we shall see.

With these contrasting assumptions of rough continuity, on the one hand, and dynamic change, on the other, we laid out the crucial questions, which the study has sought to answer in Phase II.

## **FORMULATING THE PROCESS: THE QUESTIONS ADDRESSED**

Accordingly, in Phase II, INSS focused on answering five basic questions:

- 1) What threats to U.S. interests will be created by the various circumstances seen arising in the international security environment of 2025?
- 2) What missions for the U.S. armed forces will those threats generate?
- 3) What new technologies will transform the battlefield of the future?
- 4) How can we use the technological capabilities on or just over the horizon to help us to carry out those missions?
- 5) What kinds of research and development, and acquisition strategies might we employ to help ensure that our armed forces remain capable of both protecting the national interest and increasing the prospect of prolonged global peace and stability, in a period of uncertainty and fiscal austerity?

Turning first to the security challenges that the United States should be prepared to face in the 21st century, we made our projections generic. We did not look to the circumstances for the precise "when" and "who," but rather, generally looked for the "what."

## **CHALLENGES IN THE DEVELOPING WORLD**

The security threats of the next generation will assume three basic forms. Two will emanate from the developing world. This is hardly surprising. The West is home to a small and decreasing proportion of the globe's population. Currently, the western industrial democracies make up a mere 12.7 percent of the world's population, and barring the unforeseen, that proportion will fall to 8.6 percent by 2025. That means that, while today there are 7 "Third Worlders" for every 1 of us, in 2025 there will be 11.

First, population pressures, economic stagnation, possible ecological catastrophes, and, above all, the political instability built into great parts of the developing world because of ethnic diversity and the question of legitimacy to which it often gives rise, all suggest that chaos will continue to characterize substantial portions of the underdeveloped world. We see the United States, on occasion, becoming involved because our interests will sometimes be at stake, or because a conflict may be threatening to escalate, either geographically or vertically to unacceptable levels of violence, or because, the national consciousness being what it is, we wish to intervene for humanitarian reasons. The assumption is not that the United States will decide to shoulder the burden of the world's policeman, but only that we may, selectively, decide that military intervention is necessary.

Latin America, which faces many of the problems found in the rest of the developing world, will be an especially difficult part of the Third World for U.S. policymakers to ignore. This is true because of the region's geographic proximity, its history, and the growing ethnic ties between various of its nation-states and our own.

Second, we can expect regional powers with expansionist ambitions to fish in the troubled waters of the developing world. Proliferation of advanced technologies will mean that the next generation of Saddam Husseins will possess capabilities equivalent or superior to some of those we deployed in DESERT STORM. Accordingly, there is the danger that some future aggressor will succeed in using Saddam's failed strategy: attempting to raise the potential cost of U.S. intervention beyond what the nation may consider legitimate to pay.

These two generic threats are easy to visualize since we have already seen their like. While DESERT STORM may deter regional bullies for the foreseeable future, it is unlikely that such deterrence will remain unchallenged into the next century.

## **THE EMERGENCE OF A PEER COMPETITOR**

The most significant threat that the United States could face in the future would be the emergence of a peer competitor. Such an adversary, while as difficult to envisage now as it was in the 1920s and again in the immediate afterglow of World War II, is hardly unthinkable over the next three-and-one-half decades. A peer

competitor would be a country or bloc that could compete with us globally and would have the technological and doctrinal sophistication, if not to defeat us, then at least to present us with a constraining global challenge such as we knew during the Cold War. In this study, we developed some illustrative but politically sensitive scenarios to show how today's emerging economic blocs might develop a military dimension to add to their current economic competition. The slide indicates some of the challenging coalitions with which we might some day have to contend.

As we look to 2025, we will need to preserve a global concert of major powers that supports U.S. interests in a more politically complex world where military power is more widely distributed than it is today. The diffusion will be all the more likely and proceed more rapidly in a world in which the United States not only draws down its forces but also relinquishes its monopoly of advanced military technologies. In such a world, only the United States will be able to orchestrate a global concert into the 21st century, much as England did in Europe in the century after the Congress of Vienna.

While Europe will continue to be an important center of power, increasingly the global fulcrum will shift toward the great Asian arc that reaches from Petropavlovsk to the Persian Gulf. This arc already contains over half the planet's population and has the world's highest economic growth rate. By 2025, it will probably be the economic and technological center of power. Three nations in the arc -- Japan, Russia, and China -- are each potential contenders for hegemonial status in the region, while India, Indonesia, a reunified Korea, and perhaps Iran may all become serious military powers in their own rights. Therefore, it would only be a matter of time before any power that dominated this region could extend its power globally.

## **SEVEN MISSIONS: THE NEED FOR A NEW LEXICON**

In this new international and strategic environment, words like "warning time," "MAD," "containment," "nation building," and "coupling" will have to be replaced in our national security vocabulary by terms more appropriate to the new conditions and the military missions those conditions generate. This evolution to a new defense lexicon is important because all the old terms carry with them a distracting legacy from the Cold War era. To the extent that support for the armed forces hinges on public acceptance of new roles and missions, we should begin now the process of preparing the public and members of the defense community to think in terms appropriate for the new realities. Based on our analyses, we suggest seven missions and accompanying nomenclature. This is a preliminary effort: the terms are negotiable and far less important than the concepts.

1. **CORE SECURITY** should continue to shift its focus from deterrence to the defense of U.S. territory against weapons of mass destruction. We shall eventually have to face Third World states armed with nuclear, chemical, or biological weapons, some of which will possess ballistic missiles capable of reaching CONUS. Even countries without long-range capabilities may still attempt to lash out at the United States by surreptitiously inserting NBC weapons into the country.

2. **REASSURANCE** entails persuading today's allies that they do not need to translate their economic and technological prowess into global military might. By demonstrating that we remain committed to safeguarding our common interests, we can help deflect the rise of alternative military superpowers among today's friends.

All but one of our potential peer competitors (the PRC) enjoy, or aspire to, democratic governments. We can deprive chauvinistic elements within those states of the arguments they need to increase defense spending. This requires a continuing, though of necessity diminished, U.S. commitment that makes nonsense of the argument that these potential challengers require new and expanded military roles to fill the vacuum created by U.S. retrenchment and irresoluteness. This mission requires nurturing our alliance structure -- both NATO and the bilateral arrangements in the Pacific -- to meet the conditions of a changing world so that current allies maintain complementary rather than comprehensive force structures.

3. LEVERAGE is our ability to influence the outcome of a crisis or conflict without placing large numbers of U.S. servicemen in harm's way. It covers a wide range of options, from providing intelligence and arms to our allies, to establishing command of the seas or control of the air on their behalf in a crisis, to placing a strategic defensive umbrella over nations to protect them from enemy missiles.

4. CONFLICT CONTAINMENT will entail using our military forces to create a fire lane or serve as a fire break, to limit the geographic spill-over of wars in which we are not directly engaged and prevent such conflicts from interfering with vital supplies to the United States and its allies as we did in OPERATION EARNEST WILL. Conflict containment will also seek to prevent conflicts' escalation to use of weapons of mass destruction.

5. PUNITIVE INTRUSION -- such as our raid in Libya -- will be used to dissuade a potential aggressor or punish one who has already misbehaved. The essence of punitive intrusion is brevity, accuracy, and lethality.

6. While DESERT SHIELD/STORM underscored the importance of the enduring mission of DEFENDING OR LIBERATING TERRITORY, in the next century we are unlikely to have enough active forces for such contingencies. The forces required for this mission may have to be provided by limited reconstitution if we are dealing with a formidable Third World adversary, and thus will require a program that can rebuild key technological, industrial, and personnel assets quickly.

7. Requirements for SUPPORTING HUMANITARIAN ROLES will result from greater pressures on DOD to assume responsibility for missions that are not strictly military. It will include refugee protection, disaster relief, population evacuation, border control against the entry of drugs, illegal immigrants or deadly weapons, infrastructural assistance by the Army Corps of Engineers, or environmental protection.

## **THE DUAL REVOLUTION IN MILITARY TECHNOLOGY**

In the course of the next 35 years, technology will transform the battlefield by means of two major innovations. The first, which has already made its inaugural appearance, we have dubbed "pop-up warfare." It will favor the forces that can most quickly distinguish threatening objects from decoys and friendlies, and strike them, while effectively concealing its own signatures.

Precision-guided munitions can already destroy virtually anything that can be seen. Therefore, large, fixed (or slow moving), above-the-surface targets are likely to fare poorly on tomorrow's battlefield. Accordingly, it will be vital to minimize our

platform signatures -- as stealth does -- and amplify the enemy's -- as the data fusion capabilities of the Aegis system do. Ultimately, the only survivable forces will be those that can move rapidly or covertly, and be visible only while shooting or fractionally earlier.

This "pop-up" battlefield will ultimately be flooded with systems capable of acquiring signatures -- flying drones, loitering missiles, autonomous land crawlers, submersibles, and small satellites. In the future, they should cost less, sense more, and be able to receive signals from every part of the electromagnetic spectrum.

These technologies will call into question the future effectiveness of current weapons platforms and completely transform the nature of our command and control systems. But their effects should not be viewed in isolation.

### **"FIRE ANT" WARFARE: THE SMALL AND THE MANY**

The second aspect of this revolution in technology we have labeled "fire ant" warfare. It will produce a battlefield covered with millions of sensors, emitters, micro-robots, and micro-projectiles, all linked by a sophisticated command and control network made possible by a combination of miniaturization and software capable of coordinating enormous numbers of items.

Specialized, single-purpose sensors -- the size of bottle caps -- will come in a variety of forms. They will be able to see objects, to detect their heat patterns, to pick up reflected radio waves, to hear sounds, to feel pressures, to be sensitive to magnetic fields, to sniff out chemicals, and so on.

Aiding them will be dense fields of cheap, disposable emitters, not much larger than soda straws. These will be used to illuminate targets, generate false signatures, and broadcast precise local positioning signals.

Compact micro-projectiles -- the size of soda bottles -- will replace ordnance as we now know it. Some will be conventionally armed; others may kill platforms with antimaterial chemicals, blind their electronics with carbon fibers, or stop up their motors with ceramic shards.

Getting all these into the theater of operations will present some problems, but none of them is insurmountable as we use a combination of pre-positioning, burial, air drops, artillery rounds, missiles, or even space delivery means to accomplish the task. They will dominate the terrain of future battlefields.

This transition to "fire-ant" warfare will take place through and beyond the next 35 years. It will be used to great effect initially on plains and deserts, at sea, and in the air against the large platforms that operate in those media.

As a result, organizing forces around major platforms may be an idea whose time has come and gone. Precise accuracy will force personnel out of increasingly vulnerable tanks, ships, and manned aircraft. Such platforms will simply be outnumbered by systems of very small but very effective items working in harmony toward a single, lethal end.

This dual-faceted technological revolution will increase our ability to maintain



global stability and protect our national security interests, provided that we maintain our current lead in defense technology. On the other hand, should some other nation usurp our position as the foremost manufacturer of defense technologies, the consequences could be truly catastrophic.

## **MATCHING MISSIONS AND TECHNOLOGIES**

The missions that we have envisioned for the U.S. armed forces in the 21st century will be both circumscribed and facilitated by the emergence of new military technologies. On the one hand, technology will dramatically lessen or even eliminate the old choice between mobility and firepower. In the future, U.S. military units will be simultaneously fast-moving and hard-hitting to a degree previously unimaginable. On the other hand, we expect the advantage in warfare to swing in favor of the defense. The bases for both developments will be laid by the application of new technologies.

Most of the missions we have described could be greatly facilitated by the development of appropriate new technologies. Above all, control of the upper atmosphere and space will allow us to buttress our core security by enhancing strategic surveillance and target illumination. In fact, much of the most important new technology will be space-based defensive systems. In a conflict, the side that can put the greatest capacity into orbit quickly and keep it there, even when under attack, will achieve operational and strategic superiority.

Although control of space will be essential to our core strategic security in the 21st century, space-based systems will be essential for other missions as well. For example, such systems will confer critical advantages in tactical battle management.

Our acquisition of such technologies will contribute greatly to our ability to fulfill our 21st century missions. However, should major adversaries gain possession of these same technologies, we would face unprecedented difficulties. Our ability to reassure other nations depends on our ability to project significant forces abroad, to maintain forward-deployed forces, and to maneuver such forces effectively. But our ability to perform these functions will decline as our foreign basing structure shrinks. More serious, these new technologies in enemy hands would make power projection very difficult.

We might encounter our greatest challenges at sea. Tomorrow's antiship and antisubmarine weapons will be functional descendants of today's sonobuoys -- cheap sensing devices produced by the hundreds of thousands. Future sea weapons will have longer lives, powered by tethered photovoltaic collectors, and be capable of sensing, maneuvering against, and attacking a vessel's major vulnerabilities. Such weapons will possess a variety of small, powerful sensors and be able to process information both for themselves and in cooperation with other locally distributed sonobuoys. They may be able to loiter for years before being activated. These systems could be supported by a fleet of active submersibles with internal power capable of pursuing their surface or submarine targets over considerable distances.

Such naval weapons systems could present the United States with a serious strategic problem. Since the Mexican War, the United States has had to project power overseas in order to protect its interests and allies. Thus, it is crucial that we maintain superiority in maritime deployability. Armor, speed, stealth, defensive

systems, and countermeasures will improve our ships' chances for survival and effectiveness to some degree. Furthermore, such attributes will greatly increase the demands on our maritime enemies for accuracy, large weapons, and deception-proof sensors. Still, it will be imperative for us to develop effective countermeasures against the defensive naval weapons of the future. For example, our warships may need to carry schools of a kind of "pilot fish" that swims before and around vessels, ferreting out potential threats and attaching themselves to mines and torpedoes to neutralize them.

Although the problem of future sealift may have no entirely satisfactory solution, should an adversary possess all the technologies envisioned by 2025, we can ameliorate the problem by non-naval measures as well. We should emphasize lightening maritime cargoes by reducing the weight and size of ammunition and fuel required in our overseas operational areas. We should stress developing more efficient fuels, solar collectors, energy-beam receivers, and energy storage technologies. This requirement also strengthens the case for transporting the few PGMs rather than the many dumb rounds.

In the air, our superiority will remain critical for leverage and regional suasion, and our stealth advantage will keep our manned combat aircraft effective for some time. However, in the long run, such piloted aircraft may be among the most vulnerable of platforms because, as they have little armor, they can be brought down with the smallest objects. Ultimately, stealth will not be able to hide planes from clouds of airborne detectors, variously capable of illuminating an aircraft with radar, confounding its engines with ceramic shards, or splattering it with substances that illuminate it for ground-based firing units. As a result, we shall probably not see a B-3 penetrating bomber. Drones and missiles will almost certainly replace piloted aircraft for the delivery of ordnance. Nonetheless, manned aircraft will perform other, vital functions: aiding command and control; serving as motherships for unmanned aircraft and missiles to seed large areas with sensors and lethal projectiles; and, of course, providing transport.

In the area of conflict containment, technology will provide two approaches.

First, we should be able to establish a *cordon sanitaire* around war zones. Mass deployments of sensors, emitters, and micro-projectiles could create areas through which transit would be virtually impossible, except by vehicles to which we provide safe-passage codes. This same technology would allow us to deter Third World aggression. One can imagine the deterrent effect of such technologies on some future Saddam Hussein. Would he dare invade his neighbor knowing that his immediate border area had been seeded with hundreds of thousands of sensors? This would reveal his every movement and allow for the pin-point targeting of all his equipment.

Second, C4I technology could be used to make it difficult for belligerents to communicate certain kinds of messages. A nonnuclear electromagnetic pulse or microwave burst could interrupt the nuclear launch sequence by bringing down the communications necessary to execute it. Other techniques could flood critical communications channels with useless information, completely overwhelming their capacity.

In all warfare environments, new technologies will make strike operations more effective and less costly. Cruise missiles already can substitute for many of the missions previously performed by manned bombers. Although point defense systems are improving, tomorrow's cruise missiles can be made stealthier. The development of hyper-velocity systems also will make intrusion easier. Even if space cannot be used as a launching area for micro-projectiles, emerging propulsion technologies suggest speeds greater than Mach 10 for surface-launched projectiles. Greater speed

permits the same damage from projectiles that are smaller, harder to detect, and available in greater numbers. Such missiles will be extremely difficult to defeat -- short of the development of very fast, ultra-high-energy beams.

There will be two major changes in ground warfare. First, the traditional concept of achieving a breakthrough on the front that devastates an enemy force's vulnerable rear support units will become obsolete. This will be because communications in the 21st century will increasingly make combat units more autonomous and self-sustaining. Powerful information processors in each battlefield unit will develop, suggest, and execute battle plans on the basis of coordinated field assessments. Each would adjust to the circumstances faced by its colleagues over a several-mile radius on a continuing basis. Headquarters would generate the major direction for operations, but the detailed battle plan will be left to on-site units.

Second, in the age of fire-ant warfare, armored fighting vehicles themselves will eventually become extremely vulnerable. They will have to move over terrain mined with sensors, emitters, and mini-projectile launchers. Armored vehicles could be destroyed in several ways. A sensor, for instance, might attach itself to a passing tank and act as a homing device for an antitank round -- although it would have to work quickly before the tank's smart skin detected and physically removed the sensor. Alternatively, sensors could be trained to seek out an armored vehicle's vulnerable parts using micro-mechanical cilia-like legs, then eating through its gaskets, fusing movable parts with a powdered aluminum-magnesium burst, befouling its air supply, jamming its electronics, or smearing its optics.

With the increasing accuracy of PGMs, soft targets such as command posts, runways, and logistics facilities will be increasingly vulnerable. Therefore, command posts will have to become more mobile, aircraft required to use runways reduced to a minimum, and logistics sites more widely dispersed or hidden extremely well.

For all the armed forces, evacuation of civilian populations under pressure may well become a challenging and not infrequent task. Relocation may be increasingly chosen over defense because, in today's urbanized information economy, the survival of a skilled population may be preferable to the defense of the area that it inhabits. Fire-ant warfare could provide an impenetrable security zone around such an evacuation for weeks. In the meantime, larger successors to the 747 or C-5, flying around the clock, could transport a hundred thousand people or more to safety each day.

Similar technologies will be available for border surveillance, so that a myriad of sensors may be able to track all incoming ships, aircraft, and trucks. Indeed, ant-sized sensors with micro-motors may be able to search through containers and detect the presence of illicit chemicals, biological agents, or nuclear materials before they reach our shores.

However, in order for the armed forces to have the abilities to carry out these missions in 2025, a forward-looking acquisition strategy needs to be created and implemented in this century.

## **IMPLICATIONS FOR PROCUREMENT**

With nothing but hypothetical threats and procurement budgets severely constrained, what kind of procurement strategy should we adopt? We offer a hedging strategy based on how smart companies operate under conditions of uncertainty, to take advantage of the options that technology has made available. It has four main

components: prototyping, core competencies, reconstitution, and cycle-time reduction.

Prototypes are normally undertaken in the expectation of a major procurement program, which limits the number of technologies that can be evaluated for their effectiveness. When technological and strategic uncertainties are large, it may be more sensible to design and finance many prototypes and purchase only small numbers of each. This broadens the range of capabilities that we can usefully explore if we are not sure exactly what kind of weapon systems we need.

Concentrating on core competencies -- the specialities that make any organization competitive -- is important because we stand alone in our mastery of defense technology. By 2025 every major weapons system on the battlefield may either be of our design or be a copy. It may therefore be prudent to drive technology and force others to follow where we can expect to maintain a large lead. We excel at software and systems integration -- precisely the sort of competence needed to manage large groups of very small objects. A core competence strategy would therefore reinforce this trend to our advantage.

In addition to removing the need for militarization, we should develop an R&D and procurement strategy that will lead potential rivals to conclude that even a peaceful arms race with the United States is unwinnable. Military requirements for such technical dissuasion will be found in maintaining leads in the R&D of sensor systems; in improving our ability to use space for intelligence gathering or deployment of weapons systems; in increasing our lift capacities by developing light-weight fuels, compact power units, and lighter ordnance.

The objective must be to discourage potential rivals from entering the chase, while trying to ensure that the overall U.S. force structure is not considered threatening, so as not to prompt a new arms race. This goal may be best achieved by developing and demonstrating capabilities without actually deploying the weapon systems.

Cycle-time reduction aims to shorten the time it takes to field new systems, and ensure that what is fielded has incorporated the latest technology. Japan's car companies made significant inroads into our markets by being able to field a new car in four years against Detroit's six. Similarly, we need to work more closely with defense producers in developing the technology and administrative procedures that can cut cycle times across the board. For instance, using more self-contained modular components -- each fit to a standard socket, so to speak -- will reduce this time.

As for reconstitution, we already know that it matters, but we are just beginning to grasp its interplays with technology. Normally, we think of reconstitution as something planned for by ensuring that current production lines have enough capacity to accommodate a production surge. A prototyping strategy, however, will not leave many active and correctly sized production lines to work with. Instead, we shall be relying on commercial industry in a crisis. This means planning to get at least the components of tomorrow's defense systems from the same production lines that support commercial systems. For this to happen, tomorrow's weapons have to be designed with such parts to begin with.

## IMPLICATIONS FOR THE MILITARY PLANNER

Let me summarize briefly. We face a period of dynamic change as we approach the 21st century. Project 2025 offers no prophecies but attempts to bound the limits of uncertainty. It puts forth our best guesses about what kinds of threat to the national interest will emerge over the next 35 years and what we believe would be our most effective ways for preparing for them.

Many we have already seen---chaos in the developing world and the periodic emergence of regional bullies. With the proliferation of advanced technologies, weapons of mass destruction, and ballistic missiles, those threats will be increasingly lethal. Without effective defensive systems, our ability to protect allies and interests will diminish. The emergence of a peer competitor would present an even more serious challenge. Only through a combination of reassurance and selective dominance can we hope to discourage such a competitor from emerging over the next generation; this must be the main object of any long-term security strategy. It means that we should strive to maintain our alliances and our ability for military intervention in support of common interests. It also requires preserving our lead in crucial technologies.

The nations that remain abreast of the dual revolution in military technology will enjoy an enormous advantage in future conflicts. Space will be the high ground, and the integration and management of information systems will be decisive. Large platforms will become increasingly vulnerable. Low-tech responses to our high-tech capabilities, combined with the fact that technologies will evolve gradually, suggest that while it may not be time to slay these sacred cows of the individual services -- the main battle tank, the manned bomber, or the large surface ship -- it is probably time to prevent them from breeding.

We should stress long- over short- and medium-term technology. Specifically, we may wish to consider phasing out platform-related research and begin concentrating on new defense systems. A core R&D strategy should concentrate on five areas: 1) electronics (sensors, emitters, and microprocessors), 2) nanotechnologies (microscopic mechanical and chemical devices), 3) energy (photovoltaics, compact storage, and beam delivery), 4) software (emphasizing integration), and 5) manufacturing technology (so that we can mass-produce components efficiently).

Fiscal reality will require a new acquisition strategy with an emphasis on the development of prototypes and simulators. To reduce cycle times and maintain our ability to reconstitute effectively, we must increase our reliance on commercial production lines, dual-use technologies, and modular design. An emphasis on core competencies to maintain selective dominance in certain crucial technologies will be a critical element if our procurement strategy is to discourage potential peer competitors.

While we now have in place a national military strategy to carry us through the difficult post-Cold War transition, a longer-range strategy will prepare us for the challenges of the first quarter of the 21st century. Such a strategy will, by definition, be a hedging strategy. It is essential, since R&D decisions and resource allocations over the next few years will determine the shape of U.S. forces in the next century. This study has been a preliminary effort to look beyond the base force and set out some of the central ingredients of such a long-term strategy.

## Appendix B

### SUMMARY OF SUPPORTING DOCUMENTS

Project 2025 was conceived by the Vice Chairman of the Joint Chiefs of Staff (VCJCS). He proposed it as a means of enhancing the coherence and strategic vision of U.S. military planning during a time of major international upheaval. Project 2025 began with a request for several analytical agencies to think about a range of plausible international security environments for the year 2025. These agencies were to assess the influence of significant long-term geopolitical, military, economic, demographic, technological, sociological, and ecological trends, as well as possible "wild card" events. From these, they were to identify potential threats to U.S. interests, enduring military roles and missions for the U.S. armed forces, and broad military force capability requirements. Above all, the VCJCS wanted analysts to ponder these questions unconstrained by traditional military thinking or a purely U.S. perspective. In particular, he urged analysts to adopt a broad definition of U.S. national security, exploring potential opportunities for improving the lot of humankind rather than merely reacting to potential threats to the United States. The chief aim of these future-based analyses would be to help the nation's senior military leaders make sound near-term defense investment decisions, despite the flux in the international order.

From the outset, Project 2025 proved a humbling exercise. Explaining the past is far easier than predicting the future. But it can prove difficult even to identify the trends and factors that have shaped well-known past events. Policymakers can prepare for the future realistically only by accepting the fact that their plans may have little relevance, while totally unexpected events may catch them by surprise. Yet they cannot afford to wait and merely react to events. Instead, the prudent policymaker takes anticipatory measures today, both to bolster the chances for what he hopes for tomorrow and to ward off what he fears. Success depends in part on the ability to create and examine plausible future situations. While it is impossible to predict the future with any accuracy, it is still useful to develop a plausible range of hypotheses, in order to design flexible policies and forces for an increasingly uncertain world. Recognizing their human limitations, this is what the creators of Project 2025 attempted to do.

#### PHASE I

In Phase I of Project 2025, the VCJCS charged each of four agencies or think tanks with developing three or more alternative global future visions. These "futures" were to explore widely within the realm of plausibility and represent a sufficiently broad range of potential issues that might influence future decisions and investment options. The four organizations involved in Phase I were SRS Technologies, the University of Houston at Clear Lake, the Defense Intelligence Agency, and Battelle. The four worked independently and employed different methodologies. At the same time, however, they showed a remarkable degree of continuity in their identification of both threats and opportunities. The collective insights of these Phase I reports provided a starting point for the Phase II effort, directed by the Institute for National Strategic Studies (INSS) of the National Defense University.

## SRS Technologies

As SRS Technologies defined the main task of Project 2025, their mission was to look 35 years ahead and posit a series of alternative futures. These would provide a point of reference against which strategy, policy, and military force structure could be measured. Their goal was to be not predictive, but rather descriptive of potential alternative global futures. In turn, these were to be exemplary, not inclusive. Adopting a systems approach, rather than simple extrapolation of today's trends, SRS first described a future using only aggregate measures. From these they distilled some general notions or basic organizing principles. Finally, they linked the paths from today's initial conditions to the construct of the future. SRS developed three broad-level descriptions of alternative futures. These explained both what a future world might look like and how it might work.

*"A Clash of Civilizations: Islam on the March."* The first world SRS constructed arises from the increasing assertiveness of Islamic culture across the globe. The Cold War ideological conflict is replaced when Arab conflict abates as Arab and other Islamic nation-states unite for a common struggle against the West. This modern Jihad, like the old tension between Communism and pluralism, has the potential to create rifts in international politics that are as violent and enduring as those that we experienced during the Cold War. A religious schism between the Islamic and non-Islamic worlds transcends cultural and geographic boundaries. Hence, religion strongly colors politics in this world and the Muslims reject the standards of international behavior as a western artifice. Thus, this future world illustrates the role of a transnational ideology whose domination of international politics encompasses a variety of political, economic, and socio-cultural domains. It also highlights the dangers for the United States in a world in which adversaries are hostile for religious reasons and are equipped with extremely lethal weapons.

*"Balance of Power Politics Redefined: Economic Blocs."* The second world is based on the rise of economic tensions between states that have been staunch allies for nearly half a century. Cold War politics is replaced by a redefinition of traditional balance of power politics, based on economic power and market forces. A unified European Community and an American Community attempt to preserve economic stability in a world where the Asian countries experience recession and political-military struggles. International politics stresses the ability to dominate trade blocs rather than the ability to become a local military hegemon. Thus, it is not military alliances but transregional trade blocs that vie for world power. In this world, the actions of states are driven by essentially economic calculations. Although the reasons for conflict are different from traditional causes of war, the collapse of ideological hostility and the emergence of economic motivations do not create a pacific world. Wars are fought not only to protect ideological allies but to secure trade rights and discourage protectionism as well. This world does not reflect schisms between the developed and developing worlds alone, but involves frictions among the developed nations, including the United States, Japan, and the European states.

*"Nationhood Revisited: NeueVolksWelt."* The third world is based upon the reemergence of traditional socio-cultural animosities that were muted by the Cold War. The international order is in a state of anarchy, as peoples seek to redefine themselves along ethnic, religious, and cultural lines, rather than as national groups. The Soviet Union fragments into states that are armed with nuclear weapons and are driven by ethnic passions. China collapses into feuding provinces. Japan's growing assertiveness antagonizes its neighbors. There is enormous potential for conflict

when tensions and hostilities are organized not by an ideology but by pluralistic cultural, ethnic, and religious differences. In this world there are few guideposts to action but there are numerous occasions on which a conflict could emerge. In contrast to the relatively unified visions in Worlds I and II, the third SRS world reflects a time in which societies evolve in the direction of anarchy.

No one of these worlds offers an entirely plausible vision of the future. But a synthesis of all three encompasses the broad principles used to define the future and to shape the world in the next century. The first is that ideology, whether of a secular or religious variety, is not likely to fade. There are simply too many geographic regions where ideologies play a significant role in politics. The second is that economics will play an increasingly important role in international affairs. The third principle is that, in comparison with the linear nature of diplomacy during the Cold War, international politics will likely be more anarchic in nature. This is particularly so given the collapse of old empires and the reemergence of tribal identities. The fourth principle is that the technological revolution, with new advances in biotechnology and Computer Integrated Manufacturing (CIM), that exploits technological achievements in miniaturization, fiber optics, and materials processing, will continue.

University of Houston

The program in Studies of the Future at the University of Houston-Clear Lake (UHCL) envisioned the role of scenarios differently. UHCL saw scenarios as making the possibility of future worlds more real and as sensitizing planners about trends and events that could signal possible changes in the world. UHCL designed the original process to generate a rich supply of topics from a group of futurologists, then for them to select the topics to write about. Once the topics were selected, work groups were formed to develop specific scenarios. They adopted the term "imagineering" to describe the technique used, namely the technique of "letting your imagination soar and then engineering it to reality." Key scenario variables were sixfold: demographics/population, values, nature (resources, environmental health, and energy), technology, money, and geopolitics. Employing this methodology, UHCL developed four alternative (but not mutually exclusive) images of the future.

*"Weaving the New Security Blanket."* The first scenario describes a world in which international relations shift, through incremental change, from politico-military confrontation to economic competition. Nation-states lose ground to economic blocs and multinational corporations. In this world of broad cooperation among industrial regions, international competition is keenest between industrial regions and developing regions. Military threats derive not from major powers but from developing world maverick-states and terrorists. (The Middle East, in particular, remains a "hotbed" of occasional military action.) The preferred means of enforcing international laws and conventions is the United Nations, which enforces its bans on arms sales and nuclear weapons. In this scenario, the U.S. military is assumed to be the same size as or smaller than it is today. Its mission is global and largely economic -- to protect the international economy and promote economic development. Its structure is largely management-oriented. The major threat to our military is that it is becoming totally absorbed into the U.N. Its opportunity is to have greater regional influence -- since economic power is region-based.

*"High Tech, Whose Choice?"* The second scenario explores the maturation of the information technologies, the growth of biotechnologies, and their effect on global society. In this world, U.S. technological development shifts from a military focus



(DARPA) to a commercial focus (NIST), as national security becomes defined in economic terms. The new technologies provide opportunities for those who can use them, but they also widen the gap between social classes in the industrial societies, and between industrial societies and developing ones. For example, a small social class of technologists is supported by a large group of service workers. Developing societies find it increasingly difficult to compete with advanced industrial societies. Emphasis on privatization of social functions produces a Social Darwinian struggle between the various elements of society. Technology has still not produced a secure global society. The risks of overpopulation and global pollution remain. But hopes are high that these threats will soon be eliminated. The intellectual basis of society is shifting from a paradigm of control, based on machine and computer logic, to one of mutual adaptation, based on organic models. This world is divided between the declining Cartesian world-view, which explains things in algorithmic, logical, discrete information processing terms, and the emerging organic perspective, which is beginning to understand the surrounding environment in "fuzzy," complex, and biological terms. In this scenario, the U.S. military is about the same size as or smaller than it is today. Its mission is to maintain its leading technology edge in military R&D and biotechnology. It is perceived as the guardian of the nation. The major threat to the military stems from possibly missing the key technologies of the future. Its main opportunity is to become, or sustain its position as, the world military technological leader.

*"The World Sings."* The third scenario leads to a more environmentally benign technology and economy. In this "green" scenario, the world's most salient threat to humankind is of its own making. It stems from significant, world-scale ecological problems (water, food, pollution, global warming, etc.); an AIDS epidemic in Africa; the increasing cost of protecting Middle East oil; and the decline in the number of biological species. In response, the United States abandons its frontier mentality (as an outmoded image of limitless possibilities) and settles down to lead a mature management of what it has left on the planet. Military resources are redirected to attack environmental problems, paralleling a trend to encourage decentralized means of providing basic necessities. All Americans serve two years of compulsory military service in the newly created National Planetary Service, with the mission of protecting the global ecosystem. There is a concomitant rise in the importance of nongovernmental organizations that monitor indicators of environmental well-being. The primary driver for these changes is the increasing cost of extracting and disposing of resources in a world where the low-cost sources and sinks have already been exploited. In the scenario, the U.S. military is much smaller than it is today, and its primary mission is ecological. Military officers are basically eco-engineers, and they are perceived publicly as helpers and partners. The major threat to this military is the loss of the old military ethic, but its opportunity is expanded roles and missions.

*"Life is a Cabaret."* The last scenario elaborates how a media-dominated world turns entertainment into "reality." Technology has created even more escapes from rising global troubles. These troubles include severe military security problems, overwhelming debt, energy depletion, global warming, pollution, rampant crime, and the widespread neglect of children. However, video images are manipulated so as to create the impression of universal affluence. Finally, the sources of communication are seized by the people, who broadcast the truth. Problems are identified and reasonable, although difficult, solutions are developed. The military is seen as the same size as or even larger than it is today, with a mission of internal security control. It maintains stability largely through high-technology information warfare

and is perceived by the public as a police force. Its major threat is the potential loss of public trust, and its opportunity is to demonstrate its integrity.

In some respects, these UHCL scenarios ignore the military's role in the future. Instead, the authors chose to illustrate the key themes, or drivers, of U.S. and global society. These scenarios are admittedly views of alternative futures created by civilian futurists. In a catalogue of potential new roles for the military developed by UHCL, the following descriptors were used: relief agency, green corps, civil engineers--infrastructure, security futurists, domestic peace, information warriors, government, peace academy, managers (prisoners), defenders of natural resources, mercenaries, culture corps, eco-engineers, gardeners, economic warriors, data police, consultants, educators, managers (manufacturing), and health police.

### Defense Intelligence Agency

DIA's triad of plausible futures was built on a common set of core assumptions about the year 2025:

1. Interdependence, primarily political and economic, will be the defining characteristic of the world.
2. The incidence of international conflict will drop. Hence, the political utility of military power will decline in favor of mobilizing and applying economic and technological power.
3. Life-sustaining, energy, and material resources will be adequate globally, but there will be significant local shortfalls.
4. The quality of the environment will vary across the globe, ranging from relatively high in more developed regions to abysmal in underdeveloped pockets.
5. Despite persistent societal diversity, the present world trend toward a more common world culture, based on pragmatism, will be maintained.
6. New ideologies, or radical adaptations of old ideologies, may emerge to explain the human condition in an age of interdependence and technological change.
7. The world's population will have almost doubled.
8. The pace of innovation in technology will continue to accelerate rapidly over the next 35 years.

*"Heightened Competition Within a Cooperative World Order."* DIA's first future world rests on the twin pillars of economic integration and international cooperation. The waning of the nation-state and the emergence of supranational bodies to replace its functions produce a world that is tightly integrated. This interdependence, as well as the potential cost of war, has redirected competition from military to economic channels. Consequently, military force has become a largely symbolic deterrent. A strong set of legal codes and norms, effective arms control regimes for all categories of weaponry, and an evolving international military framework serve to manage the potential for crisis and conflict. The order is enforced by designated elements of scaled-down national forces, of which strategic deterrent elements are reduced to an absolute minimum. If there are major storm clouds on the horizon of this new

integrated order, they emanate from the growing power of the world's three economic oligopolies in North America, Europe, and East Asia.

*"The Evolving World of 2025."* DIA's second future represents only a marginal departure from the world of 1991. In this world, the prospect for global war is slightly lessened, but the need for powerful defensive forces remains. This world evolved from the post-World War II order that existed at the end of the 1980s to a multipolar one. The United States will exercise leadership as part of an "Americas" bloc. It will compete with five other blocs. However, these blocs are unstable, shifting economic alliances. The nation-state remains the basic political organization but sovereignty and freedom of action are constrained by increasingly interdependent societies that, on balance, have become more cooperative and homogenous. The United States is drawn into close cooperation with other major actors, yet it must compete against other economic power centers in the developed world. At the same time, the United States will have to cope with challenges from the less developed world. There, a rapidly expanding population spawns social unrest and migration to other regions. Even so, conventional military conflicts will be less frequent, although also more lethal and costly. The most taxing challenges to U.S. security will flow from economic competition, a rapid influx of illegal immigrants, terrorism, and the proliferation of advanced weapons systems to dictators in the developing world. The key to national security will be the development and protection of economic and technological strength. Arms control monitoring through remote sensing will be the first line of defense. Offensive operations, conducted collectively with other major powers, will be the last line of defense. In sum, barring unlikely but possible "wild cards" -- such as malevolent leaders successfully exploiting tensions, cataclysmic natural disasters, devastation from plagues, or industrial calamities such as nuclear reactor meltdowns -- this world of 2025 will provide a safer, more secure environment for the United States in terms of overt military threats.

*"McFuture: The World in 2025."* DIA's third and final vision of the future represents a world in which change is revolutionary, not evolutionary. The world order as we know it is breaking up, driven by growing interdependence, accelerating technological change, and mounting stresses on traditional authority structures. A new ideology or reinterpretation of existing ideologies will emerge out of the breakup of the late 20th century world order. Its chief tenets will include the following:

1. Emphasis on managing disagreements and avoiding armed conflict.
2. Restrictions on nation-state sovereignty.
3. A new stress on cooperation.
4. A determination to link rapid technological development with an ethical framework that advances the human condition.

The nation-state will not be the primary locus of authority. Instead, the regional association, based on geographic proximity and commonality of interest, will be the basic unit of the international system. Dominant players will take the lead in bringing regional groupings together and playing an integrative role across regions. An authoritative international legal framework will be emerging. Global acceptance of human rights standards will effectively inhibit states from engaging in wholesale repression of their citizens. Regional or international associations will decide the use of military force. Defense sufficiency will be the watchword of these associations, primarily because of economic costs. Military power will be applied selectively,

because of the potential for damage to increasingly interdependent systems as well as the lethality of new weaponry. The world will have moved beyond the "nuclear age." Arsenals will be smaller because of the declining utility of the technology. Residual stocks of nuclear weapons will be tightly regulated and monitored by an international control regime. Military forces, although rarely used, will be regionally integrated. They will rely on high technology and brain power more than on manpower. The danger of regional conflicts will be minimal because of intraregional linkages. New age weapons characteristics will include the following:

1. Stealth systems making today's weapons obsolescent.
2. No human beings in steel boxes.
3. Operation by remote control.
4. New "smart" weapons that make today's look stupid by comparison.
5. Artificial intelligence and robotics as integral features.
6. Transnational weapons development.

While the trend in values and social structures will be to produce more widely shared values, localized, violent backlashes against this trend -- "movements of rage" -- will erupt intermittently. These nihilistic throwbacks to an earlier epoch -- millenarianism, neo-Slavism, religious fanaticism, linguistic separatism -- will be generated by segments of the world's population who feel excluded from the major trends of "McFuture" or disoriented by the dizzying pace of change. New kinds of movements, such as environmental activists employing terrorism or New Age Luddites, will pose fresh challenges.

Other troubles will flow from a world population that will have nearly doubled: a youth bulge in regions incapable of providing goods and services; fluid migration patterns; regions with negative or stagnant population growth, which will have to compete for people with technically specialized skills. Worst of all will be social unrest, which may escalate to violence, arising from the inability of some countries to absorb more people because of inadequate infrastructure, limited economic opportunities, and social and cultural differences.

## Battelle

Battelle employed more quantitative methods than the other groups. It used these to deal with the twofold task of describing plausible scenarios affecting U.S. security in 2025 and identifying and considering the impact on the scenarios of "wild card" events of low probability but great consequence. Three scenarios (continuity and progress; broad advances, technology-intense; and global malaise, technology stagnation) were derived from a single fundamental set of descriptors, descriptor states, and *a priori* probabilities. Two of these descriptors -- R&D expenditures and military investments -- were highly interactive. Three other descriptors -- material performance, quality of the educational environment, and information processing and storage -- greatly influenced others. Three descriptors were affected more than the others: global GNP distribution, nourishment, and health care quality. Any long-range planning should include consideration of (1) these topics and (2) the potential interaction that long-range activities or expenditures will have with these topics.

The Battelle approach allowed for both the replication of scenarios and the conduct of simulations. Three plausible scenarios resulted from an integrated set of alternative views of the global environment, based on current knowledge and expert opinion. The Battelle team also introduced "wild cards" (events that, while unlikely, would be of enormous consequence were they to occur). Three wild card events then were separately introduced to determine their impact on the scenarios. From a long list of social, political, natural-event, technical, and economic wild card events, three wild cards were selected to be representative of these various types of events that might occur in the period from 1991 to 2025. The topics chosen were political upheaval -- the political dissolution of the USSR (no longer such a wild card, after all); financial disaster -- a global depression; and technical breakthrough in superconductivity -- the ability for materials to exhibit total loss of resistance to electrical current.

While 35 years may seem a long period of time, the lead time for major innovations in science and technology is often more than 10 years and sometimes more than 20 years. In the period 1955-90, there were indeed many seemingly great technological advancements. There were also many great commonalities, especially in aggregated, global circumstances. Economic and social well-being have gradually increased. In technologies, one of the great changes has been in health care and cures, but more for the benefit of the world's most privileged people than for the masses of the less developed countries (LDCs).

The three scenarios selected for further development derive from the same fundamental set of descriptors, descriptor states, and *a priori* probabilities. Scenario 1, described as "Continuity and Progress," represents a most likely case that occurs under the stated conditions. The distinguishing differences of the other two scenarios are related to a high level of broad investment in R&D expenditures, as opposed to a relatively low, long-term commitment to scientific research and its applications. The selection of the alternative R&D-sensitive scenarios was driven largely by review of the years of progress that followed a period of enlightened discovery and application. These developments contrast sharply with the years of struggle and malaise that have characterized those parts of the world which have not benefitted from the advance of technology -- or where the general infrastructure or political system has precluded the amassing of the wealth necessary to implement technological advance.

The first scenario for global conditions to the year 2025 represents a continuation of many of the developments of the 1990s, with significant technological progress achieved over the next 35 years. This scenario is called "Continuity and Progress" because its results suggest gradual change over the next 35 years, unless very dramatic events were to stimulate wide deviations from the otherwise slow-moving paths of current trends. The world of 2025 is, in many regards, better than that of 1991, but does not represent a radical departure.

Scenarios 2 and 3, generally referred to as the "Broad Advances Technology-Intense" and "Global Malaise, Technology Stagnation" cases respectively, cannot be viewed entirely in terms of the extent to which R&D investment is high or low in the final year, 2025. Often a lengthy period intervenes between discovery and application. This suggests that it is necessary to consider scenarios as having evolved from periods of either high or low R&D intensity during the years from 1991 to 2025. (As an illustration of the gestation period between conception and realization of common innovations, one need only look at antibiotics -- 30 years, heart pacemaker -- 32 years, fluorescent lighting -- 33 years, nuclear energy -- 46 years, photography --

56 years, and television -- 63 years.) To be sure, the acceleration of technological advances has generally reduced the time period to translate an invention from the laboratory to the marketplace. However, the understanding and application of science and technology have progressed to the point where significant advances -- rather than incremental developments -- will still take considerable time and a sustained effort. Thus, a long period of high investment may be viewed as essential for laying the groundwork for broad advances in socially beneficial technology. Conversely, extended periods of low investment are expected to lead to little in the way of major advances. Meanwhile, the problems of the present and near future will merely be exacerbated.

## PHASE II

In Phase II of Project 2025, the Institute for National Strategic Studies was tasked to draw on the wealth of data and analyses summarized above, in order to identify the military implications of alternative future worlds. INSS was responsible for the following tasks:

1. Analyzing the influence of alternative futures on U.S. national policy and objectives, U.S. regional objectives, traditional and nontraditional U.S. military roles and missions, U.S. military strategy and objectives, traditional and non-traditional concepts of operation, and traditional and nontraditional U.S. military tasks and capabilities.

2. Identifying the most important threats to U.S. national interests over the next 35 years; identifying any reasonable events or "wild cards" of significant consequence that merit unique risk avoidance action, even though their likelihood is low; and identifying the risks of inaction, as well as expected outcomes for action, in response to these occurrences.

3. Identifying enduring mission needs and military force capabilities that best address military responsibilities in alternative futures.

Once again, INSS was asked to avoid constraint by traditional military thinking but, instead, to suggest the best solutions to the futures that it envisioned.

To fulfill these tasks, INSS assembled a team of two-dozen analysts from the military, academia, and the private sector. Over a period of six months, they examined alternative futures for the year 2025 and their broad strategic implications for the U.S. armed forces. Working under the direction of INSS Director Dr. Alvin H. Bernstein, the INSS Study Group completed its preliminary final report at the beginning of November 1991.

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