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Strategy for Staying Ahead Preserving US Military Superiority Two Essays by Andrew Krepinevich and Michael Vickers April 1999



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# A Strategy for Preserving U.S. Military Advantage by Andrew F. Krepinevich Executive Director Center for Swategic and Budgetary Assessments April 26, 1999

# Introduction

Since the collapse of the Soviet Union, the United States has enjoyed a period of military dominance that, with the exception of the brief period at the end of World War II, is arguably unsurpassed in our country's history. Periods of extended military dominance are rare in history and, as will be shown presently, the current period will likely prove no exception. In any case, the vital interests of the United States must be protected and its military dominance preserved. This must be accomplished at an acceptable cost. This implies, for the foreseeable future, access to human and fiscal resources roughly similar to those that have characterized the U S. national defense effort over the last decade.

The following is a *preliminary* assessment of the future security environment, to include a discussion of the key emerging areas of military competition. It is followed by the *outline* of a strategy designed to preserve U.S. military superiority in such an environment. The time period considered extends out 20-25 years, which is arguably the practical limit of reasonably informed speculation concerning such matters.

The assessment makes a number of important assumptions having a direct bearing on the future security environment and a U.S. strategy for maintaining military dominance. First, it assumes that we do not seek a *Pax Americana*, or benign hegemony over the world. Instead, our objective is to remain a global power, clearly first in military capability among the great powers, with strong emphasis on key alliance relationships, particularly those with the European Union (Gertnany, in particular) and Japan, to further augment our power. Second, it assumes a willingness to resist, by force if necessary, the use of coercion or force by other states to upset the status quo in ways that threaten U.S. vital interests. It also assumes that the United States will not consider any strategy that relies on preventive war, or preemptive war. Third, while recognizing the possibility of "wild card" events (e.g., pandemics, technological "silver bullets"), the strategy outlined below does not explicitly address them. Rather, it attempts to position the U.S. military in a posture that allows us to deal with uncertainty — indeed, *exploit* it — far more effectively than our competitors.

#### **Future Security Environment**

#### Key Trends

The greatest economic growth in the foreseeable future is still likely to be in Asia. The associated growth in U.S. trade with Asian states, combined with their rapidly growing military potential, will see this region grow in strategic importance. Twenty years from now it is quite

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possible that, after our own, the world's three largest economies will be found in Asia (i.e., in China, Japan, and India).

In contrast to rising powers such as China and India, the United States and its principal allies will experience the "graying" of their societies. This will lead to greater social welfare drains on the public purse, and threaten to crowd out investments in defense. The continued trend toward smaller families in the advanced industrial states may make them more casualty intolerant, accelerating the shift to more capital-intensive militaries, exacerbating recruitment and retention challenges, and providing competitors with an opportunity to exploit the "social dimension" of strategy. Some rising great powers (e.g., China and India) will enjoy a demographic golden age of sorts. The relatively high number of young males, combined with the aggressive nationalism that often accompanies the ascent to great power status, could find these states relatively more aggressive than other more "established" great powers (e.g., the United States, the European Union, and Japan).

The "Information Revolution." like the Industrial Revolution" before it, has the potential to shift growth rate patterns. Economic advancement will likely center on information-related technologies and, later, on bio technologies. Unlike the "proprietary" technologies that spawned the nuclear weapons/ballistic missile revolution, these technologies will be widely available in the commercial sector, and thus to our competitors. At the same time, the Information Revolution is characterized by the concentration of ever-greater destructive power in the hands of small groups and individuals. Specifically, we can expect to see this take the form of growing access to weapons of mass destruction and — with growing information awareness, connectivity, and lethality — the potential to disrupt a major portion of the growing national (and global) information infrastructure.

# Discontinuities

We should be aware that, if certain key trends deviate dramatically from their current trajectory, we could find ourselves in a very different kind of security environment. Several possibilities are particularly worthy of consideration.

The industrial revolution helped to catapult a small island nation, Great Britain, to a global power status not seen since the Roman Empire. Might the Information Revolution's economic benefits be distributed in a highly disproportionate, and very different, way than is the current distribution of industrial-age power? A country's physical size and access to industrial-age resources (i.e., coal, iron) may be poor indicators of how well it will exploit the information revolution. A high degree of information technical literacy among the population, and a society that fosters the free movement of information, individual initiative, and informal organizing principals may prove increasingly important to generating future economic wealth and military capability. If so, this could lead to an even greater shift in the relative strength of the economic great powers than is currently anticipated by the rise of China, India, and the EU. There are signs that small states, such as Israel and Singapore, may be in a position to exploit these new forms of economic growth better than many larger, more traditional (i.e., industrial-age), economic powers.

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At the same time, the growing global awareness spawned by the information revolution could make it more difficult for repressive regimes, especially those in multiethnic states, to tamp down internal dissention. This may, at some point, exert significant influence on states like China, India, and Indonesia, each of which have significant internal ethnic minority problems. It is not clear whether such problems would lead these states to focus their military capabilities on internal security problems, or if they would seek to unify support by focusing attention on an external military competitor.

The 20th century is viewed as an age of total war. If the half-century-plus moratorium on the use of nuclear weapons is broken, it could have severe consequences for how we view the competitive environment. A significant exchange between states could accelerate concerns over any strategy rooted in mutual deterrence, as opposed to active defenses (and perhaps preemption). On the other hand, if many states possess even small arsenals (e.g., a few dozen secure weapons each), we may enter a conflict regime reminiscent of the 17th and 18th centuries. During that era, wars were highly limited to contesting small provinces along the "seams" of the great powers, and no regime's existence was directly threatened. Thus the homelands of nuclear powers may become sanctuaries, and conflicts highly limited. If, however, nonstate actors employed WMD (to include perhaps strategic electronic or *genetic* strikes) on a significant scale as a form of irregular warfare, we may experience a mutation of total war, in which strategies of deterrence based on the threat of retaliation have little, if any, relevance.

#### Competitors

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Our principal competitors will be those states that can threaten our enduring vital interests, and which are disposed to do so. These interests include ensuring the physical security and material well being of the United States and its citizens. They also include preventing a hegemonic power from exerting control over key regions, such as Western Europe, East Asia, and the Persian Gulf, while preserving U.S. dominance in the Western Hemisphere. To this might be added freedom of the seas, space, and access to the electromagnetic spectrum. We should be concerned about maintaining favorable military balances in these key regions, and in these key functional areas of the competition. Challenges to these interests are most likely to emerge from rising (or recovering) powers that seek to upset the status quo, and have some reasonable prospect of succeeding. Rising powers would include China and India. Recovering powers might include Russia, and perhaps Japan and Germany (in the sense that they seem to be shedding, albeit slowly, their self-imposed constraints), and Iran. Owing to the trends noted above, one also cannot discount the possibility of our vital interests being seriously challenged by irregular forces.

#### Friends and Allies

Today we find ourselves allied with states that joined with us to contain an expansionist power that no longer exists, and to counter an ideology that is in thorough disrepute. We should attach high priority to retaining our alliance relationships with Germany (and the other major NATO powers, Britain and France) and Japan. The objective is to ensure that a favorable balance of power exists in those regional and functional (e.g., space) areas where the U.S. vital

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interests are at stake, and to deny would-be competitors the opportunity to enter into alliances with these states.

If we are to maintain our military dominance at or near its current level, it will be important to avoid a hostile alliance forming around two or more of the following powers: China, India, a major Islamic state (i.e.; Iran, Indonesia) and, perhaps, a resurgent Russia. Recent history indicates that a China-Islam or India-Russia grouping may be among the most likely. The former group would almost certainly present the more formidable challenge. Opportunities may exist to cultivate relationships with one or more of these states. As a major military competition would likely occur in South and East Asia, it will be important to retain traditional U.S. alliances in those regions (e.g., with Japan and Australia).

### State of the United States

The next two decades will see the "graying" of America, as the "Baby Boomers" reach retirement age and begin to exert heavy demands on the U.S. treasury in the form of social security and medicare entitlements. All things being equal, this will make it more difficult for national defense to compete for resources, both fiscal and human. The United States also will become more diverse, with a notable increase in its Hispanic population, both in absolute and in relative terms. This period will likely find the United States' policy focus on Europe in relative decline, and greater emphasis placed on hemispheric security issues (e.g., illegal immigration, narcoterrorism) and to East Asia. The combination of increased ethnic diversity, combined with the Baby Boomer-induced stresses on the social welfare state, could produce the kinds of tensions — and even violence — found in other multiethnic states. This, combined with growing access to weapons of large-scale destruction (WMD, electronic attack) could make defense of the homeland, to include internal security, a major military mission.

The changing character of the "target base" also will be a source of concern with respect to homeland defense. Simply put, the United States is leading the way in transitioning from an industrial-based to an information/industrial-based economy. This may make us uniquely vulnerable to electronic forms of attack.

The continued development of a global economy with ever greater U.S. participation means that we will increasingly rely on external sources to sustain our national economic base. Some cite this growing global economic interdependence as perhaps an absolute barrier to military competition and conflict. Yet history indicates otherwise. An important new factor of this phenomenon will be defense industry globalization. This could affect military competitions in several ways. First, it will be relatively more important to safeguard *process* (e.g., systems and architecture integration capabilities) transfers — areas of possible enduring competitive advantage — than to place high priority (and reliance) on restricting technologies that are becoming widely available. Moreover, it will be critical to maintain and sustain the human talent within the defense industrial base that comprises the foundation of this core competency, and source of enduring competitive advantage. Second, growing dependence on offshore suppliers of military components may, at some point, inhibit our ability to wage protracted conflicts. This problem may be exacerbated if we rely exclusively on a relatively small, highly trained, all-volunteer force that may be difficult to regenerate or sustain.

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A substantial amount of economic wealth will be derived from commercial space systems. We will need to determine how best to defend this growing quasi-national economic asset, as it will represent a source of profit, and a key component of our military capability in space as well as the national information infrastructure.

#### The Competition

#### Sources of U.S. Advantage/Core Competencies

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As our objective is to maintain our military dominance over the long term, we must consider major sources of enduring competitive advantage. Over the last century, these advantages have included geographic position, a technically sophisticated industrial base and technically literate population, and an enormous mobilization potential (the so-called Arsenal of Democracy). Many of these enduring advantages will likely erode somewhat over the next two decades.

Blessed by an insular geographic position and weak neighbors, throughout its history the United States has been able to defend the homeland at relatively small cost. This comparative advantage is likely to endure, although it will be diluted somewhat by the threat of missile attack (especially an attack employing WMD), and more novel forms of assault (e.g., electronic attack).

The United States is allied with the world's most economically strong and technically advanced powers. These states have enduring cultural and/or political common interests with the United States. They are democracies and status quo powers. They seek the peaceful resolution of disputes, and see high value in collective defense. These relationships are a great source of long-term potential competitive advantage. Our challenge will be to translate this potential into capability within the overall U.S. strategic framework.

Defense industry globalization, combined with the aging of the U.S. industry's human technical core, may see our advantages in systems integration and the emerging competence of architecture integration erode, or be short-circuited, respectively.

America's technically literate population was critical to its ability to exploit earlier transformations of warfare. However, given projected resource limitations and the nation's decision to maintain a volunteer military, it is not clear that DoD will be able to exploit this source of competitive advantage as well as it has in the past. Our core allies in Europe and Japan will experience this problem even more intensely than we will, while rising powers such as China and India may well see their access to technically literate human resources increase substantially.

Our enormous potential for mobilizing resources to generate military capability may also decline in relative value, for several reasons. To be sure, this ability will be important in any long-term competition, as we encountered with the Soviet Union. However, it may be diluted if we encounter a substantially stronger economic power (or association of powers) than we did in the Soviet Union during the Cold War. This position could be exacerbated if we compete within

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the context of diluted alliance relationships. Second, with the globalization of the defense industry, mobilization "bottlenecks" may arise over which we have little control.

Finally, there are several sources of enduring competitive advantage resident in the U.S. military. They include: global reconnaissance and surveillance; global power projection; extended-range precision strike; high-fidelity training and simulation; flexible strategic strikes; and joint operations of systems architectures (projected).

#### Sources of U.S. Weakness/Vulnerability

There exist what are likely to be enduring U.S. weaknesses with respect to its ability to compete militarily, to include: geographic position, political culture, an aversion to protracted conflicts — especially those that risk incurring significant casualties, and a declining ability to compete based on time.

While our geographic position is a source of enduring advantage, at the same time it is a source of enduring weakness, as well. The United States' long, relatively open borders and an extended coastline will continue to make defending against both missile (especially cruise missile) and nontraditional attacks on the homeland (such as narco trafficking, irregular force WMD employment) a challenging proposition. The homeland defense problem will be further compounded by our political system, which places high value on individual liberties, and on a federal government structure. Our relative insularity also will ensure that we must continue to devote substantial resources to developing the capabilities needed to project U.S. forces over long distances. Our major potential competitors, who are likely to focus their efforts on achieving regional (but not global) great power status, will not suffer from this handicap.

An aversion to waging protracted warfare, and especially to risking substantial casualties, will likely provide adversaries with a major competitive advantage. To be sure, a strong argument can be made that, if the risks to the national security are high enough, the American people will support military operations over a prolonged period, and be willing to sustain high casualties. However, the U.S. military intends to fight a high-tech war, placing substantial emphasis on highly skilled, highly trained troops. This may yield two enduring disadvantages: limited access to human resources (a consequence of the all-volunteer force), and long training cycles. Thus a protracted, limited conflict characterized by substantial casualties may find the military unable to attract the high-quality volunteers it needs to sustain the "American Way of War." In short, the United States may be fielding a highly lethal — but highly brittle — force.

The United States military-industrial base requires an extended period of time, typically a decade or more, to bring new military systems into production. Moreover, in order to economize, the Defense Department has had to emphasize production of a relatively few number of systems in relatively large quantities, further limiting the range of tools at the field commander's disposal. Doctrinal change also occurs at a relatively leisurely pace. Yet periods of military revolution often find technology advancing at a rapid rate, and key metrics of military effectiveness — military systems, operational concepts, and organizational structures — overthrown. Consequently, there will be a growing premium based on "time-based competition" — the ability of a military organization to adapt more rapidly than its competition to major

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changes in the competitive environment, while also looking for ways to dilute prospective adversaries' ability to compete based on time, as well as human, material, and technical resources. Despite the best efforts of senior Defense Department officials over the years to address our weakness in this increasingly important aspect of military competition, it has endured.

## Competitions

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Owing to the unusually high level of geopolitical and military-technical uncertainty, it is difficult to predict with precision the character of the military competition a decade or two into the future. Simply put, we do not know which state (or group) will pose the next major challenge to our security, when that challenge will occur, or how it will manifest itself. Similarly, we do not know when key military technology breakthroughs will occur, how they will be applied to military systems and doctrine, and what form they will take. For example, in the early 1920s it would have been impossible to predict when how rapid advances in emerging technologies pertaining to mechanization, aviation, and radio would play out. Nor was it yet clear which paths military organizations would take to exploit them (i.e., that Germany would pursue blitzhrieg, the United States and Japan carrier aviation, Great Britain and the United States strategic aerial bombardment, etc.). Critical technology "wild cards," like radar, could not have been forecast with confidence.

It is possible, however, to *narrow the range of uncertainty* somewhat by examining major geopolitical, military-technical, economic, and demographic trends with an eye toward identifying key areas of future competition. Although not elaborated upon here, such an exercise yields a competitive environment characterized by these challenges:

Homeland Defense. The proliferation of ballistic and cruise missile technology, combined with the concentration of great destructive power (i.e., chemical and biological agents) in the hands of small groups and individuals will place the U.S. homeland under perhaps the greatest threat of major attack in the nation's history. The challenge will be further heightened by the uncertainty surrounding the national information infrastructure's vulnerability to electronic attack.

**Power Projection.** The U.S. military's century-old reliance on access to fixed, advanced bases when deploying and sustaining military forces overseas will come under unprecedented risk. Unlike during the Cold War, with the advent of ad hoc coalitions, it cannot be assumed that prospective allies will provide base access. Our forces may also find themselves operating in areas (e.g., the Spratlys, South Asia) where no major basing structure exists. Of greatest concern, rapidly growing access to space for reconnaissance and targeting purposes, combined with the proliferation of missile and WMD technology, will allow even rogue state militaries to hold key forward ports, air bases, and supply centers at risk. Owing to the expansion of NATO further to the east, and the development of major energy reserves in Central Asia, the U.S. military also may need to project power far inland, in the absence of major base access.

Space. The coming decade will almost certainly see the growth of national satellite architectures, as well as the "commercialization" of space. Two principal consequences will

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arise from this phenomenon. First, it will force us to consider how we will defend a rapidly growing economic asset. Second, it will end the near-monopoly in explaining space for military purposes that the United States has enjoyed since the Persian Gulf War. In times of crisis and war, there will be a competition to control space, or at least to deny its use to one's adversary. We also should expect the competition in space to extend to "commerce raiding" against commercial satellite architectures.

Sea Control. The diffusion of the capability to monitor relatively large, soft, fixed targets at great distances, and to hold them at risk will influence the military competition at sea, as well as on land. This will be particularly true as militaries acquire the ability to track and engage, at extended range, relatively slow-moving maritime vessels (i.e., surface combatants and merchant vessels) operating in restricted waters (e.g., in straits, the approaches to major ports, etc.). Consequently, we will confront the challenge of land- and space-based dominant maritime commerce raiding. Such raids will likely focus on key cargoes (e.g., oil supertankers) as they approach key predetermined maritime "bottlenecks," such as straits and major ports. Applied on a larger scale, it becomes possible to conceive of predominantly land- and space-based blockades against major ports and airfields, which could be undertaken, for example, by China against Tajwan, Japan, or Korea, or by India against Sri Lanka. Finally, we must consider the growing role U.S. maritime forces might play in supporting power-projection operations in the absence of forward bases. This will force the Navy to operate in the littoral, radically shrinking an adversary's search requirements, and prospectively paving the way toward predominantly landand space-based sea denial operations against our fleet. Traditional forms of over-the-beach amphibious assault will become progressively more difficult in such an environment, requiring such operations to be spearheaded by increasingly stealthy units at extended distances, and demanding novel forms of logistical support.

**Peacekeeping**. The military competition in peacekeeping operations is likely to change substantially as a consequence of demographic trends and technology diffusion. The preponderance of peacekeeping operations are conducted in the Third World, which is experiencing rapid population growth. It seems likely, therefore, that future peacekeeping operations will find U.S. forces seeking to exercise control over urban terrain, to include megacities and "urban sprawl." There will likely be more Beiruts, Belfasts, Groznys, Mogadishus, Port au Princes, and Sarajevos in future peacekeeping operations than rice paddies, jungles, deserts, and mountains. Irregular forces will prove more intractable as they "bottom feed" off advanced technology diffusion. For example, they may radically improve their ability to coordinate their resistance using cellular phones, email, and faxes. It is likely they will possess chemical and biological weapons, which they may use to hold both U.S. forces and the noncombatant population at risk. Advanced mines and man-portable air defense weapons could greatly limit U.S. force mobility. The effect will be to exploit enduring U.S. weaknesses by creating a competitive environment requiring manpower-intensive operations over a protracted period with the prospect of incurring substantial casualties.

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Urban defense may also be a fallback strategy for competitors in the event that the United States military develops the ability to project power in the absence of forward base access. This would conform to the thinking of senior U.S. ground force commanders, who view future land warfare as "nonlinear" in form. Urban eviction operations also would dilute our competitive advantage in technology, while exploiting our aversion to manpower-intensive operations. Thus both urban control and urban eviction operations will likely be high on our list of *allied* support capabilities.

Strategic Strike and the Nuclear "Shadow". Strategic strike operations have traditionally had the objective of destroying or neutralizing an adversary's forces and/or economic support structure (e.g., industry, communications, transportation) to the point where his willingness to continue the war is overcome. The emerging transformation in economies and in warfare will likely effect a major discontinuity in strategic strike operations. Economies are becoming more information intensive, while national economic systems are becoming more integrated into a global economy. Thus the target base (or set), against which strategic strike forces are directed, is changing dramatically. Perhaps even more important, the means for conducting such strikes are undergoing a transformation. Until recently, strategic strike campaigns involved either protracted employment of traditional "dumb" munitions, as during World War II, the Korean War, and in Vielmam, or the prospective use of nuclear weapons. Over the last decade, we have seen precision conventional munitions increasingly displace "dunb" bombs in strategic strike operations. Corresponding to the transformation of advanced industrial-based economies to industrial-information hybrids, and the growing reliance of militaries on information support systems, there will arise a growing array of means for conducting electronic attacks against them. In short, precision and electronic weapons, to be joined at some point by genetic weapons, will supplement nuclear weapons and "dumb" bombs.

This will lead to two major changes in the competitive environment over the next two decades. First, the rise of far more effective "useable" means for conducting strategic strike operations will increase the incentives for states to acquire nuclear weapons. As this occurs, a nuclear "shadow" will spread and persist over the military competition. This may trump, or limit, the rise of precision and electronic strikes. Put another way, the rise of potentially highly effective nonnuclear means for strategic strike may find their use deterred by the threat of nuclear retaliation. If the 20<sup>th</sup> century was an age of total war, the coming era may be one of highly limited wars, where the homelands of even rogue states are accorded sanctuary status from strategic attack.

Second, we could witness the rise of ambiguous strategic strikes. They could be manifested in one of three ways. First, broad-based "no fingetprint" electronic attacks (e.g., computer viruses, wonns, Trojan horses, etc.) could be mounted against a state's information infrastructure by another state. The attacker might even disperse his electronic strike force to other countries before ordering them to execute their attacks. Second, an attacker could coordinate the infiltration of irregular forces carrying chemical or biological agents into the adversary's homeland. Strategic strikes could then be executed from within the defender's homeland.

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Third, to the extent that space architectures become a critical component of a state's military capability and economic viability, it is possible to envision "nonlethal" strategic strike operations being conducted, literally, in a vacuum. Although the risks for an attacker in conducting these sorts of strategic strikes may be considerably less than more direct forms of attack, it is not clear that, even under these circumstances, states will want to risk even a small chance of retaliation. Ironically, this could leave the strategic strike field dominated by small, radical groups, such as terrorists and separatists.

To sum up, we will see the military competition enter new dimensions, such as space and the information realm. We also will see existing missions undergo dramatic changes (e.g., air superiority against missile forces, ground and area control in a precision-strike regime; counterblockade operations against land- and space-based "maritime" blockade forces).

With respect to the former, there will be a military competition to gain an information advantage, both to defend the national information infrastructure (and holding the enemy's at risk), and to support the conduct of long-range precision strikes (and correspondingly degrading the enemy's capability for LRPS). Thus stealth/counterstealth, undersea/ASW, and electronic strike/defense are almost certain to be major areas of competition.

This competition will almost certainly extend broadly into space. Finally, there may also emerge a highly intense, extremely time-sensitive competition in the development of new chemical and biological agents and their corresponding antidotes. Developing sophisticated forms of detection and concealment will likely be a critical part of this competition.

Yet, whether it is obtaining, ordering, and moving information, engaging in a movecountermove competition, or translating rapid advances in technologies into military capabilities, the military competition will increasingly be time-based.

# **Competitors'** Strategies

We will find ourselves in competition with those states or groups who threaten our vitat interests in the process of advancing their own. It is reasonable to assume that these competitors will seek to exploit key asymmetries that exist in their favor, as well as enduring U.S. weaknesses. Potential first-order competitors were discussed earlier. Also noted above are the new kinds of challenges they are likely to pose to U.S. forces.

Our most formidable challenge could come from an aggressive China with strong links to key Islamic states (e.g., Indonesia, Pakistan, and Iran). If a competition develops, the United States' priorities will be to maintain its key alliances with the European Union and Japan, and to exploit the enduring divisions between India (and perhaps Russia) on the one hand, and China and the Islamic states on the other. If these two groupings were to overcome their historic differences and form an anti-U.S. front, we would find ourselves in a far more difficult competitive position than any we have ever encountered.

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Trends in the military competition would appear to favor the efforts of rising regional powers to reduce U.S. influence and, correspondingly, exert increased pressure on our vital interests. Over the next few decades, major competitors will likely limit themselves to establishing hegemony in their particular region. They will be able to focus most of their efforts on that task, while U.S. efforts will be diffused around the globe. Moreover, such competitors will almost certainly be able to determine the time at which overt competition begins, allowing them to do so when circumstances are most favorable to them. The growing challenge to power-projection (read U.S.) forces is not likely to be matched by the rise of a comparable challenge to in-theater forces. Similarly, it is not clear how the U.S. military would respond to newly emerging forms of commerce raiding and maritime blockade.

We might rely on our advantage in nonnuclear strategic strike forces (i.e.; precision and electronic strike forces) to offset these rising challenges. However, even this capability may be diluted, if not eroded entirely, by the diffusion of WMD and the effects of the nuclear "shadow." With respect to ambiguous strategic strike operations, the United States' high reliance on its information infrastructure, long, relatively open borders, and restrictions on limiting freedom of movement or conducting unreasonable searches would seem to place it at a competitive disadvantage.

#### A Strategy of Time-Based Competitive Advantage

The competitive environment outlined above poses risks to our security that are both very different and far greater than those we confront today. If we are to sustain our dominant military position, we must effect significant changes in our current strategy, placing far greater emphasis on preparing for the post-transformational challenges noted above, and shaping the future competition wherever we can. Two elements will be central to our strategy. *First, we must minimize our own uncertainty concerning the post-transformation competition while maximizing the uncertainty that our competitors will face.* This will allow us to use our superior resources more efficiently and effectively than would-be adversaries. Ideally, it would pre-empt military competitions. Failing that, it would allow us to prevail in such competitions short of war and, if need be, in war. Second, we must develop an ability to adapt more quickly than our adversaries to rapidly changing circumstances. This implies:

- A vigorous level of experimentation oriented on narrowing our uncertainty concerning the capabilities, systems, operations, and force elements needed to meet future challenges;
- Giving such experimental forces a wide range of prototype systems to maximize both the number of options available for solving post-transformational operational problems and the number of problems would-be competitors would have to address;
- Fielding such capabilities in operationally significant numbers to dissuade competitors before they emerge;

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- Avoiding, to the maximum extent practicable, large-scale serial production of long-life systems that may not be nearly as appropriate in post-transformation operations as they are today; thereby maintaining the U.S. military's competitive agility;
- Shorter production runs of new systems to maximize flexibility and hedge against uncertainty, while not locking future commanders into near-term operational concepts; and
- Integrating these new capabilities into systems architectures thereby dramatically increasing the combination and mix of capabilities that can be applied by U.S. forces, while further complicating potential adversaries' planning processes.

This strategy reduces technology-related uncertainty, and it offers a better chance of identifying long-term personnel requirements. By demonstrating a clear capability to meet future challenges, this strategy may also dissuade competitors from entering into military competitions with us. By creating system, doctrinal, and force structure options, this strategic approach positions the U.S. military to be a more effective time-based competitor — to adapt more quickly than our enemies once the character of the post-transformation environment comes into clear focus (i.e., once geopolitical and military-technical uncertainty is reduced).

To be sure, we will have to pay a premium to hedge against uncertainty. But assuming away uncertainty would be far worse. The U.S. military needs a strategy that will create access to a range of capabilities, while at the same time avoids locking us in to inflexible, long-term ways of operating. This also offers us a major competitive advantage by dramatically increasing the level of uncertainty under which would-be competitors must operate. Our strategy will confront adversaries with the need to diffuse both their strategic focus and their limited defense resources to cover a wide range of potential U.S. military capabilities. Indeed, for the foresceable future, our potential competitors' resources are almost certain to be inferior to ours and those of our allies. This is an enduring asymmetric advantage that we possess that should be exploited to the fullest.

This strategy also implies substantial changes in the pattnership between the Defense Department and the defense industry. Relative to the Cold War era when military technology was more proprietary, our competitive advantage will increasingly be derived from an ability to compete based upon time, scale, and complexity. Relatively short production runs of a wide range of systems can facilitate this. Industry must reduce dramatically the time it takes to translate widely available technologies into military capability, and to increase production rapidly if the situation demands.

At the same time, a critical core competence will be the defense industry's ability to maximize the value added to broadly available technologies by establishing the ability to move beyond systems integration to architecture integration — the creation of an integrated system of systems. At the same time, we must take steps to slow the diffusion of key proprietary technologies (i.e., those not broadly available in the commercial market place or from offshore suppliers) and processes.

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This strategy implies a greater emphasis on meeting long-term (post-transformation) challenges than our current strategy. Given current DoD budget projections, it implies a slightly smaller military than is currently envisioned. We will have to accept greater risk in our ability to respond to major theater wars. This can be offset somewhat by involving our core allies to a greater extent in maintaining favorable military balances in key regions. Moreover, as evidenced by Iran's and North Korea's emphasis on fielding forward-base denial systems, the character of the threat is already shifting to a "post-transformational" posture. A key point is that, by transforming now to address emerging challenges, we will be better able to sustain our two-war posture over the longer term than if we pursued our current course. We also will probably have to be more discriminate in committing our forces to peacekeeping operations.

In forward presence operations, we should take a page from the Royal Navy's experience at the dawn of this century when, faced with a similar problem, it imaginatively restructured its forward presence operations in both scale and form, and in the process exploited rapidly emerging technologies and alliance relationships to great effect.

As noted above, our procurement accounts would change more in the type and mix of investments, as opposed to their size. An enhanced RDT&E effort would support our developing options to hedge against uncertainty, become more effective time-based competitors, and maximize the uncertainty under which our competitors must operate.

In addition to our military being slightly smaller, it would begin to emphasize the kinds of capabilities that will be needed to address the post-transformation challenges cited above. The combination of joint experimentation at the operational level, and wide-ranging prototyping of potential systems, will provide answers as to the doctrine, structure, and equipment mix of such forces. However, it seems likely that, relative to the QDR planned force, the force emanating from this strategy would place greater emphasis on:

- Mobility (at all levels tactical, operational, and strategic)
- Stealth (in all its forms, to include undersea forces)
- Electronic protection
- Physical dispersion and electronic integration of forces and supporting elements (e.g., logistics)
- Extended-range systems and strikes
- Precision, electronic, and nonlethal forms of strike
- Speed (of systems, forces and operations tempo)
- Simultaneous, vice sequential, operations
- Unmanned (i.e., UAV/UCAVs, robotics, UGS) systems
- Compressed operational cycle rates

Procuring systems that do not represent dramatic improvements in many or most of these areas, relative to those systems they are replacing, should be avoided to the maximum extent possible. Correspondingly, experimenting with prospective systems that do align themselves well with these characteristics should be accorded high priority.

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#### Conclusion

Both in scale and in form, the challenges facing our military will likely be far more formidable over the longer term than they are today. Furthermore, the level of geopolitical and military-technical uncertainty in terms of the character, timing, and scale of the future competitive environment will remain relatively high. This environment enhances the value of maximizing key capabilities with an eye toward both reducing our own uncertainty and to creating maximum uncertainty for our competitors. It also offers greater rewards to the military organization that can most quickly adapt at the point where conflict comes, uncertainty dissipates, and time is of the essence. The strategy outlined above seeks to enable the U.S. military to do just that.

To be sure, as with any other strategy, it is not without risk. It accepts increased risk in the near-term in order to improve dramatically the U.S. military's competitive posture over the longer term, with the goal of extending its dominant position in the current military regime into the post-transformation regime as well. It does so, in large measure, by establishing time-based competition as a key Defense Department competence.

In summary, the strategy, by extending U.S. military dominance during a period of transformational change and high uncertainty, achieves the traditional objective of any strategy: to reduce the *overall* risk to the national security.

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# Preserving U.S. Military Superiority in a Period of Revolutionary Change

by Michael Vickers Director of Strategic Studies Center for Strategic and Budgetary Assessments April 26, 1999

This paper outlines a strategy for preserving U.S. military superiority through 2025. Challenges to U.S. military superiority in the next couple of decades will most likely come from potential adversaries' ability to exploit revolutionary change in the conduct of war and/or from hostile cumulation of power. Preserving U.S. military superiority requires that both of these potential challenges to U.S. preponderance be addressed. The strategy [ propose contains three sub-strategies: a transformation strategy to develop revolutionary U.S. military capabilities to preemptively limit the strategic effect of potential adversarial development; a competitive and denial strategy to retard adversarial development of destabilizing capabilities; and a rim and "porcupine" strategy to ensure that the U.S. retains the ability to reassure and defend its allies and project power in the face of emerging threats.

U.S. military superiority rests on a number of pillars: American national identity and aspirations to global leadership, the size and strength of the U.S. economy, and American technological prowess. I focus here on those aspects of U.S. military superiority that are most controllable by DoD. I likewise ignore areas, such as the maintenance of a secure, strategic nuclear deterrent, where U.S. superiority is unlikely to be challenged or sought.

I begin by considering the basis of current U.S. military superiority. Next, I assess emerging challenges to that superiority, focusing on those that are potentially the most damaging to U.S. interests. I then analyze enduring U.S. strengths, and conclude by outlining a strategy that leverages those strengths to preserve U.S. military superiority through the first quarter of the twenty-first century.

#### Current U.S. Military Superiority

U.S. military superiority over potential rivals has increased dramatically since the end of the Cold War. The retreat of Soviet power from Europe has enonnously improved U.S. positional advantage. The collapse of the Russian military has eliminated a major conventional threat. A potential emerging rival, China, has been slow at translating its growing economic strength into military capability. The U.S. currently devotes more resources to defense than all of its likely rivals combined, and spends more on research and development than almost all other major powers spend on their total defense program. Within regime and transitional modernization has enabled U.S. forces to advance far ahead of potential rivals. (A military "regime" is defined as a period of time during which the conduct of war is organized around certain dominant methods, e.g., theater-based air warfare, armored warfare, naval air warfare.) The U.S. military is currently dominant in each dimension of warfare; air, land sea, space and information. It is qualitatively and quantitatively superior in air and naval warfare, and in the use of space to support military operations. It has a significant qualitative edge in land warfare, and is dominant in its ability to conduct joint operations. :

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The U.S. military can strike targets with near impunity, great precision and low risk in most areas in the world, and is on the cusp of deploying an all-weather, precision strike capability that, absent the emergence of adversary area denial capabilities, could render mobile armored warfare obsolete as a means of conquest. The U.S. retains an operational monopoly on stealth, and is 10-20 years ahead of potential rivals in developing next generation stealth capabilities. It has a dominant, though nascent, information warfare capability, and dominant, global intelligence and communications capabilities. It has dominant strategic mobility and sustainability. Its fleet of SSNs controls the seas. Within a decade, due to Russian collapse and a slow Chinese build-up, the U.S. military could even have quantitative as well as qualitative nuclear superiority over potential rivals (though this will likely confer little strategic benetit).

### **Emerging Challenges**

The overwhelming superiority that the U.S. military currently enjoys could be challenged from a number of directions, particularly after 2010. The quarter century ahead is likely to witness a revolution in warfare that could substantially alter strategic balances. Rapid, differential, economic growth and technological modernization, most notably in China, could produce far more formidable rivals. Globalization of the defense industry could accelerate technology diffusion. Emerging commercial space and information infrastructures and the continued globalization of the biotechnology industry could dramatically bolster the military capabilities of several potential adversaries. Vital U.S. allies (Saudi Arabia, Japan) could be "lost" due to internal regime change or through a shift in foreign policy orientation. Economic and social transformation in the U.S. could result in less support for the military. Social program insolvency could cause U.S. defense resources to decline sharply. In this section J assess two broad challenges to U.S. military superiority: those that could be posed by a transformation of power, and those by a hostile cumulation of power.

#### Transformation of Power

Twin revolutions in information and biotechnology are transforming the bases of wealth and power. Economic power will increasingly be based on these "leading sector" industries. Military power will likewise be transformed by an associated revolution in military affairs. When this revolution has run its course some two-to-three decades hence, the conduct of war could be transformed on air, land and sea, and war could emerge in several new dimensions: space, information, and microbial (I use "emerge" with respect to space and information to mean the advent of potentially war-winning combat operations in these dimensions; I use the term with respect to a possible microbial dimension to encompass the potential development of qualitatively new means of biological warfare and other novel military applications of biotechnology).

Air warfare could be transformed from a regime dominated by manned, theater-range, air superiority aircraft to one dominated by extended range, unmanned, stealthy platforms. The conduct of land warfare could shift from a regime dominated by mobile, combined arms, armored forces to one that is dominated by much lighter, stealthier and information-intensive forces that make heavy use of robotics. War at sea could be transformed by the emergence of land- and space-based "anti-navy" capabilities that could allow nations that develop this capability to assert a degree of surface control over adjacent maritime areas out to several hundred miles. This in turn would likely lead to new forms of naval power projection (e.g., increased reliance on undersea warfare and/or the application of stealth to some surface vessels). Increased commercial and military use of space could lead to the emergence of expanded space control capabilities and ground- and space-based weapons designed to strike a range of space and terrestrial targets. Denied access to forward bases and/or aspirations to global power could also lead to the development of space-to-ground precision strike capabilities. New forms of warfare (e.g., computer network attack, electromagnetic pulse and high power microwave weapons) could be developed to attack information infrastructures and information-intensive forces. Advanced forms of biological warfare that precisely target specific genotypes or allow pathogens to be innocuously cloaked in other organisms could also emerge in the next decade or two.

Military capabilities are being transformed because of advances in ten principal areas, and information technologies are central to each:

- awareness and connectivity
- range and endurance
- precision and miniaturization
- speed and stealth

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• automation and simulation

New classes of space- and ground-based, commercial and military sensors (electrooptical, synthetic aperture radar, moving target indicator, SIGINT geolocation, foliage penetration, "see-through-wall" radar and micro unmanned aerial vehicles and robots) and increasingly dense sensor webs will provide future forces with unparalleled transparency. Space-based telecommunications constellations, robust network switching, fiber optic prids, and widely available cryptography will provide secure, broadband, long-haul communications Emerging power projection capabilities (chiefly, ballistic and cruise missiles and high-altitude, long-endurance UAVs) will likely witness a several fold increase in range. Wide area and very low CEP precision strike will become ubiquitous, as new classes of munitions (GPS- and laserguided, acoustic- and thermal homing, improved explosives) continue to be developed for an expanding set of delivery means. New methods of electronic attack, enhanced non-lethal capabilities (and perhaps the advent of precision biological weapons) will add additional precision to future military tool kits. New classes of long loiter (both reusable vehicles and munitions) and unattended systems (e.g., "missiles in a box) will significantly increase operational endurance. Stealth will likely be applied to a wider range of air, ground, sca, and perhaps space assets. Missile-based, long-range precision strike capabilities and applications of

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hypersonic technology and directed energy will increase significantly the speed of future operations. Unmanned systems will increasingly substitute for manned systems across warfare dimensions. Simulation advances will transform military planning and training.

Four strategic "competitions" will likely shape the transition to a future warfare regime. The first will pit evolving anti-access or area denial capabilities against current and new forms of power projection. The second will take place between "hiders" and "finders". The third will pit capabilities for stealth/barrage attack against active defenses. The fourth will be an offensestruggle between information warfare and advanced biological warfare attack and defense. Based on current trends in military capabilities, several preliminary assessments can be made about the likely outcome of these key competitions:

- the anti-access threat will likely increase dramatically over the next two decades (evolving from the ability to threaten fixed targets in the next decade to one that can hold at risk most high signature mobile targets, including those several hundred miles offshore, in the decade after next)
- the ability to find opposing forces (and the corresponding ability to destroy or neutralize what one can find) will increase dramatically, which will, in turn, place a very high premium on the ability to hide
- stealth and/or numbers will likely prevail over active defenses, thus favoring the operational offense
- the increased importance of information infrastructures and informationintensive forces to economic and military power will make offensive information warfare capabilities highly valuable; the perishable nature of such tools, however, may significantly limit their effectiveness
- advances in molecular biology are likely to favor the offense over the defense

The full transformation of war just described is by no means inevitable, but its potential implications for U.S. military superiority are profound. In the near-term, U.S. exploitation of the early phases of this transformation (e.g., advancements in sensors, communications links and munitions that lead to a theater-based precision strike capability) is already driving militarily-overmatched competitors (e.g., Yugoslavia) to pursue highly asymmetric means to blunt the most threatening forms of U.S. power. Eventually, the bulk of high-end, close combat will be driven into urban areas.

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Over the longer term, potential adversaries may be able to more directly contest or neutralize U.S. power. U.S. ability to control the air, operate on the surface in littoral areas and conduct mobile armored warfare – the core of current U.S. power projection capabilities – could be severely challenged. U.S. advantages in space and in the use of information could be sharply diminished. U.S. allies could face new, rapid power projection threats (e.g., long-range precision strike or offensive information warfare) that the U.S. military was unable to directly counter, thus potentially leading to an erosion of U.S. alliance relationships and influence. An adversary's ability to hold merchant shipping at risk with anti-navy capabilities could exert a significant influence on trade flows, resulting in a further diminution of U.S. influence. The balance could shift toward insurgents in intrastate conflict, leading to greater instability and state fragmentation, and the U.S. homeland itself could face a range of more virulent transnational threats, leading to a loss of strategic sanctuary that has been heretofore provided by U.S. strategic nuclear forces.

The ability of DoD to forestall exploitation of this revolution by potential adversaries will likely be limited. Some of the key capabilities, ballistic and cruise missile technology, for example, are well understood and are accessible by potential adversaries. Others, such as rudimentary stealth, cannot be too far behind. The dual-use nature of some capabilities (e.g., commercial space launch services) will exacerbate the control problem, as will the increasing military value of commercial or non-defense scientific capabilities (e.g., space-based imaging, navigation and communications services and information technology and biotechnology skills). Technology that may be considered "obsolete" by U.S. standards (e.g., older generation, commercial, information technology) might still substantially contribute to the development of hostile revolutionary capabilities.

More importantly, it is fundamental to the nature of "disruptive" capabilities that transformational advantage is more important than absolute advantage. The U.S. will likely be superior to its potential adversaries in each side of the emerging strategic competitions (e.g., in hiding as well as in finding). "Inferior" adversary possession of disruptive capabilities (e.g., stealth and mobile, long-range precision strike capabilities) will likely prove sufficient to transform strategic balances.

#### Cumulation of Power

A transformation of the world economic order could also challenge U.S. military superiority. A fundamental source of U.S. military strength throughout the twentieth century has been what might be called its "economic escalation dominance" over all adversaries. (No potential adversary has had a economy more than half the size of the United States' since 1912.) If the Chinese economy continues to grow as many international economists project it will, the first quarter of the twenty-first century could well see a substantial loss of that form of dominance (though the U.S. might still be considerably larger in absolute terms). Sustained economic growth by India could also have a significant impact of future strategic balances. Common core drivers of revolutionary change across warfare dimensions (e.g., advances in awareness, connectivity, range, endurance, precision, miniaturization, speed, stealth, automation and simulation), and the likelihood of substantial technological flux and "false starts" in several emerging capability areas (e.g., robotics, electromagnetic gun technology and directed energy weapons) create additional uncertainty as to the composition and mix of future military capabilities. ;

High uncertainty also exists as to the rise of a more powerful and assertive China and/or transnational actors who will seek to exploit revolutionary advances in warfare. Uncertainty also exists as to the long-term strategic implications of the economic and social transformation underway in the U.S., and the level of defense resources likely to be made available to DoD.

There are many areas, however, where the implications of long-term trends are already clear (e.g., the increased military importance of access to commercial space and information infrastructures and the potential "dark side" of the ongoing revolution in molecular biology). There is also ample evidence that several potential U.S. adversaries understand the revolutionary potential of emerging military capabilities (e.g., China, Russia, India, Iran). There should also be little disagreement that the U.S. interests could be severely injured if potential adversaries were to develop revolutionary capabilities before the U.S. was able to.

#### Transformation Strategy

Transformation strategy can be defined as plans and actions whose aim is to induce, sustain and exploit revolutionary change in the conduct of war. Transformation strategies emphasize qualitative change over quantitative, and discontinuous change over incremental. A transformation strategy aimed at preserving U.S. military superiority would therefore shift resources away from current force structure and "within regime" modernization and into research and development, experimentation and "leap-ahead" procurement. ("Leap-ahead," as used in a transformation context, means capabilities that are compatible with the emerging military regime. Advances within an existing class, no matter how revolutionary, e.g., a superior fighter, will usually fail to meet this test.)

A strategy for transforming the U.S. military over the next two decades would be implemented in two stages. The first, exploiting the early phase of the revolution in military affairs and posturing for full transformation, would span the period between the present and 2010. During this period, the U.S. would continue to exploit promising capabilities that could significantly enhance near-term force effectiveness (e.g., bomber upgrades, theater-based precision strike, theater missile defense, network-centric warfare, operational maneuver from the sea, digitization, information operations, and biological warfare defense), but would also sacrifice some near- and mid-term capability for greater long-term capability.

In broad program terms, assuming the defense top line remains unchanged, this could require a 20 percent cut to current force structure (fighter wings, carrier battle groups, and heavy and light ground forces), and the cancellation, deferment or scaling back of several incremental modernization programs (e.g., deferment of the Joint Strike Fighter and CVN-78, scaling back of the F-22 and F/A-18 E/F, and cancellation of *Crusader*, and THAAD). In addition to a major plus-up of R&D and experimentation, program cuts of this magnitude would also fund the conversion of four Trident SSBNs to SSGN-configuration, and the near-term development of an operational UCAV wing, a transitional "strike force" regiment, two stored, undersea strike modules, and a space-based radar constellation.

The additional resources devoted to R&D would fund expanded exploration of potential leap-ahead capabilities, including advanced C4ISR, advanced munitions, wide-body airframe, surface naval and ground force stealth, false target generation, hypersonic systems, directed energy, electromagnetic gun technologies, hybrid power, advanced robotics, advanced submerged power projection, advanced urban warfare, advanced unconventional warfare, advanced information warfare, advanced biological warfare defense, and COTSWAR. (With so much military capability migrating to commercial systems, an important component of this wansformation will likely be the need to develop strategies and capabilities for conflict in commercial domains. While politically sensitive, the differential possession of such capabilities could prove vital.) Resources would also be available to fund more aggressive development of space control and strike capabilities, and an earlier start on a future bomber.

RMA experimentation would, in the early phase of the RMA, emphasize the development of transitional capabilities (e.g., extended range, early entry forces against an anti-access threat that can hold fixed targets at risk), and informing the RMA R&D program. Later stage experimentation would be principally used to aid in mature operational and organizational concept development and systems choice decisions. Experimentation during both periods would focus on full-spectrum, RMA capabilities, that is, the development of capabilities not only for new ways of high intensity warfare and homeland defense, but also new approaches to stability operations.

(U.S. special operations forces could prove to be a valuable "laboratory" for prototyping many emerging capabilities. They will likely make the most extensive early use of robotics, and will likely have the earliest need for stealthy airlift and large-scale undersea delivery.)

The second stage of the transformation, from 2010 to 2025, would be characterized by the large-scale replacement of old force structure with emerging regime capabilities. The most promising R&D options would be exercised, and new warfare specialties established. Discontinuities, such as the weaponization of space, could conceivably be crossed. (Weaponization may not be in the U.S. interest. It should posture itself, however, to prevail in the competition if it looks like weaponization is becoming inevitable.)

By 2025, half of the U.S. force structure could be fundamentally new. The U.S. would rely far more on stealthy, information-intensive, extended range, distributed forces for power projection. Unmanned systems (both munitions and platforms) and space capabilities would loom much larger in the U.S. force structure. The U.S. would have robust, multidimensional homeland defense capabilities. It would retain considerable capability for labor-intensive stability operations. (The size of the U.S. military would probably have come down to around 1 million.) Its legacy forces would still be dominant in old regime contingencies, and would have provided a hedge should the transformation of U.S. capabilities have taken an unexpected turn. Embarking on a strategy for transformation and sustaining it over the near-term require DoD's leadership to accomplish five things:

- establish institutional momentum for discontinuous change
- reallocate resources to longer-term challenges
- begin creating multidimensional options and transforming the defense industrial base
- free up organizational resources and encourage inter- and intra-service competition
- conduct regular transformation strategy reviews

Establishing institutional momentum for discontinuous change would consist of four elements: (1) developing a new, long-term, joint warfighting vision ("Defense Vision 2025") that is explicitly focused on emerging challenges and potential capabilities; (2) choosing senior military leaders on the basis of their likely ability to induce and sustain transformational change; (3) obtaining sufficient Congressional support for change; and (4) demonstrating program as well as rhetorical conunitment through program decisions and leadership emphasis. (Imparting "technological momentum" to fledgling but promising capabilities could be one example of the latter. For example, unmanned combat air vehicles will likely face formidable obstacles in their path to technological maturity. Their natural "proving ground," battlefield reconnaissance, will likely be substantially crowded out by competing space and manned air systems. Accordingly, UCAVs may need a helping hand just to play on a level field.)

Fully exploiting the early phase of the revolution in military affairs and posturing the U.S. military for a much broader transformation would require \$20-40 billion annually in additional spending if offsets were not found among current capabilities. Building the full RMA force between 2010 and 2025 would cost an additional \$80-120 billion annually, again assuming no offsets, i.e., replacing old capabilities with new, are found. Beyond 2025, operations and maintenance costs for the new force could be expected to rise sharply.

Resource allocation decisions to support a strategy for transformation will likely face challenges on several fronts. The first is the current absence of appropriate decision support tools (models and simulation) that can properly account for discontinuous change in strategic effectiveness. The second is the likelihood of fundamental change in our notions about the economics of national defense. For example, some program categories, such as strategic air mobility, could rise substantially in required investment (due to the application of stealth to wide-bodied aircraft, and the necessity for large air fleets if future early entry forces are to be inserted and sustained principally via air). Others, such as the likely increased importance of space-based capabilities relative to air, could have major institutional repercussions. Still others, such as the large-scale incorporation of robotics into force structures, could have fundamentally different life cycle funding profiles from the capabilities they substitute for. In the near-term, the most difficult challenge to overcome will be bureaucratic and political resistance. In the early phase of transformational change, winners will be relatively few to the number of losers, and what "winning" means will likely be much less certain that its antithesis.)

The creation of multidimensional options that can be later exercised is essential because one can easily foresee several competing ways to do distributed, extended range power projection. For example, there are likely to be several alternatives to long-range fires, and several options with respect to maneuver and close combat. The transformation is likely to have its share of false starts, and some options, i.e., weaponization of space, are too important to exclude, even if they turn out never to be exercised.

Developing revolutionary, multidimensional options (and subsequently, revolutionary capabilities), moreover, will almost assuredly require transformation of the U.S. defense industrial base. Such an industrial transformation strategy would allow (and perhaps, strongly assist) new entrants, and would transform existing DoD-industry relationships to increase the likelihood of revolutionary innovation. (The former would entail changes in industry structure to make it more competitive; the latter would likely entail making independent R&D and low volume production runs more profitable.)

Organizational slack for innovation could be created by new ways of operating (in both the shaping and responding functions). For example, naval forward presence might be conducted more routinely with surface action groups. Near- to mid-term major theater war plans, particularly in Southwest Asia, might rely more heavily on long-range air assets, sealaunched missiles, and distributed, early entry ground forces. The likelihood of revolutionary innovation might substantially be increased by encouraging a more "competitive" approach to joint operations, and by civilian and joint intervention in intraservice competitions for warfare primacy.

Regular strategic reviews will likely be essential to obtaining critical feedback on the scope and direction of transformational change. Such reviews could be a useful mechanism to reinvigorate institutional support for change.

#### **Competitive and Denial Strategies**

A strategy for preserving U.S. military superiority should also seek to shape potential adversaries' acquisition of military capabilities in ways that are most favorable to U.S. interests Shaping strategies can have both positive and negative aims. With respect to the latter, they should seek to prevent transformation and cumulation of power inimical to U.S. interests. Two forms of shaping strategy, competitive strategy and denial strategy, will be considered here.

Denial strategies seek to obstruct or block paths to new military competitions. Denial strategies for the current transformation of war must target three areas: diffusion of revolutionary capabilities that are within the purview of the military, diffusion of revolutionary capabilities that lie outside the military sphere, and diffusion of transformational aconomic capabilities. These strategies must also target a range of potential threats to U.S. military superiority, from peer competition, to more virulent transmational actors.

The most likely path to peer competition (and, on a reduced scale, to more vigorous regional competition as well) is the development of a secure nuclear deterrent capability, a power projection capability that combines stealth and missile-based long-range precision strike with rapid assault forces, an area denial capability, an information warfare capability, and perhaps a space control and space strike capability. Other potential branches of the path include the development of an undersea warfare capability that could contest control of the oceans and project power globally and an advanced biological warfare capability. Accordingly, it should be the aim of U.S. strategy to impede access to these capabilities. Areas requiring special focus include technologies underlying the development of:

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- survivable ballistic missile forces (e.g., solid fuel, miniaturization, mobility, improved camouflage, concealment and deception, reduced flight path exposure, penetration aids, submarine basing)
- extended ballistic and cruise missile range (multiple stages, improved engines and air frames) and more lethal missile payloads (precision guidance, boosted explosives, electronic strike)
- cruise missile and UAV stealth and counterstealth capabilities
- remote (unmanned) operations capability
- all-weather, mobile target-capable, sensors and precision-guided munitions
- systems integration capability
- directed energy weapons
- space surveillance and control capabilities
- large-scale information warfare (e.g., NSA-class) capabilities
- submarine quieting and anti-submarine warfare capabilities

Some these capabilities, like first-generation stealth, have been accessible to potential competitors for so long that denial strategies may work only to preserve more advanced U.S. capabilities. The most effective strategy in such areas may be to develop countervailing U.S. capabilities (e.g., counterstealth systems and new forms of power projection that do not rely on fixed, theater bases). Others, such as access to large-scale information warfare capabilities may be so derivative of commercial and scientific exchange that they are largely beyond DoD's capacity to meaningfully restrict. (More broadly, the development of "leading sector" economic capabilities, e.g., space services, information technologies and biotechnologies, could also be central to the emergence of peer competition. To the extent that it is feasible, restricting potential competitors' access to these leading sector industries may be more important than restricting their access to much of the existing U.S. defense industry.)

Technology diffusion that could potentially make transnational actors far more virulent include:

- advanced information and biological warfare capabilities
- stand-off precision weaponry (e.g., guided missiles, mortars, man-portable surface-to-air missiles)
- micro air and ground vehicles

The civil character of many emerging military capabilities poses significant challenges for denial strategies. Where feasible, DoD should seek to leverage U.S. firms' and graduate schools' dominant positions in these emerging sectors. This could include cooperative tracking of misuse of information technologies (e.g., covert computer network attack warning, identification and neutralization capabilities), and cooperative monitoring of information technology and biotechnology skills acquired in the U.S. It could include preferential access to commercial space assets, and controlled access to genetic (e.g., human genome program) libraries.

Finally, U.S. denial programs should seek to restrict access to U.S. emerging operational concepts and capabilities. Of particular importance during a period of transformational change is the protection of emerging "crown jewels." Accordingly, DoD might be wise to adopt a policy that sought to keep black programs "black" longer. For example, demonstrating an important breakthrough too early in the competition could give a potential adversary the time he needed to develop countervailing or equivalent capabilities. In addition to those key adversary capabilities described above, areas that offer the potential for significant U.S. advantage (e.g., information operations, anti-submarine warfare, broader applications of stealth, robotics, false target generation, space asset survivability) need to be protected.

Competitive strategies seek to leverage enduring U.S. strengths and exploit enduring adversary weaknesses to induce adversarial responses that are least threatening to U.S. interests or to impose significant long-term costs on them. Potential competitive strategies that could be pursued by the U.S. include those that leverage U.S. dominance in information technologies, those that leverage U.S. emerging and legacy power projection capabilities to force adversary investment in multidimensional defense and those that leverage U.S. scale advantages.

U.S. transfer of information technologies to China, for example, could lead to an erosion of Chinese central state authority. U.S. development of multidimensional, extended range power projection capabilities could force China and other potential adversaries to invest in expensive defensive countermeasures (e.g., ballistic and cruise missile defense, multidimensional counterstealth, deep underground shelters, reliable strategic communications, and defensive information warfare). Periodic demonstrations of U.S. capabilities for "invisible" overscas presence could cause considerable uncertainty in the minds Chinese military planners and other potential adversaries. A Chinese strategic culture that places great value on the psychological use of limited force might also be reinforced to encourage continued reliance on limited, asymmetric capabilities to achieve strategic ends.

(U.S. "legacy" forces could also play an important competitive strategy role if their use induced potential adversaries to seek equivalent capabilities or defensive, within regime countermeasures. For example, U.S. carrier battle groups might be surged periodically for exercises off Chinese territorial waters.)

Similar competitive strategies might also be employed against emerging transnational threats. Demonstration of U.S. ability to quickly track and apprehend those engaged in computer network attack or biological terrorism could have considerable deterrent value. More broadly, demonstration of U.S. capability to tag and track transnational military activity in a general way, and to deploy wide-area, long endurance, sensor-to-shooter (or sensor-to-apprehender) webs to exploit the results when necessary could significantly suppress transnational operations.

## **Rim and Porcupine Strategies**

Challenges to U.S. military superiority could also arise from emerging threats to U.S. allies and U.S. overseas bases. Emerging capabilities could significantly threaten U.S. ability to reassure its allies, assist in the defense of allied territory, and use many existing overseas bases. The loss of key U.S allies, moreover, could result in significant increases to adversarial power. U.S. military superiority in Eurasia will likely best be preserved by a rim strategy that is aggressive geopolitically while more distant militarily.

While the organizing principle of the future international system (e.g., "clash of civilizations," *realpolitik*) cannot as yet be ascertained, it will likely remain an imperative of American grand strategy to prevent a hostile power or coalition of powers from dominating the Eurasian landmass. It seems likely that the locus of strategic competition on the Eurasian landmass will shift eastward, spanning the area from Southwest Asia to the Pacific Rim. (The European peninsula will likely become a secondary theater much like the Far East was during the Cold War.)

Major geopolitical threats to U.S. military superiority could stem from a hostile Confucian-Islamic alliance, a China-Russia or China-Russia-India alliance, or a China-Japan alliance. Accordingly, the U.S. must seek to ensure that Japan, Saudi Arabia and states controlling key choke points in Southeast Asia remain in its camp, and perhaps draw India, Russia (or its successor states) and Central Asia in as well. U.S. ability to exploit fissures within hostile blocs (e.g., Sino-Soviet during the Cold War, the Islamic World in the post-Cold War world – "intracivilizational" strategy and competition for "neutrals" in clash of civilization terms) will likely remain central to American grand strategy.

U.S. alliance strategy in Eurasia will likely face two challenges as a result of adversary development of new ways of war: reassuring allies confronted with transformational change in U.S. and adversary capabilities, and strengthening the ability of U.S. allies to resist new means of attack. Both will likely require new U.S. approaches to deterrence, peacetime presence, and defense.

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# Preserving U.S. Military Superiority in a Period of Revolutionary Change

by Michael Vickers Director of Strategic Studies Center for Strategic and Budgetary Assessments April 26, 1999

This paper outlines a strategy for preserving U.S. military superiority through 2025. Challenges to U.S. military superiority in the next couple of decades will most likely come from potential adversaries' ability to exploit revolutionary change in the conduct of war and/or from hostile cumulation of power. Preserving U.S. military superiority requires that both of these potential challenges to U.S. preponderance be addressed. The strategy I propose contains three sub-strategies: a transformation strategy to develop revolutionary U.S. military capabilities to preemptively limit the strategic effect of potential adversarial development; a competitive and denial strategy to retard adversarial development of destabilizing capabilities; and a rim and "porcupine" strategy to ensure that the U.S. retains the ability to reassure and defend its allies and project power in the face of emerging threats.

U.S. military superiority rests on a number of pillars: American national identity and aspirations to global leadership, the size and strength of the U.S. economy, and American technological prowess. I focus here on those aspects of U.S. military superiority that are most controllable by DoD. I likewise ignore areas, such as the maintenance of a secure, strategic nuclear deterrent, where U.S. superiority is unlikely to be challenged or sought.

I begin by considering the basis of current U.S. military superiority. Next, I assess emerging challenges to that superiority, focusing on those that are potentially the most damaging to U.S. interests. I then analyze enduring U.S. strengths, and conclude by outlining a strategy that leverages those strengths to preserve U.S. military superiority through the first quarter of the twenty-first century.

#### Current U.S. Military Superiority

U.S. military superiority over potential rivals has increased dramatically since the end of the Cold War. The retreat of Soviet power from Europe has enormously improved U.S. positional advantage. The collapse of the Russian military has eliminated a major conventional threat. A potential emerging rival, China, has been slow at translating its growing economic strength into military capability. The U.S. currently devotes more resources to defense than all of its likely rivals combined, and spends more on research and development than almost all other major powers spend on their total defense program. Within regime and transitional modernization has enabled U.S. forces to advance far ahead of potential rivals. (A military "regime" is defined as a period of time during which the conduct of war is organized around certain dominant methods, e.g., theater-based air warfare, armored warfare, naval air warfare.) The U.S. military is currently dominant in each dimension of warfare: air, land sea, space and information. It is qualitatively and quantitatively superior in air and naval warfare, and in the use of space to support military operations. It has a significant qualitative edge in land warfare, and is dominant in its ability to conduct joint operations. 3

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The U.S. military can strike targets with near impunity, great precision and low risk in most areas in the world, and is on the cusp of deploying an all-weather, precision strike capability that, absent the emergence of adversary area denial capabilities, could render mobile armored warfare obsolete as a means of conquest. The U.S. retains an operational monopoly on stealth, and is 10-20 years ahead of potential rivals in developing next generation stealth capabilities. It has a dominant, though nascent, information warfare capability, and dominant, global intelligence and communications capabilities. It has dominant strategic mobility and sustainability. Its fleet of SSNs controls the seas. Within a decade, due to Russian collapse and a slow Chinese build-up, the U.S. military could even have quantitative as well as qualitative nuclear superiority over potential rivals (though this will likely confer little strategic benefit).

#### **Emerging Challenges**

The overwhelming superiority that the U.S. military currently enjoys could be challenged from a number of directions, particularly after 2010. The quarter century ahead is likely to witness a revolution in warfare that could substantially alter strategic balances. Rapid, differential, economic growth and technological modernization, most notably in China, could produce far more formidable rivals. Globalization of the defense industry could accelerate technology diffusion. Emerging commercial space and information infrastructures and the continued globalization of the biotechnology industry could dramatically bolster the military capabilities of several potential adversaries. Vital U.S. allies (Saudi Arabia, Japan) could be "lost" due to internal regime change or through a shift in foreign policy orientation. Economic and social transformation in the U.S. could result in less support for the military. Social program insolvency could cause U.S. defense resources to decline sharply. In this section I assess two broad challenges to U.S. military superiority: those that could be posed by a transformation of power, and those by a hostile cumulation of power.

#### Transformation of Power

Twin revolutions in information and biotechnology are transforming the bases of wealth and power. Economic power will increasingly be based on these "leading sector" industries. Military power will likewise be transformed by an associated revolution in military affairs. When this revolution has run its course some two-to-three decades hence, the conduct of war could be transformed on air, land and sea, and war could emerge in several new dimensions: space, information, and microbial (I use "emerge" with respect to space and information to mean the advent of potentially war-winning combat operations in these dimensions; I use the term with respect to a possible microbial dimension to encompass the potential development of qualitatively new means of biological warfare and other novel military applications of biotechnology).

Air warfare could be transformed from a regime dominated by manned, theater-range, air superiority aircraft to one dominated by extended range, unmanned, stealthy platforms. The conduct of land warfare could shift from a regime dominated by mobile, combined arms, arnored forces to one that is dominated by much lighter, stealthier and information-intensive forces that make heavy use of robotics. War at sea could be transformed by the emergence of land- and space-based "anti-navy" capabilities that could allow nations that develop this capability to assert a degree of surface control over adjacent maritime areas out to several hundred miles. This in turn would likely lead to new forms of naval power projection (e.g., increased reliance on undersea warfare and/or the application of stealth to some surface vessels). Increased commercial and military use of space could lead to the emergence of expanded space control capabilities and ground- and space-based weapons designed to strike a range of space and terrestrial targets. Denied access to forward bases and/or aspirations to global power could also lead to the development of space-to-ground precision strike capabilities. New forms of warfarc (e.g., computer network attack, electromagnetic pulse and high power microwave weapons) could be developed to attack information infrastructures and information-intensive forces. Advanced forms of biological warfare that precisely target specific genotypes or allow pathogens to be innocuously cloaked in other organisms could also emerge in the next decade or two.

Military capabilities are being transformed because of advances in ten principal areas, and information technologies are central to each:

- awareness and connectivity
- range and endurance
- precision and miniaturization
- speed and stealth
- automation and simulation

New classes of space- and ground-based, commercial and military sensors (electrooptical, synthetic aperture radar, moving target indicator, SIGINT geolocation, foliage penetration, "see-through-wall" radar and micro uunanned aerial vehicles and robots) and increasingly dense sensor webs will provide future forces with unparalleled transparency. Space-based telecommunications constellations, robust network switching, fiber optic grids, and widely available cryptography will provide secure, broadband, long-haul communications. Emerging power projection capabilities (chiefly, ballistic and cruise missiles and high-altitude, long-endurance UAVs) will likely witness a several fold increase in range. Wide area and very low CEP precision strike will become ubiquitous, as new classes of munitions (GPS- and laserguided, acoustic- and thermal homing, improved explosives) continue to be developed for an expanding set of delivery means. New methods of electronic attack, enhanced non-lethal capabilities (and perhaps the advent of precision biological weapons) will add additional precision to future military tool kits. New classes of long loiter (both reusable vehicles and munitions) and unattended systems (e.g., "missiles in a box) will significantly increase operational endurance. Stealth will likely be applied to a wider range of air, ground, sea, and perhaps space assets. Missile-based, long-range precision strike capabilities and applications of

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hypersonic technology and directed energy will increase significantly the speed of future operations. Unmanned systems will increasingly substitute for manned systems across warfare dimensions. Simulation advances will transform military planning and training.

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Four strategic "competitions" will likely shape the transition to a future warfare regime. The first will pit evolving anti-access or area denial capabilities against current and new forms of power projection. The second will take place between "hiders" and "finders". The third will pit capabilities for stealth/barrage attack against active defenses. The fourth will be an offensestruggle between information warfare and advanced biological warfare attack and defense. Based on current trends in military capabilities, several preliminary assessments can be made about the likely outcome of these key competitions:

- the anti-access threat will likely increase dramatically over the next two decades (evolving from the ability to threaten fixed targets in the next decade to one that can hold at risk most high signature mobile targets, including those several hundred miles off shore, in the decade after next)
- the ability to find opposing forces (and the corresponding ability to destroy or neutralize what one can find) will increase dramatically, which will, in turn, place a very high premium on the ability to hide
- stealth and/or numbers will likely prevail over active defenses, thus favoring the operational offense
- the increased importance of information infrastructures and informationintensive forces to economic and military power will make offensive information warfare capabilities highly valuable; the perishable nature of such tools, however, may significantly limit their effectiveness
- advances in molecular biology are likely to favor the offense over the defense

The full transformation of war just described is by no means inevitable, but its potential implications for U.S. military superiority are profound. In the near-term, U.S. exploitation of the early phases of this transformation (e.g., advancements in sensors, communications links and munitions that lead to a theater-based precision strike capability) is already driving militarily-overmatched competitors (e.g., Yugoslavia) to pursue highly asymmetric means to blunt the most threatening forms of U.S. power. Eventually, the bulk of high-end, close combat will be driven into urban areas.

Over the longer term, potential adversaries may be able to more directly contest or neutralize U.S. power. U.S. ability to control the air, operate on the surface in littoral areas and conduct mobile annored warfare – the core of current U.S. power projection capabilities – could be severely challenged. U.S. advantages in space and in the use of information could be sharply diminished. U.S. allies could face new, rapid power projection threats (e.g., long-range precision strike or offensive information warfare) that the U.S. military was unable to directly counter, thus potentially leading to an erosion of U.S. alliance relationships and influence. An adversary's ability to hold merchant shipping at risk with anti-navy capabilities could exert a significant influence on trade flows, resulting in a further diminution of U.S. influence. The balance could shift toward insurgents in intrastate conflict, leading to greater instability and state fragmentation, and the U.S. homeland itself could face a range of more virulent transnational threats, leading to a loss of strategic sanctuary that has been heretofore provided by U.S. strategic nuclear forces.

The ability of DoD to forestall exploitation of this revolution by potential adversaties will likely be limited. Some of the key capabilities, ballistic and cruise missile technology, for example, are well understood and are accessible by potential adversaries. Others, such as rudimentary stealth, cannot be too far behind. The dual-use nature of some capabilities (e.g., conunercial space launch services) will exacerbate the control problem, as will the increasing military value of commercial or non-defense scientific capabilities (e.g., space-based imaging, navigation and communications services and information technology and biotechnology skills). Technology that may be considered "obsolete" by U.S. standards (e.g., older generation, commercial, information technology) might still substantially contribute to the development of hostile revolutionary capabilities.

More importantly, it is fundamental to the nature of "disruptive" capabilities that transformational advantage is more important than absolute advantage. The U.S. will likely be superior to its potential adversaries in each side of the emerging strategic competitions (e.g., in hiding as well as in finding). "Inferior" adversary possession of disruptive capabilities (e.g., stealth and mobile, long-range precision strike capabilities) will likely prove sufficient to transform strategic balances.

#### Cumulation of Power

A transformation of the world economic order could also challenge U.S. military superiority. A fundamental source of U.S. military strength throughout the twentieth century has been what might be called its "economic escalation dominance" over all adversaries. (No potential adversary has had a economy more than half the size of the United States' since 1912.) If the Chinese economy continues to grow as many international economists project it will, the first quarter of the twenty-first century could well see a substantial loss of that form of dominance (though the U.S. might still be considerably larger in absolute terms). Sustained economic growth by India could also have a significant impact of future strategic balances. A rising power such as China could benefit from what might be called its relative military "fiscal stance." A more narrowly focused China that saw its defense budget steadily rise to about three-quarters the level of the U.S.' by 2025 might have more fiscal "slack" for investment in revolutionary capabilities than a U.S. military that was more engaged globally and had broader capabilities across warfare dimensions and the spectrum of conflict, even though the latter could have had access to substantially greater resources over the period. 2

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The final challenge considered here is the potential loss of key allies or overseas bases. Emerging military threats or political change could cause key U.S. allies such as Japan, South Korea and Saudi Arabia to deny U.S. forces access to their territory or become allied with hostile powers. A weak but anti-U.S. Russia or an emergent India or Iran could likewise significantly affect strategic balances were they to become part of a China-led, anti-U.S. coalition.

### Sources of Sustained U.S. Advantage

Although significant asymmetries favor potential adversaries, the U.S. enters this longterm competition with several sources of enduring advantage. It is, at present, at least a decade ahead of any rival. Its economy will likely remain the world's largest and most dynamic throughout the period. It has important scale advantages, both economic and military. Its leading sector firms (information technology and biotechnology), graduate schools, and investment institutions have dominant global positions, and are the source of most innovation. The U.S. military is well ahead of potential rivals in the areas of military capability that are experiencing the most change, and the U.S.' activist foreign policy provides it with unique experience in emerging ways of war. As it begins the period, the U.S. has no major rivals, and the dynamics of emerging regional competitions (local rivalries, balancing behavior) appear to be very favorable to U.S. interests. The U.S. will tikely retain significant positional advantage over potential rivals (e.g., China, India).

There are several sources of operational advantage that the U.S. could leverage in the emerging military competition. First, despite increasing access to space imagery and communications made possible by commercial advances, the U.S. will likely retain important military advantages in all-weather imaging, moving target indicator capabilities, foliage penetration capability, infrared signature detection, space surveillance and space asset survivability. Second, the U.S. is well-positioned technologically to prevail, should it need to, in a space control competition. Third, U.S. development and management of key global space and information systems (Teledesic, GPS, Internet) could give it an important advantage in developing "COTSWAR" (commercial-off-the-shelf warfare) capabilities. Fourth, the U.S. will likely retain important qualitative and quantitative advantages in SIGINT and information warfare capabilities. Fifth, it will likely retain significant advantages in undersea warfare that will allow it to maintain control over most of the world's ocean areas and develop new forms of naval power projection. Sixth, the U.S. could develop important advantages in extended range operations, stealth (and other forms of information protection, such as false target generation), automation and miniaturization that could enable its forces to operate with great effectiveness inside and outside an adversary's threat envelope. Seventh, U.S. aerospace firms are likely to retain their significant edge in strategic mobility capabilities. Eighth, the U.S. will likely remain preeminent in hiotechnology research, which could provide DoD with differential access to that emerging competition.

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The preceding two paragraphs describe only some of the sources of sustained advantage that the U.S. will likely possess in the emerging military competition. Additionally, there are other areas – manned, tactical air operations, naval air warfare and surface warfare, and armored and amphibious warfare – where the U.S. military is likely to retain substantial superiority over the next two-to-three decades. These warfare areas will not likely be central to the emerging military competition, however. (The capabilities differential between U.S. forces and their potential adversaries could well be greater in these legacy warfare areas than it is in emerging dimensions of the military competition. Sustained U.S. superiority in these legacy operations will still make important contributions to U.S. full-spectrum dominance.)

# A Strategy for Preserving U.S. Military Superiority

A strategy for sustaining U.S. military superiority during a period of discontinuous change must incorporate five, broad elements. First, it must hedge against high levels of uncertainty. Second, despite this uncertainty, it must place the U.S. military and its allies on a path to transformational change that will produce revolutionary advances in military capability before potential adversaries can develop capabilities that render obsolete or subordinate existing means for conducting war. Third, it must seek to delay or deny adversary acquisition of destabilizing capabilities. Fourth, it must seek to retain U.S. positional advantage in a rapidly changing geostrategic environment. Fifth, it must secure resources that are sufficient to its arms and the degree of near-, mid- and long-term risk that it is willing to assume.

High uncertainty about when new U.S. capabilities will be needed, the degree of near-, mid- and long-term risk that can be accepted in developing them, their technological and fiscal feasibility and their likely strategic effectiveness mandate the adoption of a hedging strategy Key military uncertainties that must be hedged against include:

- the effectiveness of theater and national missile defenses (if theater defenses are effective against ballistic as well cruise missiles that are used in a mass attack or that incorporate some degree of stealth or other penetration aids, the need for transformational change in other areas is substantially reduced)
- the emergence of anti-access capabilities that can threaten mobile as well as fixed targets
- the continued effectiveness of stealth
- a breakthrough in anti-submarine warfare
- the relationship between the offense and defense in information warfare and advanced biological warfare
- the strategic necessity for weaponizing space

Common core drivers of revolutionary change across warfare dimensions (e.g., advances in awareness, connectivity, range, endurance, precision, miniaturization, speed, stealth. automation and simulation), and the likelihood of substantial technological flux and "false starts" in several emerging capability areas (e.g., robotics, electromagnetic gun technology and directed energy weapons) create additional uncertainty as to the composition and mix of future military capabilities.

High uncertainty also exists as to the rise of a more powerful and assertive China and/or transnational actors who will seek to exploit revolutionary advances in warfare. Uncertainty also exists as to the long-term swategic implications of the economic and social transformation underway in the U.S., and the level of defense resources likely to be made available to DoD.

There are many areas, however, where the implications of long-term trends are already clear (e.g., the increased military importance of access to commercial space and information infrastructures and the potential "dark side" of the ongoing revolution in molecular biology). There is also ample evidence that several potential U.S. adversaries understand the revolutionary potential of emerging military capabilities (e.g., China, Russia, India, Iran). There should also be little disagreement that the U.S. interests could be severely injured if potential adversaries were to develop revolutionary capabilities before the U.S. was able to.

#### **Transformation Strategy**

Transformation strategy can be defined as plans and actions whose aim is to induce, sustain and exploit revolutionary change in the conduct of war. Transformation strategies emphasize qualitative change over quantitative, and discontinuous change over incremental. A transformation strategy aimed at preserving U.S. military superiority would therefore shift resources away from current force structure and "within regime" modernization and into research and development, experimentation and "leap-ahead" procurement. ("Leap-ahead," as used in a transformation context, means capabilities that are compatible with the emerging military regime. Advances within an existing class, no matter how revolutionary, e.g., a superior fighter, will usually fail to meet this test.)

A strategy for transforming the U.S. military over the next two decades would be implemented in two stages. The first, exploiting the early phase of the revolution in military affairs and posturing for full transformation, would span the period between the present and 2010. During this period, the U.S. would continue to exploit promising capabilities that could significantly enhance near-term force effectiveness (e.g., bomber upgrades, theater-based precision strike, theater missile defense, network-centric warfare, operational maneuver from the sea, digitization, information operations, and biological warfare defense), but would also sacrifice some near- and mid-term capability for greater long-term capability.

In broad program terms, assuming the defense top line remains unchanged, this could require a 20 percent cut to current force structure (fighter wings, carrier battle groups, and heavy and light ground forces), and the cancellation, deferment or scaling back of several incremental modernization programs (e.g., deferment of the Joint Strike Fighter and CVN-78, scaling back of

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the F-22 and F/A-18 E/F, and cancellation of *Crusader*, and THAAD). In addition to a major plus-up of R&D and experimentation, program cuts of this magnitude would also fund the conversion of four Trident SSBNs to SSGN-configuration, and the near-term development of an operational UCAV wing, a transitional "strike force" regiment, two stored, undersea strike modules, and a space-based radar constellation.

The additional resources devoted to R&D would fund expanded exploration of potential leap-ahead capabilities, including advanced C4ISR, advanced munitions, wide-body airframe, surface naval and ground force stealth, false target generation, hypersonic systems, directed energy, electromagnetic gun technologies, hybrid power, advanced robotics, advanced submerged power projection, advanced urban warfare, advanced unconventional warfare, advanced information warfare, advanced biological warfare defense, and COTSWAR. (With so much military capability migrating to commercial systems, an important component of this transformation will likely be the need to develop strategies and capabilities for conflict in commercial domains. While politically sensitive, the differential possession of such capabilities could prove vital.) Resources would also be available to fund more aggressive development of space control and strike capabilities, and an earlier start on a future bomber.

RMA experimentation would, in the early phase of the RMA, emphasize the development of transitional capabilities (e.g., extended range, early entry forces against an anti-access threat that can hold fixed targets at risk), and informing the RMA R&D program. Later stage experimentation would be principally used to aid in mature operational and organizational concept development and systems choice decisions. Experimentation during both periods would focus on full-spectrum, RMA capabilities, that is, the development of capabilities not only for new ways of high intensity warfare and homeland defense, but also new approaches to stability operations.

(U.S. special operations forces could prove to be a valuable "laboratory" for prototyping many emerging capabilities. They will likely make the most extensive early use of robotics, and will likely have the earliest need for stealthy airlift and large-scale undersea delivery.)

The second stage of the transformation, from 2010 to 2025, would be characterized by the large-scale replacement of old force structure with emerging regime capabilities. The most promising R&D options would be exercised, and new warfare specialties established. Discontinuities, such as the weaponization of space, could conceivably be crossed. (Weaponization may not be in the U.S. interest. It should posture itself, however, to prevail in the competition if it looks like weaponization is becoming inevitable.)

By 2025, half of the U.S. force structure could be fundamentally new. The U.S. would rely far more on stealthy, information-intensive, extended range, distributed forces for power projection. Unmanned systems (both munitions and platforms) and space capabilities would loom much larger in the U.S. force structure. The U.S. would have robust, multidimensional homeland defense capabilities. It would retain considerable capability for labor-intensive stability operations. (The size of the U.S. military would probably have come down to around 1 million.) Its legacy forces would still be dominant in old regime contingencies, and would have provided a hedge should the transformation of U.S. capabilities have taken an unexpected turn. Embarking on a strategy for wansformation and sustaining it over the near-term require DoD's leadership to accomplish five things:

- establish institutional momentum for discontinuous change
- reallocate resources to longer-term challenges
- begin creating multidimensional options and transforming the defense industrial base
- free up organizational resources and encourage inter- and intra-service competition
- conduct regular transformation strategy reviews

Establishing institutional momentum for discontinuous change would consist of four elements: (1) developing a new, long-term, joint warflighting vision ("Defense Vision 2025") that is explicitly focused on emerging challenges and potential capabilities; (2) choosing senior military leaders on the basis of their likely ability to induce and sustain transformational change; (3) obtaining sufficient Congressional support for change; and (4) demonstrating program as well as rhetorical conunitment through program decisions and leadership emphasis. (Imparting "technological momentum" to fledgling but promising capabilities could be one example of the latter. For example, unmanned combat air vehicles will likely face formidable obstacles in their path to technological maturity. Their natural "proving ground," battlefield reconnaissance, will likely be substantially crowded out by competing space and manned air systems. Accordingly, UCAVs may need a helping hand just to play on a level field.)

Fully exploiting the early phase of the revolution in military affairs and posturing the U.S. military for a much broader transformation would require \$20-40 billion annually in additional spending if offsets were not found among current capabilities. Building the full RMA force between 2010 and 2025 would cost an additional \$80-120 billion annually, again assuming no offsets, i.e., replacing old capabilities with new, are found. Beyond 2025, operations and maintenance costs for the new force could be expected to rise sharply.

Resource allocation decisions to support a strategy for transformation will likely face challenges on several fronts. The first is the current absence of appropriate decision support tools (models and simulation) that can properly account for discontinuous change in strategic effectiveness. The second is the likelihood of fundamental change in our notions about the economics of national defense. For example, some program categories, such as strategic air mobility, could rise substantially in required investment (due to the application of stealth to wide-bodied aircraft, and the necessity for large air fleets if future early entry forces are to be inserted and sustained principally via air). Others, such as the likely increased importance of space-based capabilities relative to air, could have major institutional repercussions. Still others, such as the large-scale incorporation of robotics into force structures, could have fundamentally different life cycle funding profiles from the capabilities they substitute for. In the near-term, the

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most difficult challenge to overcome will be bureaucratic and political resistance. In the early phase of transformational change, winners will be relatively few to the number of losers, and what "winning" means will likely be much less certain that its antithesis.)

The creation of multidimensional options that can be later exercised is essential because one can easily foresee several competing ways to do distributed, extended range power projection. For example, there are likely to be several alternatives to long-range fires, and several options with respect to maneuver and close combat. The transformation is likely to have its share of false starts, and some options, i.e., weaponization of space, are too important to exclude, even if they turn out never to be exercised.

Developing revolutionary, multidimensional options (and subsequently, revolutionary capabilities), moreover, will almost assuredly require transformation of the U.S. defense industrial base. Such an industrial transformation strategy would allow (and perhaps, strongly assist) new entrants, and would transform existing DoD-industry relationships to increase the likelihood of revolutionary innovation. (The former would entail changes in industry structure to make it more competitive; the latter would likely entail making independent R&D and low volume production runs more profitable.)

Organizational slack for innovation could be created by new ways of operating (in both the shaping and responding functions). For example, naval forward presence might be conducted more routinely with surface action groups. Near- to mid-term major theater war plans, particularly in Southwest Asia, might rely more heavily on long-range air assets, sealaunched missiles, and distributed, early entry ground forces. The likelihood of revolutionary innovation might substantially be increased by encouraging a more "competitive" approach to joint operations, and by civilian and joint intervention in intraservice competitions for warfare primacy.

Regular strategic reviews will likely be essential to obtaining critical feedback on the scope and direction of transformational change. Such reviews could be a useful mechanism to reinvigorate institutional support for change.

#### **Competitive and Denial Strategies**

A strategy for preserving U.S. military superiority should also seek to shape potential adversaries' acquisition of military capabilities in ways that are most favorable to U.S. interests. Shaping strategies can have both positive and negative aims. With respect to the latter, they should seek to prevent transformation and cumulation of power inimical to U.S. interests. Two forms of shaping strategy, competitive strategy and denial strategy, will be considered here.

Denial strategies seek to obstruct or block paths to new military competitions. Denial strategies for the current transformation of war must target three areas: diffusion of revolutionary capabilities that are within the purview of the military, diffusion of revolutionary capabilities that lie outside the military sphere, and diffusion of transformational economic capabilities. These strategies must also target a range of potential threats to U.S. military superiority, from peer competition, to more virulent transnational actors.

The most likely path to peer competition (and, on a reduced scale, to more vigorous regional competition as well) is the development of a secure nuclear deterrent capability, a power projection capability that combines stealth and missile-based long-range precision strike with rapid assault forces, an area denial capability, an information warfare capability, and perhaps a space control and space strike capability. Other potential branches of the path include the development of an undersea warfare capability that could contest control of the oceans and project power globally and an advanced biological warfare capability. Accordingly, it should be the aim of U.S. strategy to impede access to these capabilities. Areas requiring special focus include technologies underlying the development of:

- survivable ballistic missile forces (e.g., solid fiel, miniaturization, mobility, improved camouflage, concealment and deception, reduced flight path exposure, penetration aids. submarine basing)
- extended ballistic and cruise missile range (multiple stages, improved engines and air frames) and more lethal missile payloads (precision guidance, boosted explosives, electronic strike)
- cruise missile and UAV stealth and counterstealth capabilities
- remote (unmanned) operations capability
- all-weather, mobile target-capable, sensors and precision-guided munitions
- systems integration capability
- directed energy weapons
- space surveillance and control capabilities
- large-scale information warfare (e.g., NSA-class) capabilities
- submarine quieting and anti-submarine warfare capabilities

Some these capabilities, like first-generation stealth, have been accessible to potential competitors for so long that denial strategies may work only to preserve more advanced U.S. capabilities. The most effective strategy in such areas may be to develop countervailing U.S. capabilities (e.g., counterstealth systems and new forms of power projection that do not rely on fixed, theater bases). Others, such as access to large-scale information warfare capabilities may be so derivative of commercial and scientific exchange that they are largely beyond DoD's capacity to meaningfully restrict. (More broadly, the development of "leading sector" economic capabilities, e.g., space services, information technologies and biotechnologies, could also be central to the emergence of peer competition. To the extent that it is feasible, restricting potential competitors' access to these leading sector industries may be more important than restricting their access to much of the existing U.S. defense industry.)

Technology diffusion that could potentially make transnational actors far more virulent include:

- advanced information and biological warfare capabilities
- stand-off precision weaponry (e.g., guided missiles, mortars, man-portable surface-to-air missiles)
- micro air and ground vehicles

The civil character of many emerging military capabilities poses significant challenges for denial strategies. Where feasible, DoD should seek to leverage U.S. finns' and graduate schools' dominant positions in these emerging sectors. This could include cooperative tracking of misuse of information technologies (e.g., covert computer network attack warning, identification and neutralization capabilities), and cooperative monitoring of information technology and biotechnology skills acquired in the U.S. It could include preferential access to commercial space assets, and controlled access to genetic (e.g., human genome program) libraries.

Finally, U.S. denial programs should seek to restrict access to U.S. emerging operational concepts and capabilities. Of particular importance during a period of transformational change is the protection of emerging "crown jewels." Accordingly, DoD might be wise to adopt a policy that sought to keep black programs "black" longer. For example, demonstrating an important breakthrough too early in the competition could give a potential adversary the time he needed to develop countervailing or equivalent capabilities. In addition to those key adversary capabilities described above, areas that offer the potential for significant U.S. advantage (e.g., information operations, anti-submarine warfare, broader applications of stealth, robotics, false target generation, space asset survivability) need to be protected.

Competitive strategies seek to leverage enduring U.S. strengths and exploit enduring adversary weaknesses to induce adversarial responses that are least threatening to U.S. interests or to impose significant long-term costs on them. Potential competitive strategies that could be pursued by the U.S. include those that leverage U.S. dominance in information technologies, those that leverage U.S. emerging and legacy power projection capabilities to force adversary investment in multidimensional defense and those that leverage U.S. scale advantages.

U.S. transfer of information technologies to China, for example, could lead to an erosion of Chinese central state authority. U.S. development of multidimensional, extended range power projection capabilities could force China and other potential adversaries to invest in expensive defensive countermeasures (e.g., ballistic and cruise missile defense, multidimensional counterstealth, deep underground shelters, reliable strategic communications, and defensive information warfare). Periodic demonstrations of U.S. capabilities for "invisible" overseas presence could cause considerable uncertainty in the minds Chinese military planners and other potential adversaries. A Chinese strategic culture that places great value on the psychological use of limited force might also be reinforced to encourage continued reliance on limited, asymmetric capabilities to achieve strategic ends.

(U.S. "legacy" forces could also play an important competitive strategy role if their use induced potential adversaries to seek equivalent capabilities or defensive, within regime countermeasures. For example, U.S. carrier battle groups might be surged periodically for exercises off Chinese territorial waters.)

Similar competitive strategies might also be employed against emerging transnational threats. Demonstration of U.S. ability to quickly track and apprehend those engaged in computer network attack or biological terrorism could have considerable deterrent value. More broadly, demonstration of U.S. capability to tag and track transnational military activity in a general way, and to deploy wide-area, long endurance, sensor-to-shooter (or sensor-to-apprehender) webs to exploit the results when necessary could significantly suppress transnational operations.

# **Rim and Porcupine Strategies**

Challenges to U.S. military superiority could also arise from emerging threats to U.S. allies and U.S. overseas bases. Emerging capabilities could significantly threaten U.S. ability to reassure its allies, assist in the defense of allied territory, and use many existing overseas bases. The loss of key U.S allies, moreover, could result in significant increases to adversarial power. U.S. military superiority in Eurasia will likely best be preserved by a rim strategy that is aggressive geopolitically while more distant militarily.

While the organizing principle of the future international system (e.g., "clash of civilizations," *realpolitik*) cannot as yet be ascertained, it will likely remain an imperative of American grand strategy to prevent a hostile power or coalition of powers from dominating the Eurasian landmass. It seems likely that the locus of strategic competition on the Eurasian landmass will shift eastward, spanning the area from Southwest Asia to the Pacific Rim. (The European peninsula will likely become a secondary theater much like the Far East was during the Cold War.)

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Major geopolitical threats to U.S. military superiority could stem from a hostile Confucian-Islamic alliance, a China-Russia or China-Russia-India alliance, or a China-Japan alliance. Accordingly, the U.S. must seek to ensure that Japan, Saudi Arabia and states controlling key choke points in Southeast Asia remain in its camp, and perhaps draw India, Russia (or its successor states) and Central Asia in as well. U.S. ability to exploit fissures within hostile blocs (e.g., Sino-Soviet during the Cold War, the Islamic World in the post-Cold War world – "intracivilizational" strategy and competition for "neutrals" in clash of civilization terms) will likely remain central to American grand strategy.

U.S. alliance strategy in Eurasia will likely face two challenges as a result of adversary development of new ways of war: reassuring allies confronted with transformational change in U.S. and adversary capabilities, and strengthening the ability of U.S. allies to resist new means of attack. Both will likely require new U.S. approaches to deterrence, peacetime presence, and defense.

In the near-to-mid-term, the principal challenge will be to ensure that U.S. transformation efforts are not perceived by its allies as a weakening of U.S. commitment. This perception could accompany the adoption of alternative approaches to U.S. overseas presence that were intended to provide organizational slack for transformation. U.S. reductions in near-term force structure could likewise call into question U.S. capacity to conduct two major theater wars nearly simultaneously. Accordingly, it is imperative that alternative approaches to presence (e.g., substitution of surface action groups for carrier battle groups) be fully explained, and that periodic demonstrations of overwhelming presence (e.g., surging carriers and air expeditionary forces) be conducted. Similarly, the U.S. declaratory policy of being able to fight two major theater wars in close succession should be maintained. The approach taken should be to redefine the metrics, as U.S. capabilities evolve, of what constitutes a major theater war capability, that is, that qualitative improvements more than offset any quantitative reductions.

Should adversary area denial capabilities evolve along the lines described earlier, the U.S. will need to make further adjustments to the way it conducts overseas presence. While traditional forces will still be useful for peacetime engagement, a future warfighting capability would likely emphasize survivable assets that constitute an "invisible" presence (e.g., those that rely on stealth, endurance and automation). Reassuring allies of the value of stealthy presence will require periodic demonstrations of U.S. capabilities. (Stealthy presence, it should be remembered, will introduce greater uncertainty in the calculations of opposing military planners.)

New means of coercion will pose additional challenges for U.S. alliance strategy. A hostile power's mere possession of a large, conventional, long-range precision strike arsenal could allow it to gain important diplomatic concessions from U.S. allies. This challenge will likely be most acute with respect to Japan and its relations with a rising China. U.S. reassurance of Japan could take the form of a conventional, long-range precision strike deterrent combined with damage-limiting, missile defenses to supplement its long-standing extended nuclear deterrent, or it could take the form of assisting Japan to develop similar capabilities. Should Chinese long-range power projection and area denial capabilities evolve as described, U.S. bases in Japan would likely lose much of their value.

Retention of Japan as a U.S. ally is vital for several reasons. First, Japan is key to an effective technology denial strategy against China. Second, were Japan to go over to the other side, its latent military power might be exploited in ways inimical to U.S. interests.

Emerging power projection and area denial capabilities will similarly pose challenges for allied defense. Future power projection is likely to be far more rapid, and could take place with much less warning (e.g., precision missile and information warfare strikes, followed by air assault). This new form of blitzkrieg could make rapid defeat of U.S. allies more likely. Area denial capabilities could make U.S. reinforcement/resupply more problematic. An allied defense that could make conquest more problematic is a porcupine strategy. Through its security assistance programs, the U.S. would bolster the capabilities of its allies to resist occupation by providing them with survivable area denial capabilities of their own. Such capabilities would need to be able to survive a first strike (including electronic). They might include stored, remotely activated missile pods and unattended ground sensors, and distributed force capabilities to fight in urban areas (e.g., a range of infantry weapons, including manportable, surface-to-air missile systems, prepositioned caches). U.S. power projection capabilities, long-range strike and forced entry, would augment the porcupine defense by severely restricting and eventually eliminating the aggressor's power projection capabilities.

Finally, U.S. overseas basing strategy needs to adapt to changing military capabilities. Future U.S. power projection will likely rely on three types of bases: stealthy, transitory bases in theater, peripheral bases located 1-3,000 miles from the theater, and supporting global infrastructure. To support future extended range operations in Eurasia, the U.S. will likely want to adopt a rim strategy that employs peripheral and mobile sea bases ranging from Alaska to Diego Garcia. Alaska and Australia look like particularly attractive areas to develop. Other bases, such as Singapore, are valuable not only for their contribution to global support, but also because U.S. possession of them blocks adversary access through a critical strategic chokepoint.

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