

the | **JOE** **2010**
JOINT OPERATING ENVIRONMENT



READY FOR TODAY. PREPARING FOR TOMORROW.



ABOUT THIS STUDY

The Joint Operating Environment is intended to inform joint concept development and experimentation throughout the Department of Defense. It provides a perspective on future trends, shocks, contexts, and implications for future joint force commanders and other leaders and professionals in the national security field. This document is speculative in nature and does not suppose to predict what will happen in the next twenty-five years. Rather, it is intended to serve as a starting point for discussions about the future security environment at the operational level of war. Inquiries about the Joint Operating Environment should be directed to USJFCOM Public Affairs, 1562 Mitscher Avenue, Suite 200, Norfolk, VA 23551-2488, (757) 836-6555.

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THE JOINT OPERATING ENVIRONMENT (JOE)

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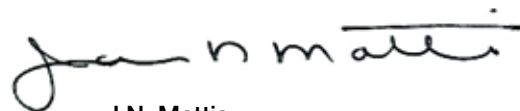
F O R E W O R D

While U.S. Joint Forces Command's Joint Operating Environment (JOE) in no way constitutes U.S. government policy and must necessarily be speculative in nature, it seeks to provide the Joint Force an intellectual foundation upon which we will construct the concepts to guide our future force development. We will likely not call the future exactly right, but we must think through the nature of continuity and change in strategic trends to discern their military implications to avoid being completely wrong. These implications serve to influence the concepts that drive our services' adaptations to the environments within which they will operate, adaptations that are essential if our leaders are to have the fewest regrets when future crises strike.

In our guardian role for our nation, it is natural that we in the military focus more on possible security challenges and threats than we do on emerging opportunities. From economic trends to climate change and vulnerability to cyber attack, we outline those trends that remind us we must stay alert to what is changing in the world if we intend to create a military as relevant and capable as we possess today. There is a strong note of urgency in our efforts to balance the force for the uncertainties that lie ahead. The JOE gives focus to those efforts which must also embrace the opportunities that are inherent in the world we imperfectly foresee.

Every military force in history that has successfully adapted to the changing character of war and the evolving threats it faced did so by sharply defining the operational problems it had to solve. With the JOE helping to frame future security problems and highlighting their military implications, the Chairman's companion document, Capstone Concept for Joint Operations (CCJO), answers the problems we have defined, stating how the Joint Force will operate. Taken together, these documents will drive the concept development and experimentation that will, in turn, drive our evolutionary adaptation, while guarding against any single preclusive view of future war. None of us have a sufficiently clear crystal ball to predict fully the changing kaleidoscope of future conflicts that hover over the horizon, even as current fights, possible adversaries' nascent capabilities, and other factors intersect.

We will update the JOE in a year or two, once we have a sufficiently different understanding to make a new edition worthwhile. If you have ideas for improving our assessment of the future security environment and the problems our military must solve to provide relevant defense for our country and like-minded nations, please forward them to J-5 (Strategy), Joint Forces Command.



J.N. Mattis
General, U.S. Marines
Commander, U.S. Joint Forces Command

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*War is a matter of vital importance to the State; the province of life or death; the road to survival or ruin. It is mandatory that it be thoroughly studied.*¹ -Sun Tzu

I N T R O D U C T I O N

The next quarter century will challenge U.S. joint forces with threats and opportunities ranging from regular and irregular wars in remote lands, to relief and reconstruction in crisis zones, to cooperative engagement in the global commons. Our enemy's capabilities will range from explosive vests worn by suicide bombers to long-range precision-guided cyber, space, and missile attacks. The threat of mass destruction – from nuclear, biological, and chemical weapons – will likely expand from stable nation-states to less stable states and even non-state networks.

It is impossible to predict precisely how challenges will emerge and what form they might take. Nevertheless, it is absolutely vital to try to frame the strategic and operational contexts of the future, in order to glimpse the possible environments where political and military leaders will work and where they might employ joint forces. The value of such efforts lies not as much in the final product, but much more in the participation of senior leaders and decision-makers in the discussion. Only by wrestling with the possibilities, determining the leading indicators, and then reading the signposts of the times will the Joint Force have some of the answers to the challenges of the future. The alternative, to focus exclusively on the here and now or to pass this mission to the bureaucracy, will certainly result in getting caught flat-footed, reacting to near-term crises as they arise, at great cost in blood and treasure.

Thinking about the future requires an understanding of both what is timeless and what will likely change. As Thucydides suggested in the fifth century BC, “the events which happened in the past...(human nature being what it is) will at some time or other and in much the same way be repeated in the future.”² Many features will not change. The challenges of the future will resemble, in many ways, the challenges that American forces have faced over the past two centuries. In spite of the current intellectual climate in much of the developed world, conflict will not disappear. War has been a principal driver of change over the course of history, and there is no reason to believe that the future will differ in this respect. Neither will the fundamental nature of war change. War will remain primarily a human endeavor.

In contrast, changes in the strategic landscape, the introduction and employment of new technologies, and the adaptation and creativity of our adversaries will alter the character of joint operations a great deal. Here too, the past can suggest much about the future – the nature of change, its impact on human societies, and the interplay among human societies in peaceful and warlike competition.

Over the next quarter century, U.S. military forces will be continually engaged in some dynamic combination of combat, security, engagement, and relief and reconstruction. There will continue to be those who will hijack and exploit religion for extremist ends. There will continue to be opponents who will try to disrupt the political stability and deny the free access to the global commons that is crucial to the world's economy. In this environment, the presence, reach, and capability of U.S. military forces, working with like-minded partners, will continue to be called upon to protect our national interests. Merely sustaining the health of the Joint Force, never mind adapting and transforming, is far more complicated in a period of persistent conflict, with its toll on equipment, people, and national will.

¹ Sun Tzu, *The Art of War*, trans. and ed. by Samuel B. Griffith (Oxford, 1963), p. 63.

² Thucydides, *The History of the Peloponnesian War*, trans. by Rex Warner (London: Penguin Books, 1954), p. 48.

The nature of the human condition will guarantee that uncertainty, ambiguity, and surprise will dominate the course of events. However carefully we think about the future; however thorough our preparations; however coherent and thoughtful our concepts, training, and doctrine; we will be surprised. Even the wisest of statesmen have found their assumptions about the future confounded by reality. The eighteenth century British leader, William Pitt, the Younger, declared in a speech before the House of Commons in February 1792: “Unquestionably there has never been a time in the history of our country when, from the situation in Europe, we might more reasonably expect fifteen years of peace, than we have at the present moment.”³ Within a matter of months, Britain would become embroiled in a conflict that would last nearly a quarter of a century and would kill more Europeans than any other war in history up to that time.

In the broadest sense, the Joint Operating Environment examines three questions:

- What future trends and disruptions are likely to affect the Joint Force over the next quarter century?
- How are these trends and disruptions likely to define the future contexts for joint operations?
- What are the implications of these trends and contexts for the Joint Force?

By exploring these trends, contexts, and implications, the Joint Operating Environment provides a basis for thinking about the world over the next quarter century. Its purpose is not to predict, but to suggest ways leaders might think about the future.

As war at its essence is a human endeavor, then it follows that one of the most effective ways to understand human nature is by a close consideration of history. As such, rather than futuristic vignettes, the Joint Operating Environment uses history as a principal way to gain insight into the future. The discussion begins with the enduring nature of war, the causes and consequences of change and surprises, and the role of strategy. Part II then describes some trends, discontinuities and potential trouble spots that joint forces may confront. Part III analyzes how these trends and disruptions may combine into contexts that will likely define joint operations over the next quarter century. Part IV describes the implications of these contexts for the Joint Force as it confronts an uncertain future. This section also suggests how senior leaders might think about creating a force that is suited to address the challenges that these contexts will present. This is the unique contribution of the Joint Operating Environment to the broader discussion about the future. Before concluding, Part V offers some “leading questions” about topics that may fall outside the traditional purview of this study, but that nonetheless have important implications for the future Joint Force.

We will find ourselves caught off guard by changes in the political, economic, technological, strategic, and operational environments. We will find ourselves surprised by the creativity and capability of our adversaries. Our goal is not to eliminate surprise – that is impossible. Our goal is, by a careful consideration of the future, to suggest the attributes of a joint force capable of adjusting with minimum difficulty when the surprise inevitably comes. The true test of military effectiveness in the past has been the ability of a force to diagnose the conditions it actually confronts and then quickly adapt. In the end, it will be our imagination and agility to envision and prepare for the future, and then to adapt to surprises, that will determine how the Joint Force will perform over the next twenty-five years. The ability to adapt to the reality of war, its political framework, and its technical and industrial modes, and to the fact that the enemy also consists of adaptive human beings, has been the key component in military effectiveness in the past and will continue to be so in the future.

³ Quoted in Colin Gray, *Another Bloody Century*, (London: Penguin Books, 2005), p. 40.

In the late fifth century BC, Athenian negotiators, speaking to their Spartan competitors, with whom they were soon at war, staked out their rationale for their refusal to abandon their position as Greece's other great power: "We have done nothing extraordinary, nothing contrary to human nature in accepting an empire when it was offered to us and then in refusing to give it up. Three very powerful motives prevent us from doing so – security, honour, and self interest. And we were not the first to act in this way. Far from it."⁴ -Thucydides

PART 1: THE CONSTANTS

THE NATURE OF WAR

We cannot predict exactly what kind of war, or for what purposes, the armed forces of the United States will find themselves engaged in over the next quarter century; we can only speculate about possible enemies and the weapons they will bring to the fight. However, we can state with certainty that the fundamental nature of war will not change. In a democracy such as the United States, political aims, pressures, and hesitations have always conditioned military operations – and will continue to do so. "When whole communities go to war... the reason always lies in some political situation."⁵ War is a political act, begun for political purposes. Indeed, both nonstate actors such as insurgents and transnational movements such as Al Qaeda use force for political ends. Thus, war retains its political dimension in the twenty-first century, even when it originates in the actions of non-state and transnational groups.

The Joint Force will operate in an international environment where struggle predominates. While the origins of war may rest on policy, a variety of factors have influenced the conduct of that struggle in the past and will do so in the future. The tension between rational political calculations of power on one hand and secular or religious ideologies on the other, combined with the impact of passion and chance, makes the trajectory of any conflict difficult if not impossible to predict. Rational strategy is often difficult in a world where organizational processes, bureaucratic politics, legislative restrictions, and economic conditions may dominate choices.

The Joint Force will face actors who view the world through different lenses than we do. In coming decades, Americans must struggle to resist judging the world as if it operated along the same principles and values that drive our own country. In many parts of the world, actors will judge costs and benefits differently than we do. Some of our enemies are eager to die for radical ideological, religious, or ethnic causes; enemies who ignore national borders and remain unbound by the conventions of the developed world – who leave little room for negotiations or compromise.

Among these, we face irreconcilable enemies capable of mobilizing large numbers of young men and women, to intimidate civilian populations with machetes or to act as suicide bombers in open markets. It can become a matter of survival when human passion takes over.

⁴ Thucydides, *History of the Peloponnesian War*, trans. by Rex Warner (London: Penguin Books, 1954) p. 80.

⁵ Carl von Clausewitz, *On War*, translated and edited by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), p. 87.

War, more than any other human activity, engages our senses: at times providing a “rush” of fear, horror, confusion, rage, pain, helplessness, nauseous anticipation, and hyper-awareness. It is in these vagaries that imponderables and miscalculations accumulate to paralyze the minds of military and political leaders. In the cauldron of war, “It is the exceptional [human being] who keeps his powers of quick decision intact.”⁶

There are other aspects of human conflict that will not change no matter what advances in technology or computing power may occur: fog and friction will distort, cloak, and twist the course of events. Fog will result from information overload, our own misperceptions and faulty assumptions, and the fact that the enemy will act in an unexpected fashion. Combined with the fog of war will be its frictions - that almost infinite number of seemingly insignificant incidents and actions that can go wrong. It will arise “from fundamental aspects of the human condition and unavoidable unpredictabilities that lie at the very core of combat processes.”⁷

The constant fog and friction of war turns the simple into the complex. In combat, people make mistakes. They forget the basics. They become disoriented, ignoring the vital to focus on the irrelevant. Occasionally, incompetence prevails. Mistaken assumptions distort situational awareness. Chance disrupts, distorts, and confuses the most careful of plans. Uncertainty and unpredictability dominate. Thoughtful military leaders have always recognized that reality and no amount of computing power will eradicate this basic messiness.

Where friction prevails, tight tolerances, whether applied to plans, actions, or materiel are an invitation to failure – the more devastating for being unexpected. Operational or logistical concepts or plans that make no allowance for the inescapable uncertainties of war are suspect on their face – an open invitation to failure and at times defeat.

Still another enduring feature of conflict lies in the recurring fact that military leaders often fail to recognize their enemy as a learning, adaptive force. War “is not the action of a living force upon a lifeless mass... but always the collision of two living forces.”⁸ Those living forces possess all the cunning and intractable characteristics human beings have enjoyed since the dawn of history.

Even where adversaries share a similar historical and cultural background, the mere fact of belligerence guarantees profound differences in attitudes, expectations, and behavioral norms. Where different cultures come into conflict, the likelihood that adversaries will act in mutually incomprehensible ways is even more likely. Thus, Sun Tzu’s maxim that, “if you know the enemy and know yourself, you need not fear the results of a hundred battles” is easier said than done.⁹ The conduct of war demands a deep understanding of the enemy – his culture, history, geography, religious and ideological motivations, and particularly the manifest differences in his perceptions of the external world.

⁶ Carl von Clausewitz, *On War*, translated and edited by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), p. 113.

⁷ Barry D. Watts, *Clausewitzian Friction and Future War* (Washington, DC: Institute for National Strategic Studies McNair Paper #68, 2004), p. 78.

⁸ Carl von Clausewitz, *On War*, translated and edited by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976) p. 77.

⁹ Sun Tzu, *Art of War*, translation by Samuel B. Griffith (Oxford University), p.84.

THE NATURE OF CHANGE

War will remain a human endeavor, a conflict between two learning and adapting forces, yet changes in the political landscape, adaptations by the enemy, and advances in technology will change the character of war. Leaders are often late to recognize such changes, and even when they do, inertia tends to limit their ability to adapt quickly. Driven by an inherent desire to bring order to a disorderly, chaotic universe, human beings tend to frame their thoughts about the future in terms of continuities and extrapolations from the present and occasionally the past. But a brief look at the past quarter century, to say nothing of the past four thousand years, suggests the extent of changes that coming decades will bring.

Twenty-five years ago the Cold War encompassed every aspect of the American military's thinking and preparation for conflict – from the strategic level to the tactical. Today, that all-consuming preoccupation is a historical relic. A quarter century ago, the United States confronted the Soviet Union, a truculent, intractable opponent with leaders firmly committed to the spread of Marxist-Leninist ideology and expansion of their influence. At that time, few in the intelligence communities or even among Sovietologists recognized the deepening internal crisis of confidence that would lead to the implosion of the Soviet Empire. The opposing sides had each deployed tens of thousands of nuclear weapons, as well as vast armies, air forces, and navies across the globe. Soviet forces were occupying Afghanistan and appeared on the brink of crushing an uprising of ill-equipped, ill-trained guerrillas. In El Salvador, a Soviet-backed insurgency was on the brink of victory.

Beyond the confrontation between the United States and Soviet Union lay a world that differed enormously from today. China was only emerging from the dark years of Mao's rule. To China's south, India remained mired in an almost medieval level of poverty, from which it appeared unlikely to escape. To the sub-continent's west, the Middle East was as plagued by political and religious troubles as today. But no one could have predicted then that within 25 years the United States would wage two major wars against Saddam Hussein's regime and commit much of its ground power to suppressing simultaneous insurgencies in Iraq and Afghanistan.

The differences between the culture and organization of the American military then and now further underline the extent of the disruptions with the past. The lack of coordination among the forces involved in overthrowing the "New Jewel" movement in Grenada in October 1983 reminds us that at the time jointness was a concept honored more in the breach than observance. That situation led to the Goldwater-Nichols Act in 1986.

In terms of capabilities, stealth did not yet exist outside of the research and development communities. The M-1 Tank and the Bradley Fighting Vehicle were only starting to reach the army's forward deployed units. The Global Positioning System (GPS) did not exist. The training ranges of the National Training Center, Twenty-Nine Palms, Fallon, and Nellis were just beginning to change U.S. preparations for war. Precision attack was a problem to be solved with tactical nuclear weapons.

One might also note how much the economic and technological landscapes outside of the military had changed. Economically, in 1983 globalization was in its first stages and largely involved trade among the United States, Europe, and Japan. The tigers of Southeast Asia were emerging, but the rest of the world seemed caught in inescapable poverty. Just to give one example: in 1983 the daily transfer of capital among international markets was approximately \$20 billion. Today, it is \$1.6 trillion.

STRATEGIC ESTIMATES IN THE TWENTIETH CENTURY

1900

If you are a strategic analyst for the world's leading power, you are British, looking warily at Britain's age old enemy, France.

1910

You are now allied with France, and the enemy is now Germany.

1920

Britain and its allies have won World War I, but now the British find themselves engaged in a naval race with its former allies, the United States and Japan.

1930

For the British, naval limitation treaties are in place, the Great Depression has started, and defense planning for the next five years assumes a "ten year" rule – no war in ten years. British planners posited the main threats to the Empire as the Soviet Union and Japan, while Germany and Italy are either friendly or no threat.

1936

A British planner now posits three great threats: Italy, Japan, and the worst, a resurgent Germany, while little help can be expected from the United States.

1940

The collapse of France in June leaves Britain alone in a seemingly hopeless war with Germany and Italy, with a Japanese threat looming in the Pacific. The United States has only recently begun to scramble to rearm its military forces.

1950

The United States is now the world's greatest power, the atomic age has dawned, and a "police action" begins in June in Korea that will kill over 36,500 Americans, 58,000 South Koreans, nearly 3,000 Allied soldiers, 215,000 North Koreans, 400,000 Chinese, and 2,000,000 Korean civilians before a cease-fire brings an end to the fighting in 1953. The main opponent in the conflict is China, America's ally in the war against Japan.

1960

Politicians in the United States are focusing on a missile gap that does not genuinely exist; massive retaliation will soon give way to flexible response, while a small insurgency in South Vietnam hardly draws American attention.

1970

The United States is beginning to withdraw from Vietnam, its military forces in shambles. The Soviet Union has just crushed incipient rebellion in the Warsaw Pact. Détente between the Soviets and Americans has begun, while the Chinese are waiting in the wings to create an informal alliance with the United States.

1980

The Soviets have just invaded Afghanistan, while a theocratic revolution in Iran has overthrown the Shah's regime. "Desert One" – an attempt to free American hostages in Iran – ends in a humiliating failure, another indication of what pundits were calling "the hollow force." America is the greatest creditor nation the world had ever seen.

1990

The Soviet Union collapses. The supposedly hollow force shreds the vaunted Iraqi Army in less than 100 hours. The United States has become the world's greatest debtor nation. Very few outside of the Department of Defense and the academic community use the Internet.

2000

Warsaw is the capital of a North Atlantic Treaty Organization (NATO) nation. Terrorism is emerging as America's greatest threat. Biotechnology, robotics, nanotechnology, HD energy, etc. are advancing so fast they are beyond forecasting.

2010

Take the above and plan accordingly! What will be the disruptions of the next 25 years?

On the technological side, the Internet existed only in the Department of Defense, and its economic and communications possibilities and implications for the civilian world were not yet apparent. Cellular phones came equipped with briefcases and shoulder straps and only worked in select urban areas. Personal computers were beginning to come into widespread use, but their reliability was terrible. Microsoft was just emerging from Bill Gates' garage, while Google existed only in the wilder writings of science fiction writers. In other words, the revolution in information and communications technologies, taken for granted today, was largely unimaginable in 1983. A revolution had begun, but its implications remained uncertain and unclear. Other advances in science since 1983, such as the completion of the human genome project, nano technologies, and robotics, also seemed the provenance of writers of science fiction.

In thinking about the world's trajectory, we have reason to believe that the next twenty-five years will bring changes just as dramatic, drastic, and disruptive as those that have occurred in the past quarter century. Indeed, the pace of technological and scientific change is increasing. Changes will occur throughout the energy, financial, political, strategic, operational, and technological domains. How drastic, how disruptive and how surprising these changes might be is at present not discernible and in some cases their full impact will not be understood until they are upon us.

The interplay between continuities and disruptions will demand a Joint Force that can see both what has changed and what endures. The force must then have the ability to adapt to those changes while recognizing the value of fundamental principles. That can only result from a historically-minded mentality that can raise the right questions.

THE CHALLENGE OF DISRUPTIONS

Trends may suggest possibilities and potential directions, but they are unreliable for understanding the future because they interact with and are influenced by other factors. The downturn of Wall Street after the crash of 1929 might well have remained a recession, but passage of the Smoot-Hawley tariffs destroyed American trade with other nations and turned the recession into a catastrophic global depression. In considering the future, one should not underestimate the ability of a few individuals, even a single person, to determine the course of events. One may well predict that human beings will act in similar patterns of behavior in the future, but when, where and how remains entirely unpredictable. The rise of a future Stalin, Hitler, or Lenin is entirely possible, but completely unpredictable, and the context in which they might reach the top is unforeseeable.

The interplay of economic trends, vastly different cultures and historical experiences, and the idiosyncrasies of leaders, among a host of other factors, provide such complexity in their interactions as to make prediction impossible. Winston Churchill caught those complexities best in his masterful history of World War I:

One rises from the study of the causes of the Great War with a prevailing sense of the defective control of individuals upon world fortunes. It has been well said, "there is always more error than design in human affairs." The limited minds of the ablest men, their disputed authority, the climate of opinion in which they dwell, their transient and partial contributions to the mighty problem, that problem itself so far beyond their compass, so vast in scale and detail, so changing in its aspects – all this must surely be considered...¹⁰

Thus, individuals and their idiosyncrasies, genius, and incompetence, are major actors in these disruptions. Perhaps the worst president in American history, James Buchanan, was followed by possibly the greatest, Abraham Lincoln. Individuals invariably remain the prisoners of their cultural and historical frame of reference, which makes the ability to understand, still less to predict, the actions of other states and other leaders difficult. Yet we should not allow this to discourage us from gaining as deep an understanding as possible of the historical influences of potential political and military leaders at the strategic, operational, and tactical level.

¹⁰Winston S. Churchill, *The World Crisis* (Toronto: MacMillan, 1931), p. 6.

Clearly, not all disruptions occur through the actions of individual leaders. Great events, involving the overthrow of regimes, the collapse of economic systems, natural disasters, and great conflicts within or among states have taken the flow of history and channeled it into new and unforeseen directions. Such disruptions are truly unpredictable, except for the fact that we can be sure that they will happen again. They will twist the future into new and unforeseen directions. Here, the only strategy that can mitigate the impact of surprise is knowledge of the past, an understanding of the present, and a balanced force that is willing and able to adapt in the future.

The Fragility of History – and the Future...

The patterns and course of the past appear relatively straightforward and obvious to those living in the present, but only because some paths were not taken or the events that might have happened, did not. Nothing makes this clearer than the fates of three individuals in the first thirty plus years of the twentieth century. Adolf Hitler enlisted in the 16th Bavarian Reserve Regiment (the “List” Regiment) in early August 1914; two months later he and 35,000 ill-trained recruits were thrown against the veteran soldiers of the British Expeditionary Force. In one day of fighting the List Regiment lost one third of its men. When the Battle of Langemark was over, the Germans had suffered approximately 80% casualties. Hitler was unscratched. Seventeen years later, when Winston Churchill was visiting New York, he stepped off the curb without looking in the right direction and was seriously injured. Two years later in February 1933, Franklin Roosevelt was the target of an assassination attempt, but the bullet aimed for him hit and killed the mayor of Chicago. Can any one doubt that, had any one of these three individuals been killed, the history of the twentieth century would have followed a fundamentally different course?

GRAND STRATEGY

As in a building, which, however fair and beautiful the superstructure, is radically marred and imperfect if the foundations be insecure -- so if the strategy be wrong, the skill of the general on the battlefield, the valor of the soldier, the brilliancy of victory, however otherwise decisive, fail of their effect.¹¹ -Mahan

Future Joint Force commanders will not make grand strategy, but they must fully understand the ends it seeks to achieve. They will have a role to play in suggesting how the Joint Force might be used and the means necessary for the effective use of joint forces to protect the interests of the United States. Thus, their professional, nuanced advice as military leaders is essential to cast effective responses to strategic challenges.

In the twentieth century the relationship in the United States between political vision and military leaders responsible for the execution of policy proved crucial in winning two world wars and the Cold War. Yet the dialogue and discourse between those responsible for casting grand strategy and those responsible for conducting military operations has always involved tension because their perspectives of the world inevitably differ. In the future, Joint Force commanders must understand the ends of strategy to recommend the forces required (the means) to achieve those ends, and policy makers must be clearly aware of the strengths, limitations, and potential costs of the employment of military forces. The relationship between ends and means drives the logic of joint operations. Only clear and unfettered military advice from commanders to policy makers can provide the understanding required to employ the Joint Force effectively.

¹¹Robert Heintz, Dictionary of Military and Naval Quotations (U.S. Naval Institute Press, 1976), p. 311.

*Engage people with what they expect; it is what they are able to discern and confirms their projection. It settles them into predictable patterns of response, occupying their minds while you wait for the extraordinary moment—that which they cannot anticipate.*¹² -Sun Tzu

PART II: TRENDS INFLUENCING THE WORLD'S SECURITY

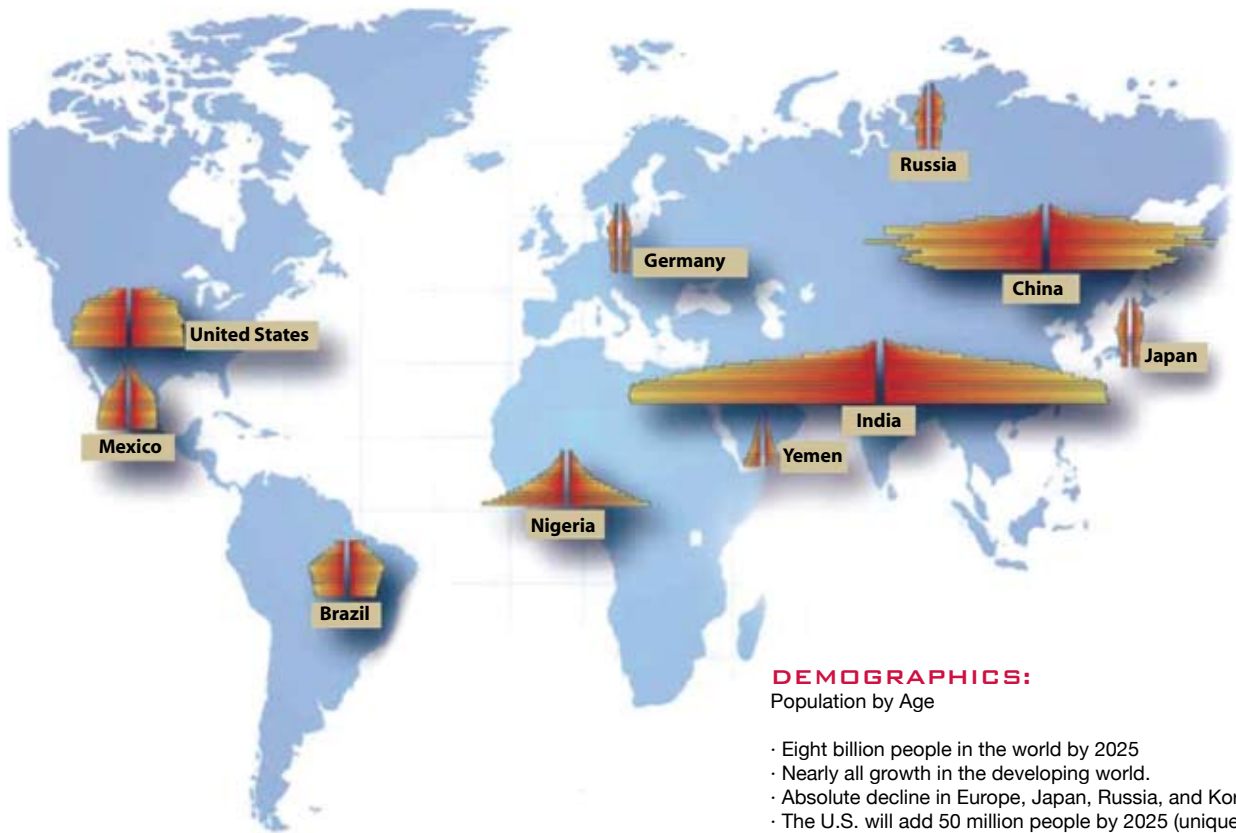
Trend analysis is the most fragile element of forecasting. The world's future over the coming quarter of a century will be subject to enormous disruptions and surprises, natural as well as man-made. These disruptions, and many other contiguous forces, can easily change the trajectory of any single trend. The Joint Operating Environment recognizes that many, if not all, of the trends and trajectories of the future will be non-linear. For the purpose of analysis, however, it has used a traditional approach to examine many of the trends and utilized conservative estimates. For example, demographic trends are derived from sources such as the U.S. Census Bureau. In the final analysis, the value of the trends lies not in accurately predicting them, but in inferring how they might combine in different ways and form more enduring contexts within which future operations might be conducted. Trend analysis can also help in identifying some indicators or signposts that one can use to “check” the path that the world takes into the future and make adjustments as necessary. Nevertheless, the resource and strategic implications of even a conservative and linear rate of increase possess consequences that suggest a number of troubling challenges for U.S. national security in the future.

The reason that specific trends have been selected for inclusion in the JOE is based upon three major ideas, or themes. The first of these is how a trend might enhance or erode the power of a specific state. The second is how a trend might enhance or erode the power of the overall state system of relations relative to non-state actors. The third is how trends contribute to the emergence or suppression of global networks or ideologies that transcend the international system as we currently perceive it. Together the trends examined in JOE 2010 set the stage for more focused contexts of future conflict and war that we find in Part III of this document.

DEMOGRAPHICS

A good place to begin the discussion of trends is demographics because what is happening demographically today, unless altered by some catastrophe, has predictable consequences for the populations of regions and states. Equally important, it possesses implications for future strategic postures and attitudes. In total, the world will add approximately 60 million people each year and reach a total of 8 billion by the 2030s. Ninety-five percent of that increase will occur in developing countries. The more important point is that the world's troubles will occur not only in the areas of abject poverty but also, to an even greater extent, in developing countries where the combination of demographics and economy permits populations to grow, but makes meeting rising expectations difficult. Here, the performance of the global economy will be key in either dampening down or inflaming ethnically or religiously based violent movements.

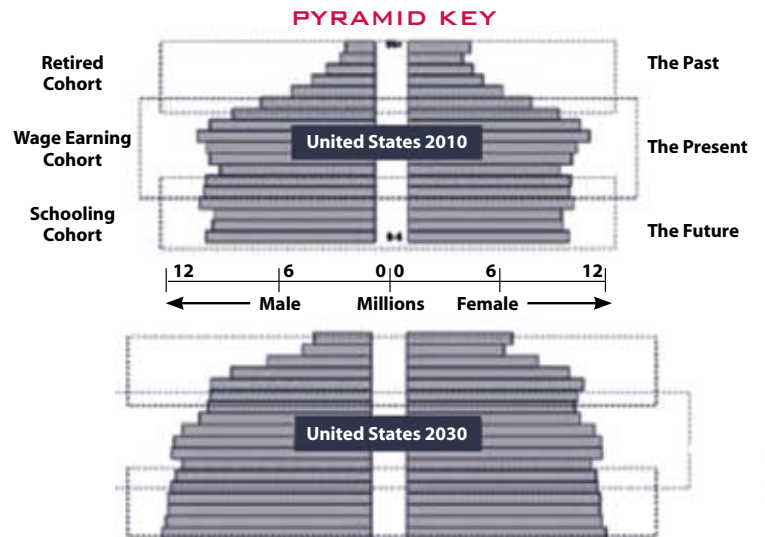
¹²Sun Tzu, *The Art of War*, translated and edited by Samuel B. Griffith (Oxford, 1963), p. 92.



DEMOGRAPHICS:
Population by Age

- Eight billion people in the world by 2025
- Nearly all growth in the developing world.
- Absolute decline in Europe, Japan, Russia, and Korea.
- The U.S. will add 50 million people by 2025 (unique among the developed countries of the world).

A population pyramid is a demographer's tool used to track the size and age composition of a country or group. Each bar represents an age group in four-year increments (youngest at the bottom) with males on the left and females on the right. The pyramids above show projected populations of selected countries in the 2030 time frame and the width of each pyramid is to scale. Thus, we see a 2030 Yemen that rivals Russia in terms of population. Developed countries generally show a typical "inverted" pattern with dramatic declines in the raw numbers of youth relative to the retired. This pattern of decline will be difficult to manage as most welfare systems in the developed world are based on an assumption of moderate population growth. Developing countries such as Nigeria and Yemen illustrate how the population pyramid in fact got its name, and are typical of fast-growing countries with large multi-children families. The effects of China's one-child policy are clear, especially when compared to fast-growing India. The United States occupies a middle position among states, with a large, yet relatively stable population.

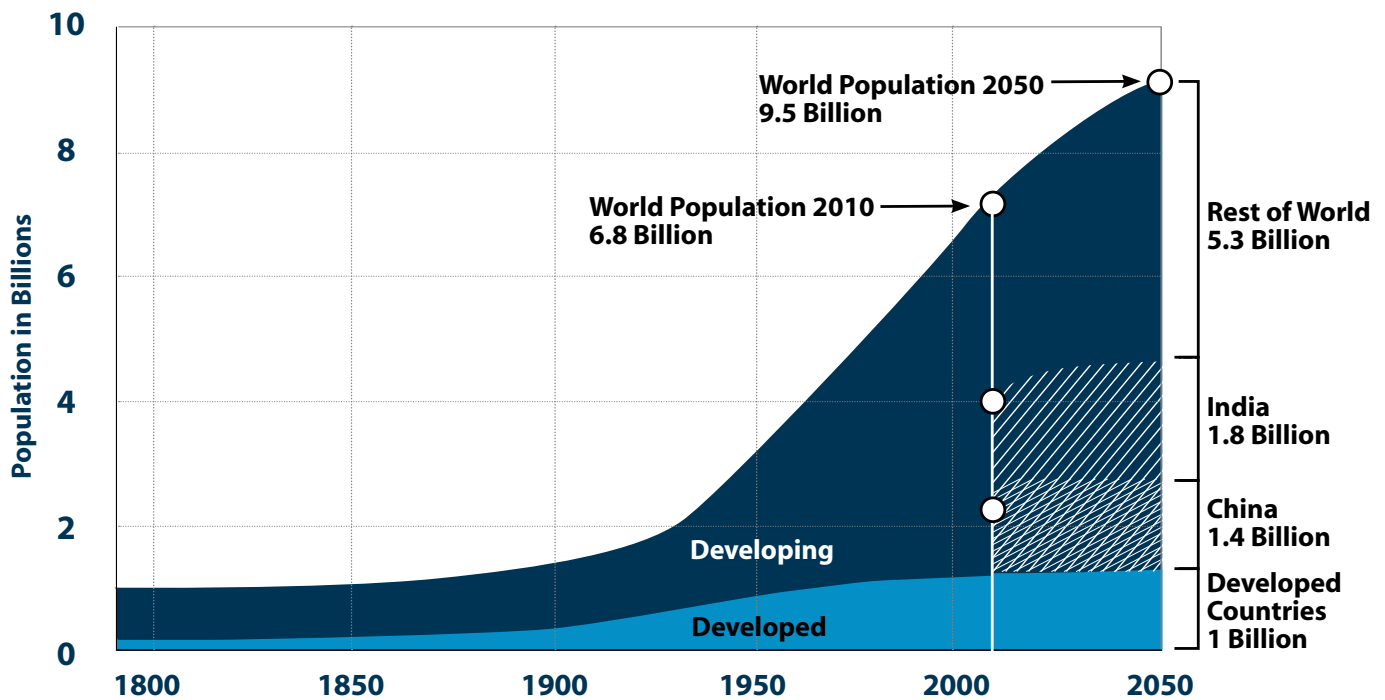


WORLD POPULATION PYRAMIDS

<http://www.census.gov/ipc/www/idb/country.php>

The developed world faces the opposite problem. During the next 25 years population growth in the developed world will likely slow or in some cases decline. Russia in particular exemplifies this trend. Russia's population is currently declining by 0.5% annually, and given Russian health and welfare profiles, there is every prospect that decline will continue, barring a drastic shift in social attitudes or public policy. As a recent Center for Strategic and International Studies (CSIS) report suggested, "Russia needs to cope with a rate of population decline that literally has no historical precedent in the absence of pandemic."¹³ To Russia's west, a similar, albeit less disastrous, situation exists. Over all, European nations stopped replacing their losses to deaths in 2007, and despite considerable efforts to reverse those trends, there is little likelihood their populations will significantly increase by the 2030s. This raises serious concerns about the sustainability of economic growth in that region. It also has serious implications for the willingness of European societies to bear the costs involved in lives and treasure that the use of military force inevitably carries with it.

Likewise, Japan's population will fall from 128 million to approximately 117 million in the 2030s, but unlike the case of Russia this will result not from any inadequacy of Japanese medical services, which are among the world's best, but from the collapse of Japan's birth rate. The Japanese are taking serious steps to address their demographic decline, a fact which explains their major research and development efforts in the field of robotics as well as their shift to a capital-intensive economy.



POPULATION TO 2050: DEVELOPED AND DEVELOPING WORLD

SOURCE: United Nations Population Reference Bureau

¹³Center for Strategic International Studies (CSIS), "The Graying of the Great Powers," (Washington, DC), p. 7.

Over the next quarter century, China's population will grow by 170 million, but its population will age significantly because of strict enforcement of the government's edict of one child per family. An additional demographic factor, which may influence Chinese behavior, is the choice of many families to satisfy that limitation with a male child. How the resulting imbalance between young males and females will play out in China's external and internal politics is impossible to predict because there are few historical analogues. Already we have seen exuberant displays of nationalistic feeling among the youth in response to criticisms of China's behavior in Tibet.

By the 2030s, the U.S. population will climb by more than 50 million to a total of approximately 355 million, in contrast to many of its peers. This growing population may be a significant advantage in international economic competition. This growth will result not only from births in current American families, but also from continued immigration, especially from Mexico and the Caribbean, which will lead to major increases in America's Hispanic population. By 2030 at least 15% of the population of every state will be Hispanic in origin, in some states reaching upwards of 50%. How effective Americans prove in assimilating these new immigrants into the nation's politics and culture will play a major role in America's prospects. In this regard, the historical ability of the United States to assimilate immigrants into its society and culture gives it a distinct advantage over most other nations, which display little willingness to incorporate immigrant populations into the mainstreams of their societies.

India will grow by 320 million during the next quarter of a century. The tensions that arise from a growing divide between rich and poor could seriously impact its potential for further economic growth. Exacerbating tensions will be the divide between the sub-continent's huge middle class and those in the villages mired in poverty, as well as the divide between Muslims and Hindus. Nevertheless, India's democratic system gives the country wide latitude for political changes to accommodate the society's poor.

The continued population growth across the Middle East and in Sub-Saharan Africa has only recently begun abating, but not fast enough to forestall a demographic crisis in which economic growth fails to keep pace with population growth. In areas of abject poverty, continued growth of youthful populations has significance for the employment of U.S. forces called upon to feed the starving and mitigate the suffering. Where economic growth fuels but does not satisfy expectations, the potential for revolution or war, including civil war, will be significant.

Even as the developing world copes with its youth bulge, the developed world will confront an acute aging problem. By the 2030s the number of elderly people in developed countries will double. In Japan there will be 63 elderly for every 100 workers, with Europe not far behind with 59 per 100. The United States will be slightly better off with 44 elderly per 100 workers. Even China will see its ratio of elderly to working population double (from 12 to 23 per 100 workers) as a result of better diet and improved medical care. Such demographic trends will make it less likely that nations in the developed world will sacrifice their youth in military adventures, unless extraordinary threats appear. Regions such as the Middle East and Sub-Saharan Africa, where the youth bulge will reach over 50% of the population, will possess fewer inhibitions about engaging in conflict.

Around the world, humanity is on the move, with Muslims and Africans moving to Europe, ethnic Chinese moving into Siberia, Mexicans and other Latin Americans moving north to the United States and Canada, and citizens of the Philippines and India providing the labor and small commercial backbones of the economies of the Gulf States. Equally important are the migrations occurring in war torn areas in Africa in areas like the Sudan, Somalia, Darfur, and Rwanda. Such migrations disrupt patterns of culture, politics, and economics and in most cases carry with them the potential of further dislocations and troubles.

Everywhere, people are moving to cities. Skilled workers, doctors, and engineers are leaving the undeveloped world as fast as they can to make a living in the developed world. Increasingly, these global diasporas connect through the Internet and telephone to their home countries. Often, the money they send back to their families forms major portions of the local economies back in their home communities.

GLOBALIZATION

For the most part, the developed world recognizes that it has a major stake in the continuing progress of globalization. The same can be said for those moving into the developed world. Nevertheless, one should not ignore the histories and passions of popular opinion in these states as they make their appearance. One should not confuse developed world trappings for underlying stability and maturity of civil societies. A more peaceful, cooperative world is possible only if the pace of globalization continues. In particular, this means engaging China and other nations politically and culturally as they enter into the developed world.

Lessons From the History Of Globalization

How can one best define globalization? Some might delineate it in terms of increased international trade, limited restrictions on the movement of peoples, and light regulation on the flow of capital. At least that was how politicians and pundits defined it at the start of the Twentieth Century. At that time, Europeans did not require passports to travel from one country to another on the continent, a situation altered only in the late 1990s. By 1913 the value of international trade as a percentage of world GDP had reached a level the global economy would not replicate until the last decade of the Twentieth Century. The economies of the United States and the German Reich were expanding at unheard of rates. Western merchants were queuing up to supply China's teeming masses, as that country opened its markets for the first time in centuries. Furthermore, the largest migration – and a peaceful one at that – in history was taking place, as 25 million Europeans left home, most immigrating to the United States.

The world also saw technological and scientific revolutions unequaled in history, which in turn spawned revolutions in travel and communications. Travel across the Atlantic was now a matter of days rather than weeks or months. Telegraph cables linked the continents for near instantaneous communications. Railroads allowed travelers to cross continents in days rather than months. The internal combustion engine was already having an impact on travel by land, while the appearance of the aircraft in 1903 suggested even greater possibilities. A complex web of international agreements, such as the International Postal Union and the International Telegraph Conventions, welded these changes together. Again, as with today, many were not content to leave the direction of the new world order to governments. Activists formed 119 international organizations in the first decade and 112 in the second decade.

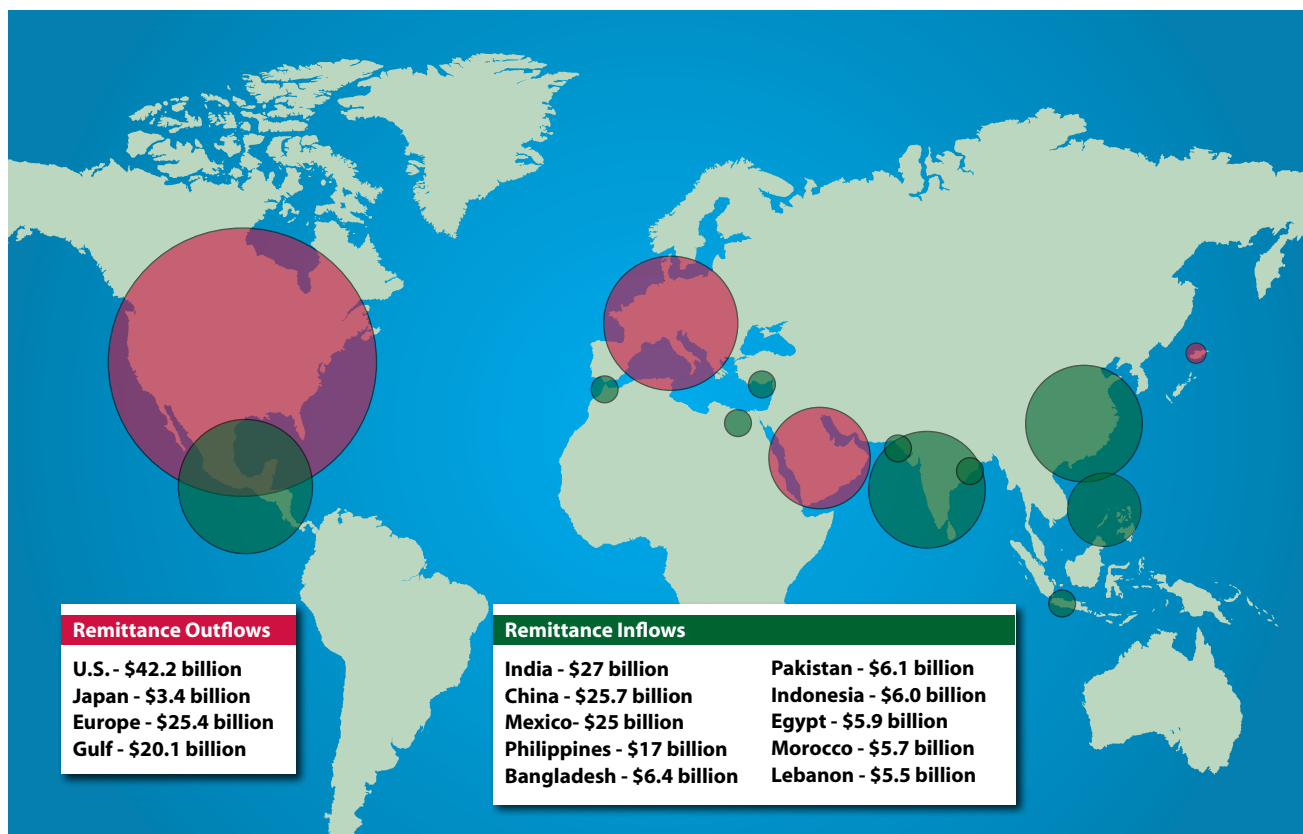
For much of humanity, this was a time of hope and optimism. As early as the mid-19th century, John Bright, a British industrialist, argued that “nothing could be so foolish as a policy of war for a trading nation. Any peace was better than the most successful war.” In 1911 a British journalist, Norman Angell, published a work titled *The Great Illusion*, which became an international best seller. In it, he argued the expansion of global commerce had changed the nature of wealth, which no longer would depend on control of territory or resources. For Angell, the belief that military strength was the basis for security represented a dangerous illusion. As for war itself, it represented a futile endeavor incapable of creating material wealth, while putting much at risk. His arguments boiled down to a belief that the interlocking networks of global trade made war impossible. In 1913, he published an improved edition to even greater acclaim. Within a year the First World War had broken out. The result of that conflict in political and economic terms was to smash globalization for the next seventy years. Angell had been right about the absolutely destructive effects of modern war. He had been wrong about human nature and its passions.

Today's interlocking trading and communications networks may tempt leaders to consider once again that war is, if not impossible, then at least obsolete. Accordingly, any future war would cost so much in lives and treasure that no “rational” political leader would pursue it. The problem is that rationality is often a matter of perspective – in the cultural, political, and ideological eye of the beholder. For what must have seemed perfectly rational reasons, Saddam Hussein invaded two of Iraq's six neighbors in the space of less than ten years and sparked three wars during the period he ruled. The first of his wars against Iran resulted in approximately 250 thousand Iraqi deaths and half a million Iranian deaths, while his wars against his own people killed upwards of 100 thousand.

The critics of globalization often portray its dark side in the inequality of rich and poor. In some worst-case scenarios, they portray the rise of resentment and violence throughout the world as a direct result of globalization. Not surprisingly, the future is likely to contain both good and bad as globalization accelerates the pace of human interaction and extends its reach.

Remittances sent home by emigrant workers are often overlooked as a facet of globalization, but represent the single biggest income source for developing nations. The total amount sent home by foreign workers exceeds the amount that the whole world spends on foreign aid and capital investments combined. For 2007, world-wide remittances were estimated by the World Bank at \$318 billion, of which \$240 billion went to developing countries. This estimate includes only remittances sent through formal banking channels; the actual amount is certainly much greater. Remittances are strategically important to developing countries for a number of reasons, not the least of which is that they provide a source of foreign exchange in addition to a stabilizing force for economies in turbulent times.

The top three recipients of emigrant remittances in 2007 were: India, \$27 billion; China, \$25.7 billion; and Mexico, \$25 billion. In the case of Mexico, remittances were the second largest source of hard currency after the sale of oil. These flows of money are generally resilient in economic downturns and add a measure of stability to families that would otherwise be at or near thresholds of poverty. Furthermore, remittances are spent in the local economy, providing business for shop owners and other parts of the local middle classes. However, as a prolonged economic downturn reduces work opportunities for emigrants, the reduction of this key source of income may also stunt the growth of the middle classes in developing countries, which are the driving force for the development and support of democratization and the rule of law, all of which are central to the evolution of stable and orderly states around the world.



GLOBAL REMITTANCE FLOWS

SOURCE: Migration and Remittances Handbook, Development Prospects Group, World Bank (2006)

The processes propelling globalization over the next two decades could improve the lives of most of the world's population, particularly for hundreds of millions of the poorest. Serious violence resulting from economic trends has almost invariably arisen where economic and political systems have failed to meet rising expectations. A failure of globalization would equate to a failure to meet those rising expectations. Thus, the real danger in a globalized world, where even the poorest have access to pictures and media portrayals of the developed world, lies in a reversal or halt to global prosperity. Such a possibility would lead individuals and nations to scramble for a greater share of shrinking wealth and resources, as they did in the 1930s with the rise of Nazi Germany in Europe and Japan's "co-prosperity sphere" in Asia. Admittedly, some will also be left behind by globalization, either through the misfortunes of geography, culture, or design. Many of these nations will be weak and failing states and will require an international array of economic, diplomatic, and military resources to establish or sustain stability.

In a globalized world of great nations, the United States may not always have to take the lead in handling the regional troubles that will arise. By the 2030s, every region of the world will likely contain local economic powers or regional organizations capable of leadership. In any case, the United States will often find it prudent to play a cooperative or supporting role in military operations around the world and will almost certainly provide support in organizing or convening global coalitions for some time to come. In most cases the assisting of, or intervention in, failing states will require a cooperative engagement between the United States and regional powers. Again, the skills of a diplomat in working with other people and military organizations from different cultures must be in the tool kit of commanders, staffs, and personnel throughout the Joint Force.

The Volatility of Trends

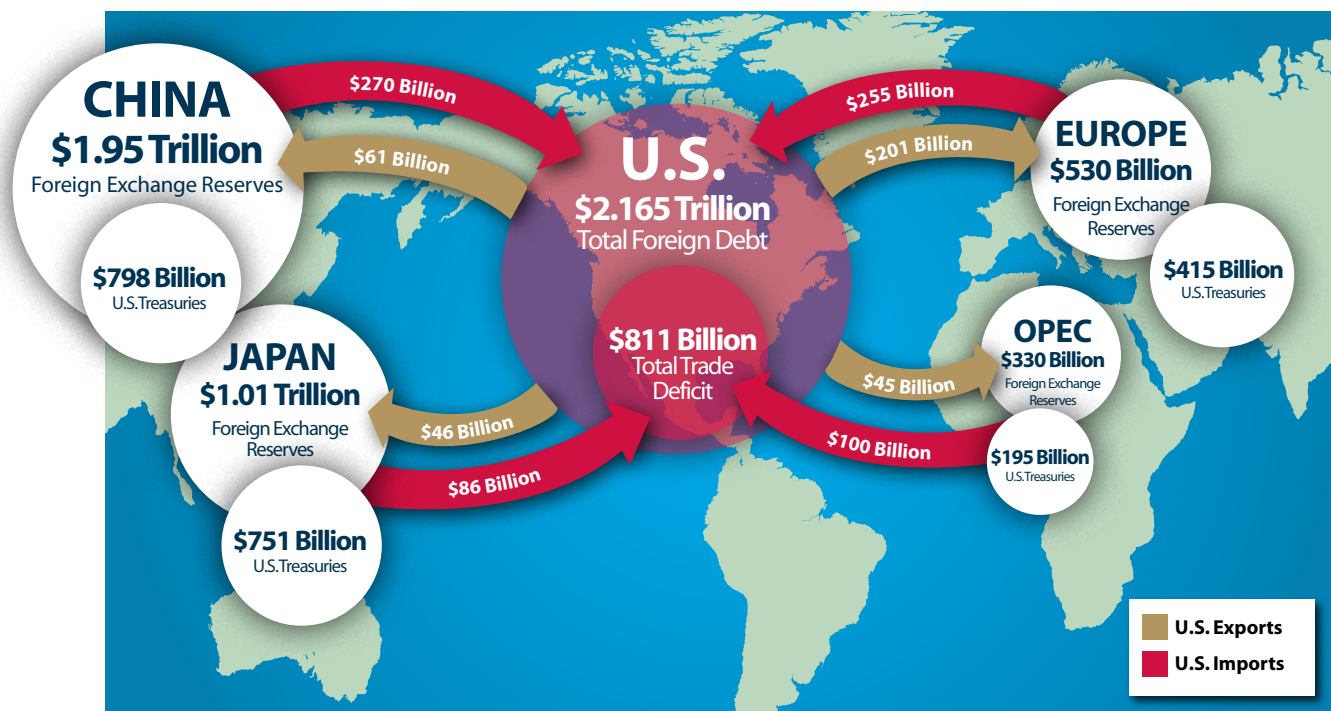
Economic estimates rest on trend lines easily disputed both in the present and the future. In 1928 most economists would have given far rosier prospects for the American and world economies. Four years later, they would have given a far darker picture. That is the nature of change in economics as well as in every other human endeavor. Wide variations in either direction are not just feasible – they are likely.

Nevertheless, the long-term strategic consequences of the current financial crises are likely to be significant. Over the next several years a new international financial order will likely arise that will redefine the rules and institutions that underpin the functioning, order, and stability of the global economy. There is one new watchword that will continue to define the global environment for the immediate future: "interconnectedness." Until a new structure emerges, strategists will have to prepare to work in an environment where the global economic picture can change suddenly, and where even minor events can cause a cascading series of unforeseen consequences.

ECONOMICS

The country faces a fundamental disconnect between the services people expect the government to provide...and the tax revenues that people are willing to send to the government ... The fundamental disconnect will have to be addressed in some way if the budget is to be placed on a sustainable course. -Douglas W. Elmendorf, Director of CBO, November 24, 2009¹⁴

JOE 2008 reported that the emerging economic downturn and financial crises were likely to be significant events. From our vantage point in 2010 the scope and implications of the downturn are clarifying, though the perturbations both in mid and longer terms are yet unclear. Projected revenues from taxation in most plausible economic scenarios are far below that which is necessary to meet current and assumed commitments by the federal government. Furthermore, chronic trade and currency exchange imbalances in the global economic system (see graphic below) have exacerbated both U.S. current account deficits and overall government indebtedness such that the amount of U.S. government debt held by foreigners has grown from 1.3 trillion to 3.5 trillion dollars representing some 40% of total U.S. debt. Large exporting nations accept U.S. dollars for their goods and use them both to build foreign exchange reserves and to purchase U.S. treasuries (which then finance ongoing U.S. federal operations). The dollar's "extraordinary privilege" as the primary unit of international trade allows the U.S. to borrow at relatively low rates of interest. However, the emerging scale of U.S. Government borrowing creates uncertainty about both our ability to repay the ever growing debt and the future value of the dollar. Moreover, "any sudden stop in lending...would drive the dollar down, push inflation and interest rates up, and perhaps bring on a hard landing for the United States..."¹⁵

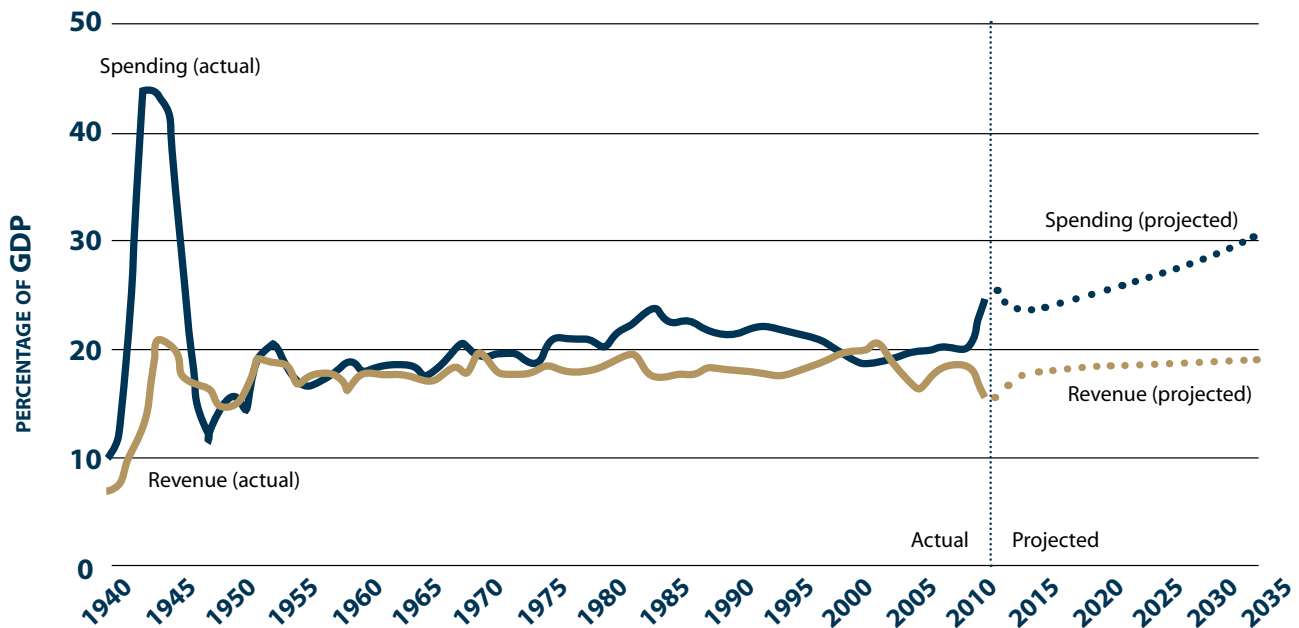


GLOBAL TRADE AND FINANCE IMBALANCES

SOURCES: World Bank, World Development Indicators (2008) U.S. Census Bureau(2009) Economist Intelligence Unit

¹⁴Elmendorf, Douglas W. "CBO American Association for Budget and Program Analysis: The Economic and Budget Outlook." November 24, 2009. <http://www.cbo.gov/ftpdocs/107xx/doc10748/11-24-09AABPA-Presentation.pdf>

¹⁵C. Fred Bergsten, "The Dollar and Deficits" *Foreign Affairs* (November/December 2009) p. 21.



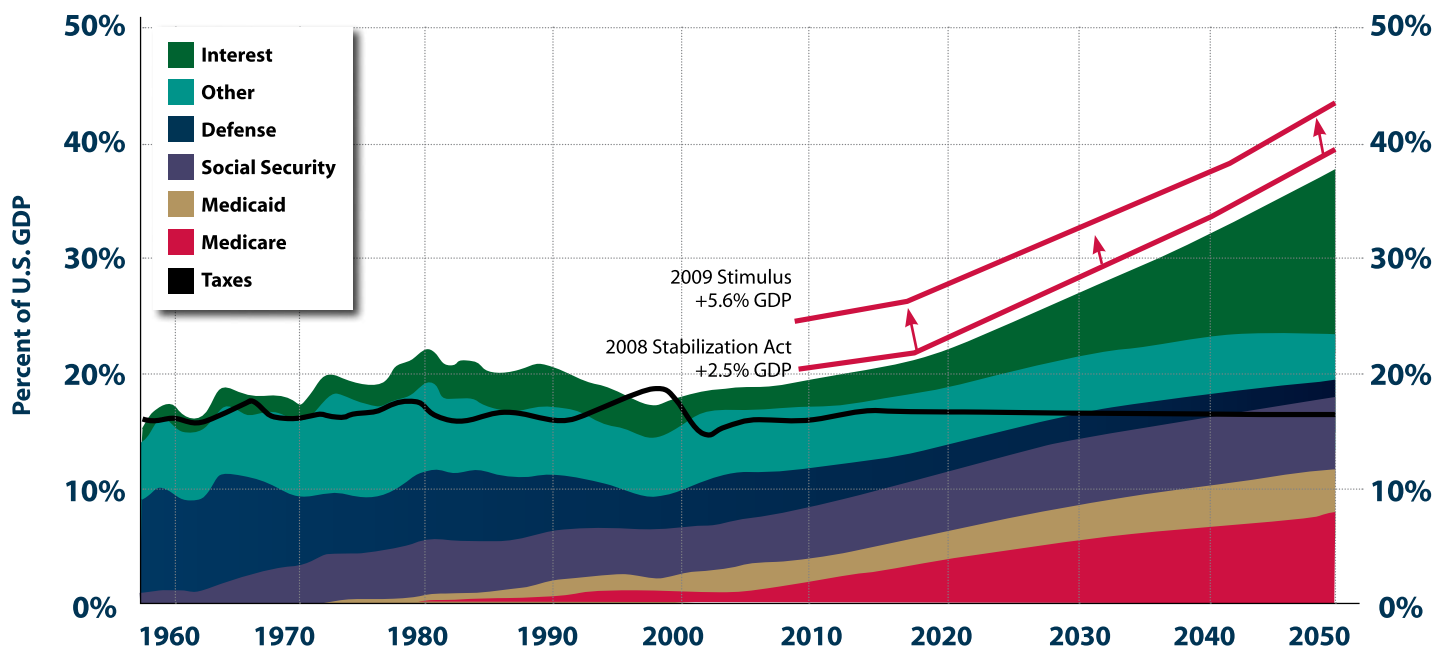
FEDERAL SPENDING AND REVENUE

SOURCE: "Summary of Receipts, Outlays, and Surpluses of Deficits as percentages of GDP," *Budget of the United States Government, Fiscal Year 2010, Historical Tables*, Office of Management and Budget (May 2009) and Peterson-Pew Commission on Budget Reform, "Red Ink Rising" (December 2009)

The precise nature of a "hard landing" of this sort is difficult to predict should creditor nations such as China demand higher interest rates, increasing the perception that the U.S. no longer controls its own financial fate.¹⁶ This dynamic could encourage the establishment of new reserve currencies as global economic actors search for alternatives to the dollar. Changing conditions in the global economy could likewise have important implications for global security also, including a decreased ability of the United States to allocate resources for defense purposes, less purchasing power for available dollars, and shifting power relationships around the world in ways unfavorable to global stability.

Domestically, the future of the U.S. financial picture in both the short and long term is one of chronic budget deficits and compounding debt. The federal deficit for the 2009 fiscal year was about \$1.42 trillion or one tenth of U.S. economic production in that year. For the first two months of the 2010 fiscal year, the cumulative deficit was already higher than any previous total yearly deficit run by the federal government and even the most optimistic economic projections suggest that the U.S. will add \$9 trillion to the debt over the next decade, outstripping even the most optimistic predictions for economic growth upon which the federal government relies for increased tax revenue. The graph above illustrates the scale of this shortfall between government spending and available revenue – a shortfall unprecedented since the end of the Second World War.

¹⁶Dr. Krugman noted these implications in 2003 when the 10 year deficit was only three trillion dollars, rather than today's significantly larger 10 year budget outlook of some *nine* trillion dollars. Paul Krugman, "A Fiscal Train Wreck" *New York Times* (11 March 2003).



THE SQUEEZE ON DISCRETIONARY SPENDING

SOURCE: Congressional Budget Office: High Spending Outlook (December 2005), and Heritage Foundation: A Rude Way to Wake Up to the Fiscal Crisis (2008)

Although these fiscal imbalances have been severely aggravated by the recent financial crisis and attendant global economic downturn, the financial picture has long term components which indicate that even a return to relatively high levels of economic growth will not be enough to right the financial picture. The near collapse of financial markets and slow or negative economic activity has seen U.S. Government outlays grow in order to support troubled banks and financial institutions, and to cushion the wider population from the worst effects of the slowdown. These unfunded liabilities are a reflection of an aging U.S. Baby-Boom population increasing the number of those receiving social program benefits, primarily Social Security, Medicare, and Medicaid, versus the underlying working population that pays to support these programs.¹⁷

Rising debt and deficit financing of government operations will require ever-larger portions of government outlays for interest payments to service the debt. Indeed, if current trends continue, the U.S. will be transferring approximately seven percent of its total economic output abroad simply to service its foreign debt.¹⁸ As the graph above illustrates, interest payments are projected to grow dramatically, further exacerbated by recent efforts to stabilize and stimulate the economy, far outstripping the current tax base shown by the black line. Interest payments, when combined with the growth of Social Security and health care, will crowd out spending for everything else the government does, including National Defense.

¹⁷ Joel Feinleib and David Warner, "The Impact of Immigration on Social Security and the National Economy," *Social Security Advisory Board Issue Brief #1* (December 2005).

¹⁸ Bergsten, p. 21.

The foregoing issues of trade imbalance and government debt have historic precedents that bode ill for future force planners.

Habsburg Spain defaulted on its debt some 14 times in 150 years and was staggered by high inflation until its overseas empire collapsed. Bourbon France became so beset by debt due to its many wars and extravagances that by 1788 the contributing social stresses resulted in its overthrow by revolution. Interest ate up 44% of the British Government budget during the interwar years 1919-1939, inhibiting its ability

to rearm against a resurgent Germany.¹⁹ Unless current trends are reversed, the U.S. will face similar challenges, anticipating an ever-growing percentage of the U.S. government budget going to pay interest on the money borrowed to finance our deficit spending.

U.S. Defense Spending: The “Hidden Export”

The global trade and finance illustration on page 19 overlooks one large “export” that the United States provides to the world – the armed force that underpins the open and accessible global system of trade and travel that we know as “globalization.” At a cost of 600 billion dollars a year, U.S. Joint Forces around the world provide safety and security for the major exporters to access and use the global commons for trade and commerce.

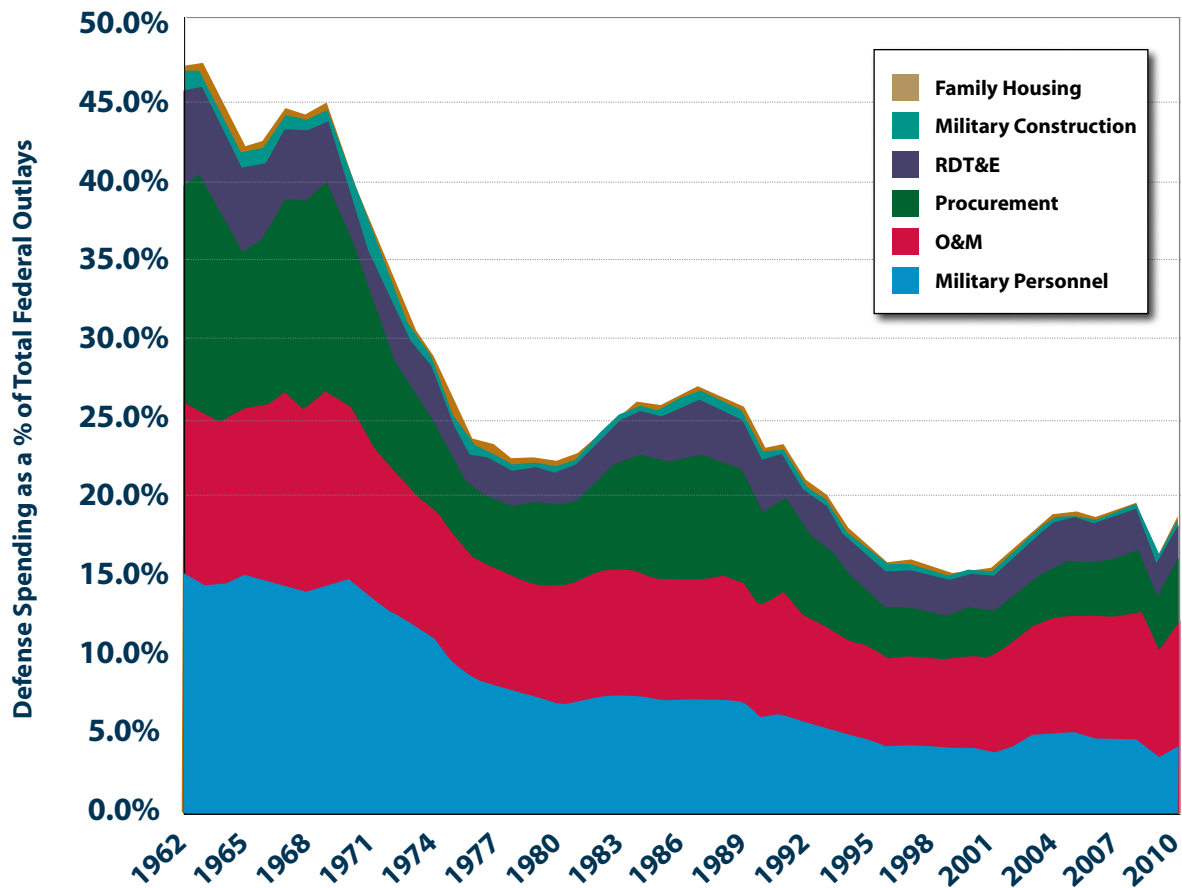
A more immediate implication of these twin deficits will likely mean far fewer dollars available to spend on defense. In 1962 defense spending accounted for some 49% of total government expenditures, but by 2008 had dropped to 20% of total government spending.²⁰ Following current trend lines, by 2028 the defense budget will likely consume between 2.6 percent and 3.1 percent of GDP – significantly lower than the 1990s average of 3.8%.²¹ Indeed, the Department of Defense may shrink to less than ten percent of the total Federal budget. The graph at right illustrates the main components of the defense budget: operations and maintenance, personnel, procurement, research and development, military construction, and family housing. Much like the overall U.S. budget, personnel costs could continue to grow faster than other components, crowding out investments in future capabilities as well as resources for current operations and the maintenance of systems and capabilities already in the inventory. These costs deserve close scrutiny for efficiencies. Moreover, if the U.S. enters a financial regime in which defense is to be cut by a third or more, Joint Force planners must carefully explore new areas of risk as force posture and procurement budgets shrink.

This report describes a future in which the Joint Force will be continually engaged, yet the larger economic outlook is one of increasing pressure on discretionary spending of which the DOD budget is a part. The Department must always search for more efficient ways of attending to the Nation’s defense, to reduce both cost and our vulnerability to deliberate disruption, while maintaining our quest for greater effectiveness across all future security environments. We must be prepared to make hard decisions about the trade-off between performance and price in our capabilities, while recognizing that a push for “one-size-fits-all” solutions may result in a greater risk of reduced flexibility during operations. If we are to maintain a shock absorber in our forces to fight different forms of war across a range of conflicts, the joint community must introduce multi-purpose, multi-role, and flexible systems that can provide adequate performance against a broad array of challenges.

¹⁹From Niall Ferguson, “An Empire at Risk,” Newsweek (28 November 2009).

²⁰<http://www.gpoaccess.gov/USbudget/fy10/hist.html>

²¹Goldberg, Matthew S. “CBO testimony: Long-Term Implication of the Fiscal Year 2010 Budget Submission.” November 18, 2009. <http://www.cbo.gov/ftpdocs/107xx/doc10730/DoDBudgetTestimony.1.1.shtml>



DEFENSE AS A PERCENT OF THE TOTAL FEDERAL BUDGET

SOURCE: <http://gpoaccess.gov/USbudget/fy10/hist.html>

The graph above shows the scale and relationships of DOD's major budget categories from 1962 to present. If we are to find efficiencies in future budgets we should consider ways to decrease these costs while maintaining effectiveness. Over the last two decades competitive commercial enterprises have resized organizations and decreased mid-level leaders through the smart use of information technologies and by pushing responsibilities and authorities ever downward. The Joint Force should further adapt its own organizations in similar ways where appropriate, reengineering military staffs from their Industrial Age origins, innovating more agile, adaptable, and perhaps smaller structures. Personnel and training costs (part of O&M) are a major portion of the defense budget, yet we too frequently allow or even encourage personnel to leave the military at the height of their experience, losing highly trained and expensively acquired skills in the process. There are significant opportunities to retain these vital, hard-won skills of our military personnel beyond the current expected 20 year retirement timeline. Furthermore, the current balance of capabilities and force structure between the Regular, Reserve, and Guard forces might be reexamined in light of future national security challenges involving surprise and uncertainty described throughout the JOE. The joint community must bring critical judgment to bear on the question of future basing, recommending rationalization and downsizing to match our smaller 21st Century force structures. Finally, the Joint Force should seek change in weapons procurement and acquisition processes to ensure that our procurement budget achieves maximum military power for each dollar spent. Further, the imposition of cost-imposing strategies against potential foes and expanding strategic and operational partnerships are called for in our adaptation to the emerging realities.

The fundamental issues for the Joint Force are the long term sustainability of our current allocation of the federal budget and how we can contribute to continued security while operating within the fiscal constraints that are unfolding. For over six decades the U.S. has underwritten the “hidden export” of global security for the great trading nations of the world, yet global and domestic pressures will dramatically impact the defense budget in the face of rising debt and trade imbalances. This may diminish this service which is of great benefit to the international community. In this world, new security exporters may rise, each having opinions and objectives that differ from the global norms and conventions that we have encouraged since our own emergence as a great power a century ago. Moreover, they will increasingly have the power to underwrite their own not-so-hidden export of military power. Unless we address these new fiscal realities we will be unable to engage in this contest on terms favorable to our nation.

ENERGY

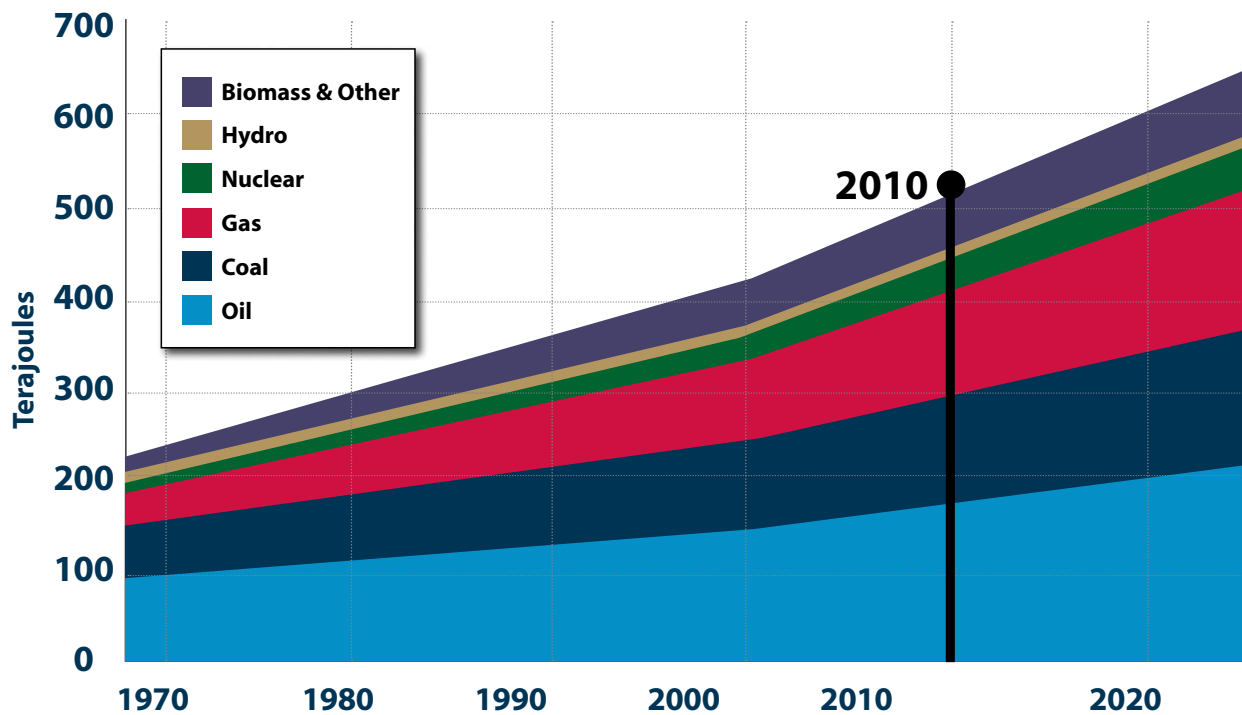
To meet even the conservative growth rates posited in the economics section, global energy production would need to rise by 1.3% per year. By the 2030s, demand is estimated to be nearly 50% greater than today. To meet that demand, even assuming more effective conservation measures, the world would need to add roughly the equivalent of Saudi Arabia’s current energy production every seven years.

Absent a major increase in the relative reliance on alternative energy sources (which would require vast insertions of capital, dramatic changes in technology, and altered political attitudes toward nuclear energy), oil and coal will continue to drive the energy train. By the 2030s, oil requirements could go from 86 to 118 million barrels a day (MBD). Although the use of coal may decline in the Organization for Economic Cooperation and Development (OECD) countries, it will more than double in developing nations. Fossil fuels will still make up 80% of the energy mix in the 2030s, with oil and gas comprising upwards of 60%. The central problem for the coming decade will not be a lack of petroleum reserves, but rather a shortage of drilling platforms, engineers and refining capacity. Even were a concerted effort begun today to repair that shortage, it would be ten years before production could catch up with expected demand. The key determinant here would be the degree of commitment the United States and others display in addressing the dangerous vulnerabilities the growing energy crisis presents.

That production bottleneck apart, the potential sources of future energy supplies nearly all present their own difficulties and vulnerabilities. None of these provide much reason for optimism. At present, the United States possesses approximately 250 million cars, while China with its immensely larger population possesses only 40 million.

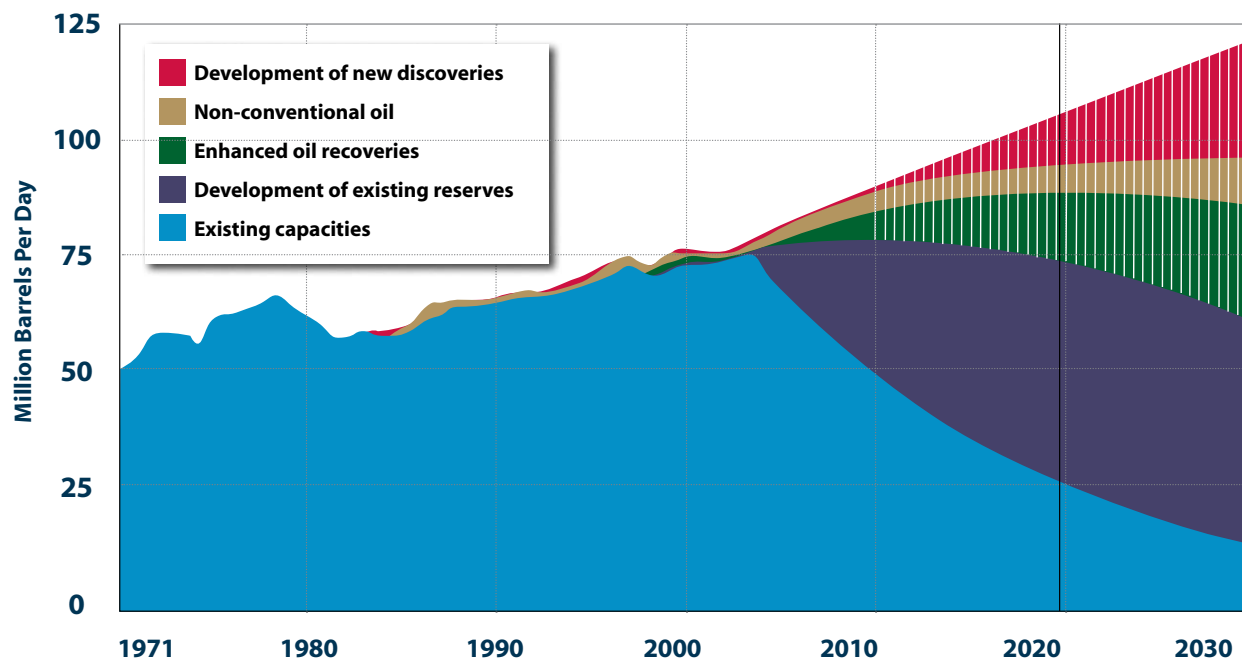
Peak Oil

As the figure at right shows, petroleum must continue to satisfy most of the demand for energy out to 2030. Assuming the most optimistic scenario for improved petroleum production through enhanced recovery means, the development of non-conventional oils (such as oil shales or tar sands) and new discoveries, petroleum production will be hard pressed to meet the expected future demand of 118 million barrels per day.



PROJECTED ENERGY RESOURCES

SOURCE: OECD/IEA World Energy Outlook



FUTURE WORLD OIL PRODUCTION

SOURCE: International Energy Agency - World Energy Outlook, p. 103

Possible Future Energy Resources

Non-Organization of Petroleum Exporting Countries (OPEC) oil: New sources (Caspian Sea, Brazil, Colombia, and new portions of Alaska and the Continental shelf) could offset declining production in mature fields over the course of the next quarter century. However, without drilling in currently excluded areas, they will add little additional capacity.

Oil Sands and Shale: Recently, shale gas has been the primary source of growth in technically-recoverable natural gas resources in the U.S. Production of liquid fuels from oil sands could increase from 1MBD to over 4 MBD, but legal constraints may discourage investment. Additionally, the diversion of already scarce water resources needed to extract energy from these formations will further limit supplies for agriculture and other human purposes.

Natural Gas: Europe relies on Russia for one third of its natural gas imports. Uncertainty about Russia as a reliable supplier will encourage Europe to diversify sources of supply and support the construction of pipelines to access Central Asian gas reserves. Russia, meanwhile will seek to ensure that Central Asian gas flows across its own pipeline network. Furthermore, Russia will diversify its own network to bypass Central Europe and provide gas more directly to Western Europe – allowing it greater freedom to decouple the interests of its rich customers from its close neighbors.

Biofuels: Production could increase to approximately 3 MBD– equivalent, but starting from a small base, biofuels are unlikely to contribute more than 1% of global energy requirements by the 2030s. Moreover, even that modest achievement could curtail the supply of foodstuffs to the world’s growing population, which would add another National Security challenge to an already full menu.

Renewable: Wind and Solar combined are unlikely to account for more than 1% of global energy by 2030. That figure assumes the energy from such sources will more than triple, which alone would require major investments.

Nuclear: Nuclear energy offers one of the more promising technological possibilities, given significant advances in safety since the 1970s. In particular, it could play a major role in replacing coal-fired plants, and a greater supply of cheap electricity could encourage electric-powered transportation. Nevertheless, the expansion of nuclear plants faces considerable opposition because of public fears, while the disposal of nuclear waste remains politically controversial. Although the U.S. seems to be committing to the development of new nuclear plants, their construction in substantial numbers will take decades.

OPEC: To meet climbing global requirements, OPEC will have to increase its output from 30 MBD to at least 50 MBD. Significantly, no OPEC nation, except perhaps Saudi Arabia, is investing sufficient sums in new technologies and recovery methods to achieve such growth. Some, like Venezuela and Russia, are actually exhausting their fields to cash in on the bonanza created by rapidly rising oil prices.

The Chinese are laying down approximately 1,000 kilometers of four-lane highway every year, a figure suggestive of how many more vehicles they expect to possess, with the concomitant rise in their demand for oil. The presence of Chinese “civilians” in the Sudan to guard oil pipelines underlines China’s concern for protecting its oil supplies and could portend a future in which other states intervene in Africa to protect scarce resources. The implications for future conflict are ominous, if energy supplies cannot keep up with demand and should states see the need to militarily secure dwindling energy resources.

Another potential effect of an energy crunch could be a prolonged U.S. recession which could lead to deep cuts in defense spending (as happened during the Great Depression). Joint Force commanders could then find their capabilities diminished at the moment they may have to undertake increasingly dangerous missions. Should that happen, adaptability would require more than preparations to fight the enemies of the United States, but also the willingness to recognize and acknowledge the limitations of America’s military forces. The pooling of U.S. resources and capabilities with allies would then become even more critical. Coalition operations would become essential to protecting national interests.

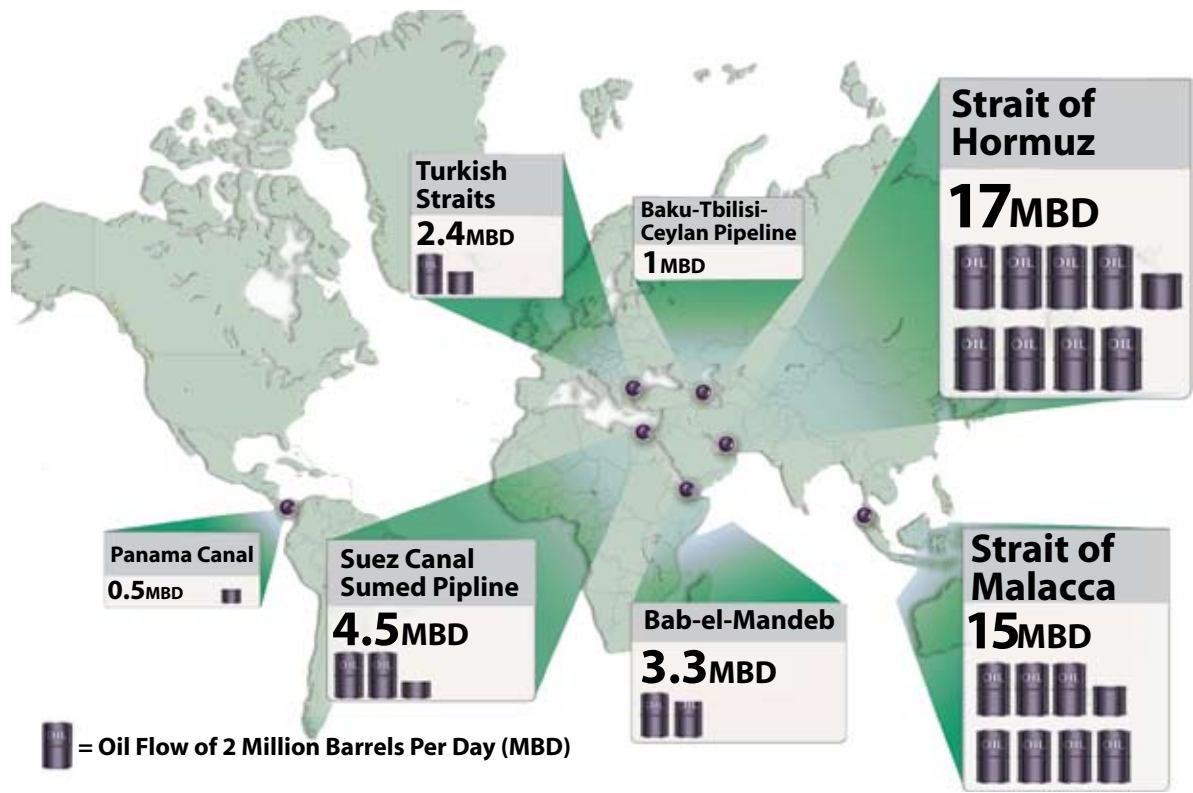
OPEC and Energy Resources

OPEC nations will remain a focal point of great-power interest. These nations may have a vested interest in inhibiting production increases, both to conserve finite supplies and to keep prices high. Should one of the consumer nations choose to intervene forcefully, the “arc of instability” running from North Africa through to Southeast Asia easily could become an “arc of chaos,” involving the military forces of several nations.

OPEC nations will find it difficult to invest much of the cash inflows that oil exports bring. While they will invest substantial portions of such assets globally through sovereign wealth funds – investments that come with their own political and strategic difficulties – past track records, coupled with their appraisal of their own military weaknesses, suggest the possibility of a military buildup. With the cost of precision weapons expected to decrease and their availability increasing, Joint Force commanders could find themselves operating in environments where even small, energy-rich opponents have military forces with advanced technological capabilities. These could include advanced cyber, robotic, and even anti-space systems.

Finally, presuming the forces propelling radical extremism at present do not dissipate, a portion of OPEC’s windfall might well find its way into terrorist coffers, or into the hands of movements with deeply anti-modern, anti-Western goals – movements which have at their disposal increasing numbers of unemployed young men eager to attack their perceived enemies.





WORLD OIL CHOKEPOINTS

SOURCE: U.S. Department of Energy/Energy Information Administration

A severe energy crunch is inevitable without a massive expansion of production and refining capacity. While it is difficult to predict precisely what economic, political, and strategic effects such a shortfall might produce, it surely would reduce the prospects for growth in both the developing and developed worlds. Such an economic slowdown would exacerbate other unresolved tensions, push fragile and failing states further down the path toward collapse, and perhaps have serious economic impact on both China and India. At best, it would lead to periods of harsh economic adjustment. To what extent conservation measures, investments in alternative energy production, and efforts to expand petroleum production from tar sands and shale would mitigate such a period of adjustment is difficult to predict. One should not forget that the Great Depression spawned a number of totalitarian regimes that sought economic prosperity for their nations by ruthless conquest.

Energy Summary

To generate the energy required worldwide by the 2030s would require us to find an additional 1.4 MBD every year until then.

During the next twenty-five years, coal, oil, and natural gas will remain indispensable to meet energy requirements. The discovery rate for new petroleum and gas fields over the past two decades (with the possible exception of Brazil) provides little reason for optimism that future efforts will find major new fields.

At present, investment in oil production is only beginning to pick up, with the result that production could reach a prolonged plateau. By 2030, the world will require production of 118 MBD, but energy producers may only be producing 100 MBD unless there are major changes in current investment and drilling capacity.

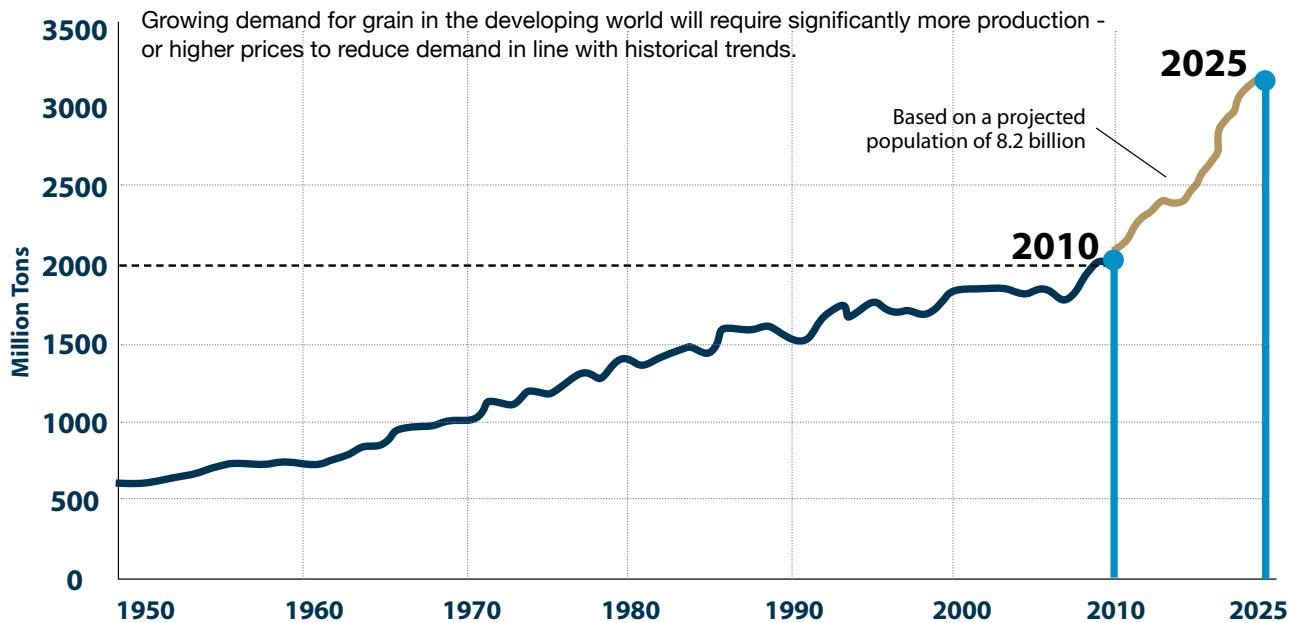
By 2012, surplus oil production capacity could entirely disappear, and as early as 2015, the shortfall in output could reach nearly 10 MBD.

Energy production and distribution infrastructure must see significant new investment if energy demand is to be satisfied at a cost compatible with economic growth and prosperity. Efficient hybrid, electric, and flex-fuel vehicles will likely dominate light-duty vehicle sales by 2035 and much of the growth in gasoline demand may be met through increases in biofuels production. Renewed interest in nuclear power and green energy sources such as solar power, wind, or geothermal may blunt rising prices for fossil fuels should business interest become actual investment. However, capital costs in some power-generation and distribution sectors are also rising, reflecting global demand for alternative energy sources and hindering their ability to compete effectively with relatively cheap fossil fuels. Fossil fuels will very likely remain the predominant energy source going forward.

FOOD

Two major factors drive food requirements: a growing global population and prosperity that expands dietary preferences. While food shortages occur today, they are more likely to reflect politically-inflicted, rather than natural causes. Several mitigating trends could diminish the possibility of major food shortages.

Any slowdown in the world's population growth may reduce overall growth in demand for food, thus easing pressure to expand and intensify agriculture. On the other hand, increased animal protein use in countries with rapidly rising income levels will place considerable pressure on the world's food supply because animal production requires much greater input for calories produced. At the same time, opposition to genetically modified foods is dissipating. As a result, there is a reasonable chance of sparking a new "green revolution" that would expand crop and protein production sufficiently to meet world requirements. The main pressures on sufficient food supplies will remain in countries with persistently high population growth and a lack of arable land, in most cases exacerbated by desertification and shortages in rainfall.



GRAIN USE AND PROJECTED DEMAND

SOURCE: USDA; www.ciesin.columbia.edu

In a world with adequate global supply, but localized food shortages, the real problems will stem from food distribution. How quickly the world reacts to temporary food shortages inflicted by natural disasters will also pose challenges. In such cases, the Joint Force may find itself involved in providing lift, logistics, and occasionally security to those charged with relief operations.

Natural disease also has an impact on the world's food supply. The Irish Potato Famine was not an exceptional historical event. As recently as 1954, 40% of America's wheat crop failed as a result of black-stem disease. There are reports of a new aggressive strain of this disease (Ug99) spreading across Africa and possibly reaching Pakistan. Blight threatening basic food crops such as potatoes and corn would have destabilizing effects on nations close to the subsistence level. Food crises have led in the past to famine, internal and external conflicts, the collapse of governing authority, migrations, and social disorder. In such cases, many people in the crisis zone may be well-armed and dangerous, making the task of the Joint Force in providing relief that much more difficult. In a society confronted with starvation, food becomes a weapon every bit as important as ammunition.

Access to fish stocks has been an important natural resource for the prosperity of nations with significant fishing fleets. Competition for access to these resources has often resulted in naval conflict. Conflicts have erupted as recently as the Cod War (1975) between Britain and Iceland and the Turbot War (1995) between Canada and Spain. In 1996, Japan and Korea engaged in a naval standoff over rocky outcroppings that would establish extended fishing rights in the Sea of Japan. These conflicts saw open hostilities between the naval forces of these states, and the use of warships and coastal protection vessels to ram and board vessels. Over-fishing and depletion of fisheries and competition over those that remain have the potential for causing serious confrontations in the future.

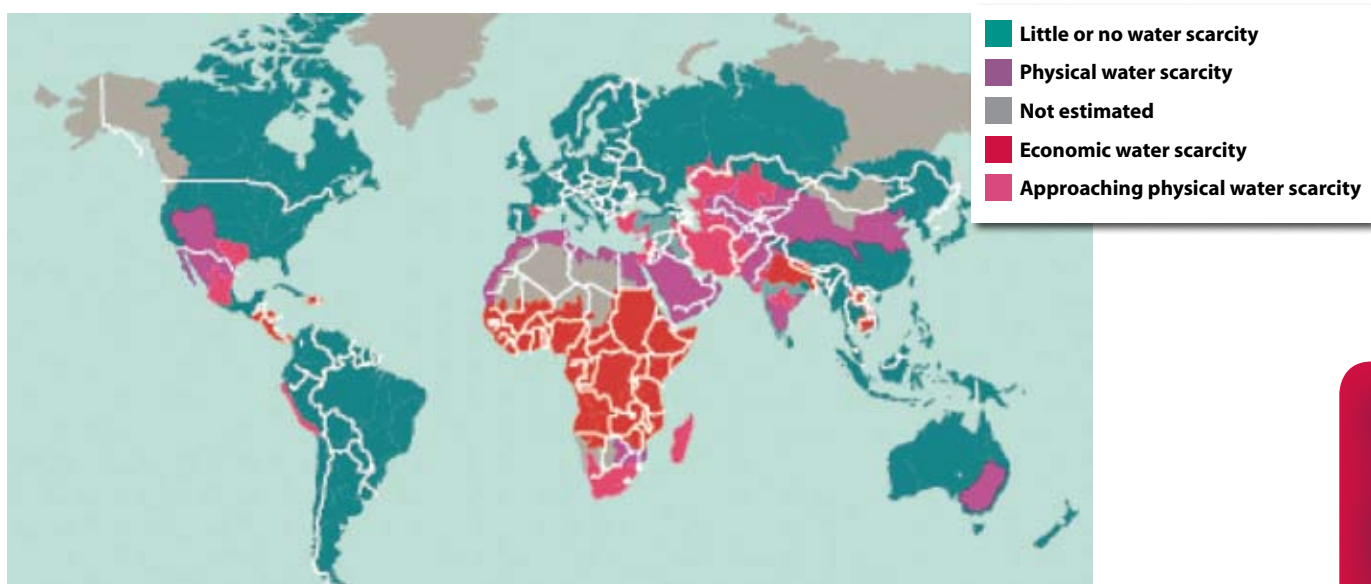
WATER

As we approach the 2030s, the world's clean water supply will be increasingly at risk. Growing populations and increasing pollution, especially in developing nations, are likely to make water shortages more acute. Most estimates indicate nearly 3 billion (40%) of the world's population will experience water stress or scarcity. Absent new technology, water scarcity and contamination have human and economic costs that are likely to prevent developing nations from making significant progress in economic growth and poverty reduction.

Agriculture will likely remain the source of greatest demand for water worldwide, accounting for 70% of total water usage. In comparison, industry will account for only 20%, while domestic usage will likely remain steady at 10%. Per unit harvest yield, developed nations are more efficient than developing nations in using available water supplies for agricultural irrigation and use far less than the 70% average. Improved agricultural techniques could further increase the amount of land under irrigation and increase yields per unit of water used.

In short, from a global perspective, there should be more than sufficient water to support the world's population during the next quarter century. However, in some regions the story is quite different. The Near East and North Africa use far more than the global average of 70% of available water dedicated to irrigation. By the 2030s, at least 30 developing nations could use even more of their water for irrigation.

The unreliability of an assured supply of rainwater has forced farmers to turn more to groundwater in many areas. As a result, aquifer levels are declining at rates between one and three meters per year. The impact of such declines on agricultural production could be profound, especially since aquifers, once drained, may not refill for centuries. Glacial runoff is also an important source of water for many countries. The great rivers of Southeast Asia, for example, flow through India, Pakistan, China, Nepal, Thailand, and Burma, and are fed largely from glacial meltwaters in the Himalaya Range. Construction of dams at the headwaters of these rivers may constrict the flow of water downstream, increasing the risk of water-related population stresses, cross-border tension, migration and agricultural failures for perhaps a billion people who rely on them.



Physical Water Scarcity: Physical access to water is limited, or sources of water overused and overmanaged, leading to serious water scarcity downstream.

Economic Water Scarcity: A population does not have adequate financial or political means to obtain adequate sources of water.

WORLD WATER SCARCITY

SOURCE: International Water Management Institute

One should not minimize the prospect of wars over water. In 1967, Jordanian and Syrian efforts to dam the Jordan river were a contributing cause of the Six-Day War between Israel and its neighbors. Today Turkish dams on the upper Euphrates and Tigris Rivers, the source of water for the Mesopotamian basin pose similar problems for Syria and Iraq. Turkish diversion of water to irrigate mountain valleys in eastern Turkey already reduces water downstream. Even though localized, conflicts sparked by water scarcity easily could destabilize whole regions. Continuing crisis in Sudan's Darfur region is an example of what could happen on a wider scale between now and the 2030s. Indeed, it is precisely along other potential conflict fault lines that potential crises involving water scarcity are most likely.

Whether the United States would find itself drawn into such conflicts is uncertain, but what is certain is that future Joint Force commanders will find conflict over water endemic to their world, whether as the spark or the underlying cause of conflicts among various racial, tribal, or political groups. Were they called on to intervene in a catastrophic water crisis, they might well confront chaos, with collapsing or impotent social networks and governmental services. Anarchy could prevail, with armed groups controlling or warring over remaining water, while the specter of disease resulting from unsanitary conditions would hover in the background.

The latter is only one potential manifestation of a larger problem. Beyond the problems of water scarcity will be those associated with water pollution, whether from uncontrolled industrialization, as in China, or from the human sewage expelled by the mega-cities and slums of the world. The dumping of vast amounts of waste into the world's rivers and oceans threatens the health and welfare of large portions of the human race, to say nothing of the affected ecosystems. While joint forces rarely will have to address pollution problems directly, any operations in polluted urban areas will carry considerable risk of disease. Indeed, it is precisely in such areas that new and deadly pathogens are most likely to arise. Hence, commanders may be unable to avoid dealing with the consequences of chronic water pollution.

Technology could mitigate the effects of water pollution. By the year 2030, advances in technology may provide many nations with more efficient, sustainable, and affordable means of purifying and desalinating water, providing billions of people with access to clean water and improved sanitation. The ability of the United States and its partners to purify scarce water resources could serve to reduce the potential for interstate friction or state collapse directly related to water scarcity. The development of a rapidly deployable, lightweight and easily maintainable purification system that requires little infrastructure and only modest power generation could likewise increase the effectiveness of humanitarian relief operations. In addition to reducing both the number of forces and the time required to rebuild or improve water infrastructure, leave-behind water-purification technology could contribute to positive views of the U.S.

CLIMATE CHANGE AND NATURAL DISASTERS

The impact of climate change, specifically global warming and its potential to cause natural disasters and other harmful phenomena such as rising sea levels, has become a concern. Scientific conclusions about the potential effects of climate change are contradictory, with some arguing that there will be more and greater storms and natural disasters: others, that there will be fewer.²²

Climate change is included as one of the ten trends most likely to impact the Joint Force. For example, sea ice has been shrinking dramatically in Arctic regions each summer, and in the future this could open new shipping routes across archipelagic Canada and Northern Russia that could dramatically shorten transit times between Europe and Northeast Asia. Furthermore, shrinking sea ice opens new areas for natural resource exploitation, and may raise tensions between Arctic nations over the demarcation of exclusive economic zones and between Arctic nations and maritime states over the designation of important new waterways as international straits or internal waters. As an early move in this new competition, in 2007 two Russian submersibles made an unprecedented dive 2.5 miles to the arctic sea floor, where one ship dropped a titanium capsule containing a Russian flag. Retreating ice creating access to previously unavailable natural resources is but one example of potential security challenges that did not exist in the past.

²²Kerry Emanuel, Ragoth Sundaraarajan, and John Williams, "Hurricanes and Global Warming," *Bulletin American Meteorological Society*, March 2008, pp. 347-367.

Global sea levels have been on the rise for the past 100 years. Some one-fifth of the world's population as well as one-sixth of the land area of the world's largest urban areas are located in coastal zones less than ten meters above sea level. Furthermore, populations in these coastal areas are growing faster than national averages. In places such as China and Bangladesh, this growth is twice that of the national average.²³ Should global sea levels continue to rise at current rates, these areas will see more extensive flooding and increased saltwater intrusion into coastal aquifers upon which coastal populations rely, compounding the impact of increasing shortages of fresh water. Additionally, local population pressures will increase as people move away from inundated areas and settle farther up-country.

In this regard, tsunamis, typhoons, hurricanes, tornadoes, earthquakes and other natural catastrophes have been and will continue to be a concern of Joint Force commanders. In particular, where natural disasters collide with growing urban sprawl, widespread human misery could be the final straw that breaks the back of a weak state. Furthermore, if such a catastrophe occurs within the United States itself - particularly when the nation's economy is in a fragile state or where U.S. military bases or key civilian infrastructure are broadly affected - the damage to U.S. security could be considerable. Areas of the U.S. where the potential is great to suffer large-scale effects from these natural disasters are the hurricane-prone areas of the Gulf and Atlantic coasts, and the earthquake zones on the west coast and along the New Madrid fault. In the 2030s, as in the past, the ability of U.S. military forces to relieve the victims of natural disasters will impact the reputation of the United States in the world. For example, the contribution of U.S. and partner forces to relieve the distress caused by the catastrophic Pacific tsunami of December 2004 reversed the perceptions of America held by many Indonesians. Perhaps no other mission performed by the Joint Force provides so much benefit to the interests of the United States at so little cost.

PANDEMICS

One of the fears haunting policy makers is the appearance of a pathogen, either manmade or natural, able to devastate mankind, as the "Black Death" did in the Middle East and Europe in the middle of the Fourteenth Century. Within barely a year, approximately a third of Europe's population died. The second- and third-order effects of the pandemic on society, religion, and economics were devastating. In effect, the Black Death destroyed the sureties undergirding Medieval European civilization.

It is not likely that a pandemic on this scale will devastate mankind over the next two decades. Even though populations today are much larger and more concentrated, increasing the opportunities for a new pathogen to spread, the fact that mankind lives in a richer world with greater knowledge of the world of microbes, the ability to enact quarantines, a rapid response capability, and medical treatment suggest that authorities could control even the most dangerous of pathogens. The crucial element in any response to a pandemic may be the political will to impose quarantine.

The rapid identification and response to the 2009 H1N1 flu strain and the rapid termination of the 2003 Severe Acute Respiratory Syndrome (SARS) pandemic illustrate the seriousness with which medical authorities view these. In the case of SARS, after initial reports surfaced from East Asia in February of an atypical respiratory disease, medical authorities reported more than 8,000 cases in 30 different countries. The disease itself was highly contagious and life-threatening; almost 10% of reported cases died. However, once doctors identified the disease, the combined efforts of local, national, and international authorities contained it within five months. Newly reported cases increased rapidly in March and April 2003, peaked in early May, and rapidly declined thereafter.

The H1N1 and SARS examples do not mean, however, that the threat of social disorder or disruption originating from a viral source requiring Joint Force capabilities is nonexistent. A repetition of the 1918 influenza pandemic, which led to the deaths of millions world-wide, would have the most serious consequences for the United States and the world politically as well as socially. The dangers posed by the natural emergence of a disease capable of launching a global pandemic are serious enough, but the possibility exists also that a terrorist organization might acquire a dangerous pathogen.

²³Science Daily, quoting authors of IEEE report, Gordon McGranahan and Bridget Anderson.

The deliberate release of a deadly pathogen, especially one genetically engineered to increase its lethality or virulence, would present greater challenges than a naturally occurring disease like SARS. While the latter is likely to have a single point of origin, terrorists could seek to release the pathogen at several different locations in order to increase the rate of transmission across a population. This would seriously complicate both the medical challenge of bringing the disease under control and the security task of fixing responsibility for its appearance.

The implications for the Joint Force of a pandemic as widespread and dangerous as that of 1918 would be profound. American and global medical capabilities would soon find themselves overwhelmed. If the outbreak spreads to the United States, the Joint Force might have to conduct relief operations in support of civil authorities that, consistent with meeting legal prerequisites, could go beyond assisting in law enforcement and maintaining order. Even as Joint Force commanders confronted an array of missions, they would also have to take severe measures to preserve the health of their forces and protect medical personnel and facilities from public panic and dislocations. Thucydides captured the moral, political, and psychological dangers that a global pandemic would cause in his description of the plague's impact on Athens: "For the catastrophe was so overwhelming that men, not knowing what would happen next to them, became indifferent to every rule of religion or of law."²⁴

CYBER

The pace of technological change is accelerating exponentially. If the pace of technological advancement continues, greater change will occur over the next twenty years than occurred in the whole of the Twentieth Century. The key will be the use to which these technologies are put. In many ways the world of 2030 could appear nearly as strange to us today as the world of 2000 would have to an observer from 1900.

The advances in communication and information technologies will significantly improve the capabilities of the Joint Force. Global information networks enabled by wireless and broadband technologies will link deployed forces to supporting assets at home. Deployed forces will be able routinely to access analysis, research, computation and planning capabilities located outside the theater. Joint forces will conduct globally-ranging cyber warfare, either as independent operations or in support of deployed units, manipulating or overwhelming adversary systems. The creation of virtual models of potential operational areas will allow the Joint Force to train and plan for those environments. Much as flight simulators allow pilots to refine flight skills, immersive training environments could allow future joint forces to practice key operational tasks.

Cyberspace permeates nearly every aspect of societies from personal computers and cell phones to networked transportation and inventory systems. Our society's very way of life has come to depend fundamentally on the use of cyberspace. In much the same way that we depend on our highways and the oceans, we rely on networks pieced together through the electromagnetic spectrum to conduct business, purchase goods, entertain ourselves, and run our basic utilities. Our ability to maneuver freely in cyberspace amplifies all instruments of national power. In fact, our ability to maneuver in cyberspace is an emerging instrument of power itself.

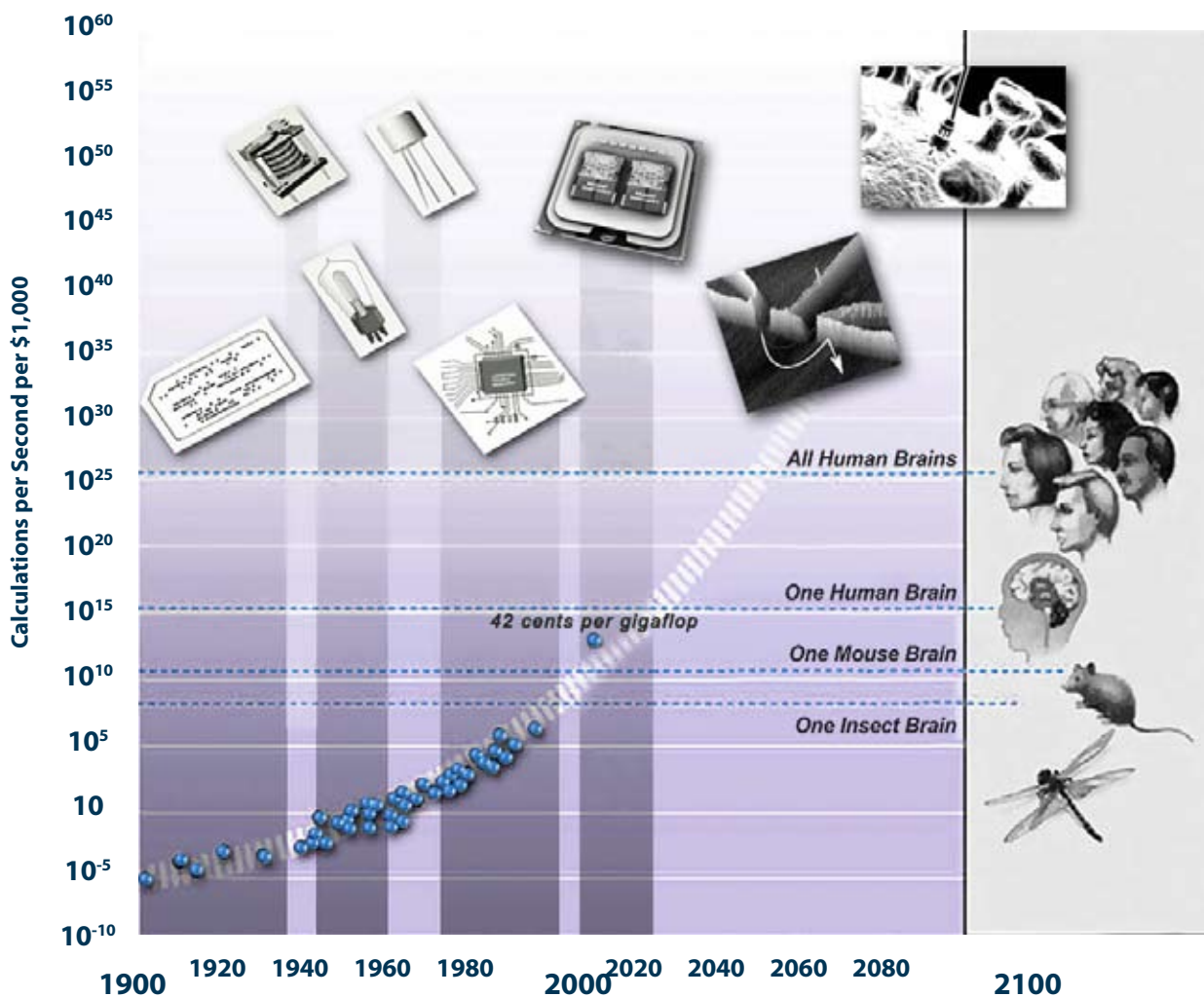
Many of those same advances also will be available to America's opponents, who will use them to attack, degrade, and disrupt communications and the flow of information. It is also essential that the Joint Force be capable of functioning in a hostile information environment, so as not to create an Achilles' heel by becoming too network dependent.

Cyberspace represents an avenue of great national opportunity, but is also a major source of critical strategic challenges. Low barriers to entry coupled with the anonymous nature of activities in cyberspace greatly broaden the list of potential adversaries. Furthermore, the globe-spanning range of cyberspace and its disregard for national borders challenge our legal system and complicate our ability to deter threats and respond to contingencies. The first months of 2009 highlighted this emerging vulnerability as media reported on the presence of potential adversaries on our power grids, via cyberspace.

²⁴Thucydides, *History of the Peloponnesian War*, trans. by Rex Warner (London: Penguin Books, 1954) p. 155.

With the availability of so much open source material, cyber security will not just be compromised by adept hacking, but also through the systematic analysis of the activities of many millions of Internet users. The internet has evolved from the simple repository of information into a powerful social networking tool. Individuals are adding vast amounts of data, including lifelogs, blogs, and social networking information (Web 2.0) while computers are beginning to be able to understand, analyze, and interpret patterns within this mountain of data (Web 3.0). The open and free flow of information favored by the West will allow adversaries an unprecedented ability to gather intelligence. Other nations without the legal and cultural restraints found in the U.S. may excel at capturing, assessing, or even manipulating this information for military purposes as an aid to waging the “Battle of Narratives.”

The graphic below illustrates the growth of the number of calculations per second per unit cost over time. The pace of technological change in computing is accelerating at an exponential, rather than linear rate, transcending the specific method of computation. From punch cards to electromechanical relays, from vacuum tubes to transistors, from integrated circuits to future spintronics and quantum computers, the exponential growth of computing power continues. Because people tend to view change in a linear fashion, the implication of this trend means that we often overestimate what is achievable by technology in the short term, while dramatically underestimating and discounting the power and capabilities of computing power in the longer term.



EXPONENTIAL GROWTH OF COMPUTING

Adapted from: Ray Kurzweil

Addressing the cyber threat is no small challenge. Cyber threats will demand new approaches to managing information, securing information systems, and ensuring our ability to operate through attack. As we seek to address the threats from cyberspace, Joint Force personnel must always understand that every networked computer is on the front line. Everyone who logs on is a cyber defender first. There are no “protected zones” or “rear areas” because all are equally vulnerable. Finally, future growth in intelligence, planning, and operations requirements emphasizes an increasing need to act and react at machine, not human, speeds. While progress toward defining requirements and advocating for Service cyberspace forces has been made, cyber threats will demand a new mindset to ensure agility in adapting to new challenges.

With very little investment, and cloaked in a veil of anonymity, our adversaries will inevitably attempt to harm our national interests. Cyberspace will become a main front in both irregular and traditional conflicts. Enemies in cyberspace will include both states and non-states and will range from the unsophisticated amateur to highly trained professional hackers. Through cyberspace, enemies will target industry, academia, government, as well as the military in the air, land, maritime, and space domains. In much the same way that airpower transformed the battlefield of World War II, cyberspace has fractured the physical barriers that shield a nation from attacks on its commerce and communication. Indeed, adversaries have already taken advantage of computer networks and the power of information technology not only to plan and execute savage acts of terrorism, but also to influence directly the perceptions and will of the U.S. Government and the American population.

- Connectivity to the home (or node in military networks) grows by 50% a year. Therefore by 2030, people will have about 100,000 times more bandwidth than today.
- The computing capacity available to the average home will be a computer that runs at a rate of one million times faster than a computer today (2.5 petabytes vs. 2.5 gigabytes). A typical home computer would be capable of downloading the entirety of today’s Library of Congress (16 terabytes), in 128 seconds – just over two minutes’ time. The technical capacity of the telegraph in 1900, was some 2 bits per second across continental distances, meaning that same Library of Congress would have required a transmission time of 3,900 years.
- An iPod today can hold some 160 gigabytes of data, or 160,000 books. The iPod of 2020 could potentially hold some 16 terabytes of information – essentially the entire Library of Congress

SPACE

Over the past several decades, the United States has enjoyed significant advantages in the use of space for military and commercial purposes. Hitherto the domain of superpowers, space technology has become increasingly available to any country or multinational corporation with pockets deep enough to fund the research or acquire the technology and place it in orbit. Furthermore, the increasing proliferation of launch and satellite capabilities, as well as the development of anti-satellite capabilities have begun to level the playing field. Other countries will be able to develop or acquire satellites for their own commercial and defense interests similar to ongoing efforts by Japan, China, India, Israel, and Iran. Moreover, timely high-resolution imagery of much of the globe is already available. This has empowered not only states, but also citizens who have, for example, used such imagery to identify hundreds of facilities throughout North Korea. As a result, the future Joint Force commander will not be able to assume that his deployments and operations will remain hidden; rather, they will be exposed to the scrutiny of both adversaries and bystanders.

Moreover, challenges to free access to space are growing. The U.S. relies heavily on space-based assets to observe the operating environment and orient far-flung forces at global distance in highly distributed networks. This dependence creates both advantage and vulnerability.

China's 2007 successful test of a direct-ascent anti-satellite weapon sent shock waves throughout the international community and created tens of thousands of pieces of space debris. Then in 2009, a commercial telecommunications satellite was destroyed in a collision with a defunct Russian satellite, raising further concerns about the vulnerability of low-earth orbit systems. These events and others highlight the need to protect and operate our space systems in an increasingly contested and congested orbital environment. The relative vulnerability of space assets plus our heavy reliance on them could provide an attractive target for a potential adversary.

Date	Event
March 1999	Hackers attack UK satellite
March 2003	Iraq jams GPS signals during Operation Iraqi Freedom
July 2003	Voice of America broadcasts to Iran jammed
September 2006	China attempts to blind US satellites with laser
Extended periods in 2006	Libya jams mobile satellite communications
January 2007	China destroys inactive weather satellite, creating a wide field of debris
February 2009	Russian and American satellites collide in orbit

DEGRADATION OF SPACE SYSTEMS

This situation begs for increased protection capabilities that include rapid systems replenishment, hardening, redundancy, active prevention and denial measures, and nonmaterial solutions to enable our nation to detect and respond to any space threat contingency. The implications are clear: the Joint Force commander must be poised to anticipate, protect, and act to ensure the space assets that allow the Joint Force to operate around the world are available during critical periods.

CONCLUSION

The previous discussion outlined the major trends that are likely to influence the security environment for the next quarter century. These individual trends, whether they adhere to predictions or not, will combine in ways that form broader and more robust contexts that will define the world in which the Joint Force will operate in the future. By understanding the trends and resultant contexts, Joint Force leaders have a way to appreciate their implications and to identify some key indicators to watch along the way. This provides a means of assessing our assumptions and predictions, and our progress towards building and operating the Joint Force to meet the future. What follows then is a discussion of the contextual world of the 2030s.

*Contexts of conflict and war are the environment created by the confluence of major trends. Contexts illuminate why wars occur and how they might be waged.*²⁵ -Colin Gray

PART III: THE CONTEXTUAL WORLD

COOPERATION AND COMPETITION AMONG CONVENTIONAL POWERS

Despite serious challenges to international stability by unconventional powers using a variety of tools and methods, cooperation and competition among conventional powers will continue to be a primary operational context for the Joint Force for the next 25 years. For the purpose of the Joint Operating Environment, a “conventional power” is an organization that is governed by, and behaves according to, recognized norms and codes – conventions. Such institutions may be political (the state), financial, judiciary, business and economic, academic, and many more. Conventions may include, but are not limited to, the Geneva Convention, the Law of Armed Conflict, United Nations Resolutions, National and International Law, international trade agreements, diplomatic alliances, and monetary and banking conventions. These are groups that are broadly recognized as being legitimate actors, behaving according to recognized rule sets.

The state will continue to be the most powerful international actor. It has become popular to suggest that the era of states is coming to an end. In fact, states, in one form or another, have been the order of human affairs for centuries. The chaos in places such as Somalia and Sierra Leone, where the state’s structure has been dysfunctional for periods of time, is further testimony to the utility of a working state. The power of states will vary dramatically from culture to culture, region to region but will mutate and adapt to the international environment’s changing conditions as a centralized mechanism through which power is organized and which provides the internal and external security required by its citizens. Some aspects of globalization, and the related rise of non-state powers, will pose difficulties to states in their efforts to preserve their status, but the state will endure as a major power broker into the 2030s.

In the next 25 years, the relative balance of power between states will shift, some growing faster than the United States and many states weakening relative to the United States. The variables that affect the growth of states range from wars to the effectiveness of political leaders, economic realities, ideological preconceptions, and ethnic and religious forces. All will to some extent influence the course of future events. Recognizing that reality, present trends suggest that the era of the United States as the sole superpower may be coming to an end.

While China’s rise represents the most significant single event on the international horizon since the collapse of the Soviet Union, it is not the only story. Steady, if not rapid, economic growth appears to be the norm for much of the world over the coming decades, providing that sufficient energy remains available to fuel that growth and the financial crisis can be resolved. Russia and India are both likely to become richer, although Russia’s strength is fragile, resting as it does on unfavorable demographic trends, a single-commodity economy based on hydrocarbon extraction, and a lack of serious investment in repairing its crumbling infrastructure.

²⁵Colin Gray, “Sovereignty of Context”, Strategic Studies Institute, (2006)

Indeed, the story around the globe is one of substantial potential rearmament. While the rise of Nigeria, Turkey, Brazil, Vietnam, and Egypt may not be as dramatic as what is happening in South and East Asia, their increasing power is, and will be, remarkable. Although these nations are unlikely to be able to field globally deployable forces, they are in a position to build military forces that will be used to influence events in their regions and will feature significantly in U.S. considerations in their respective areas.

The critical issue will lie in national will. What has mattered most in the past has been the intent and national goals of states. In the 1930s, the democracies of Western Europe and the United States possessed the economic strength to build a force to crush Hitler's rising Germany, but chose not to rearm, even in light of this very clear threat. The great question confronting Europe is whether some impending threat – an aggressive and expansionist hegemon, competition for resources, the internal stress of immigration, or violent extremism – will inspire them to raise a larger armed force to preserve their security.

It is also conceivable that combinations of regional powers with sophisticated capabilities could band together to form a powerful anti-American alliance. It is not hard to imagine an alliance of small, cash-rich countries arming themselves with high-performance long-range precision weapons. Such a group could not only deny U.S. forces access into their countries, but could also prevent American access to the global commons at significant ranges from their borders.

Not all conventional organizations will be states. Many transnational organizations will also behave according to a recognized set of conventional rules. Samuel Huntington describes the activity of these groups in this way:

Transnational organizations try to ignore sovereignty. While national representatives and delegations engage in endless debate at U.N. conferences and councils, the agents of transnational organizations are busily deployed across the continents, spinning the webs that link the world together.²⁶

In this environment, the U.S. must strive to use its tremendous powers of inspiration, not just its powers of intimidation.²⁷ How America operates in this world of states and other conventional powers will be a major factor in its ability to project its influence and soft power beyond the long shadow cast by its raw military power. It will remain first among equals because of its military, political and economic strengths. However, in most endeavors it will need partners, whether from traditional alliances or coalitions of the willing. Thus, the United States will need to sharpen its narrative of the unique vision we offer to the world and to inspire like-minded partners to strive and sacrifice for common interests. Alliances, partnerships, and coalitions will determine the framework in which Joint Force commanders operate. This will require diplomacy and cultural and political understanding, as well as military competencies. Here, the example that Dwight Eisenhower displayed as overall commander of Allied Forces that invaded Europe is particularly useful for future U.S. military leaders.

POTENTIAL FUTURE CHALLENGES

China

The Sino-American relationship represents one of the great strategic question marks of the next twenty-five years. Regardless of the mixture of cooperation and confrontation that characterizes the Sino-American relationship, China will become increasingly important in the considerations and strategic perceptions of Joint Force commanders.

²⁶Samuel Huntington, quoted in Joseph Nye (with Robert Keohane), *Power in the Global Information Age: From Realism to Globalization*. (London, 2004) p. 172.

²⁷John Hamre, President, Center for Strategic and International Studies. (June 2007)



The course that China takes will determine much about the character and nature of the 21st Century - whether it will be “another bloody century,”²⁸ or one of peaceful cooperation. The Chinese themselves are uncertain as to where their strategic path to the future will lead. Deng Xiaoping’s advice for China to “disguise its ambition and hide its claws” may represent as forthright a statement as the Chinese can provide. What does appear relatively clear is that the Chinese are thinking in the long term regarding their strategic course. Rather than emphasize the future strictly in military terms, they seem willing to see how their economic and political relations with the United States develop, while calculating that eventually their growing strength will allow them to dominate Asia and the Western Pacific.

History provides some hints about the challenges the Chinese confront in adapting to a world where they are on a trajectory to become a great power. The continuities of Chinese civilization reach back to a time when the earliest civilizations in the Nile and the Mesopotamian valleys were emerging. But those continuities and the cultural power of China’s civilization have also provided a negative side: to a considerable extent they have isolated China from currents and developments in the external world. Much of its Twentieth Century experience had further exacerbated that isolation. The civil wars between the warlords and the central government and between the Nationalists and Communists, the devastating invasion and occupation of the 1930s and 1940s by the Japanese, and the prolonged period of China’s isolation during Mao’s rule further isolated China.

Yet, one of the fascinating aspects of China’s emergence over the past three decades has been its efforts to learn from the external world. This has been neither a blatant aping of the West nor an effort to cherry pick ideas from history or Western theoretical writings on strategy and war, but rather a contentious debate to examine and draw lessons from the West’s experience. Two historical case studies have resonated with the Chinese: the Soviet Union’s collapse and the rise of Germany in the late Nineteenth and early Twentieth Centuries. These case studies, written in a series of books, were also made into documentary films that constitute one of the most popular shows on Chinese television.

From the case of the Soviets the Chinese have drawn the lesson that they must not pursue military development at the expense of economic development. That is the path Deng laid out in the late 1970s and one which they have assiduously followed. Indeed, if one examines their emerging military capabilities in intelligence, submarines, cyber, and space, one sees an asymmetrical operational approach that is different from Western approaches, one consistent with the classical Chinese strategic thinkers.

There are interesting trends in the People’s Liberation Army (PLA). The Party has ceded considerable autonomy to the military, allowing the PLA’s generals and admirals to build a truly professional force. This has led to a renaissance in military thinking, one that draws not only from the classics of Chinese writings but also from an extensive examination of Western literature on history, strategy, and war. The internal consensus seems to be that China is not yet strong enough militarily and needs to become stronger over the long term. But the debate extends also to issues on China’s strategic and operational choices: Should it be offensive or defensive? Should it have a continental or maritime focus, or a mixture of the two? How can the PLA best protect the nation’s emerging global interests?

The Chinese are interested in the strategic and military thinking of the United States. In the year 2000, the PLA had more students in America’s graduate schools than the U.S. military, giving the Chinese a growing understanding of America and its military. As a potential future military competitor, China would represent a most serious threat to the United States, because the Chinese could understand America and its strengths and weaknesses far better than Americans understand the Chinese. This emphasis is not surprising, given Sun Tzu’s famous aphorism:

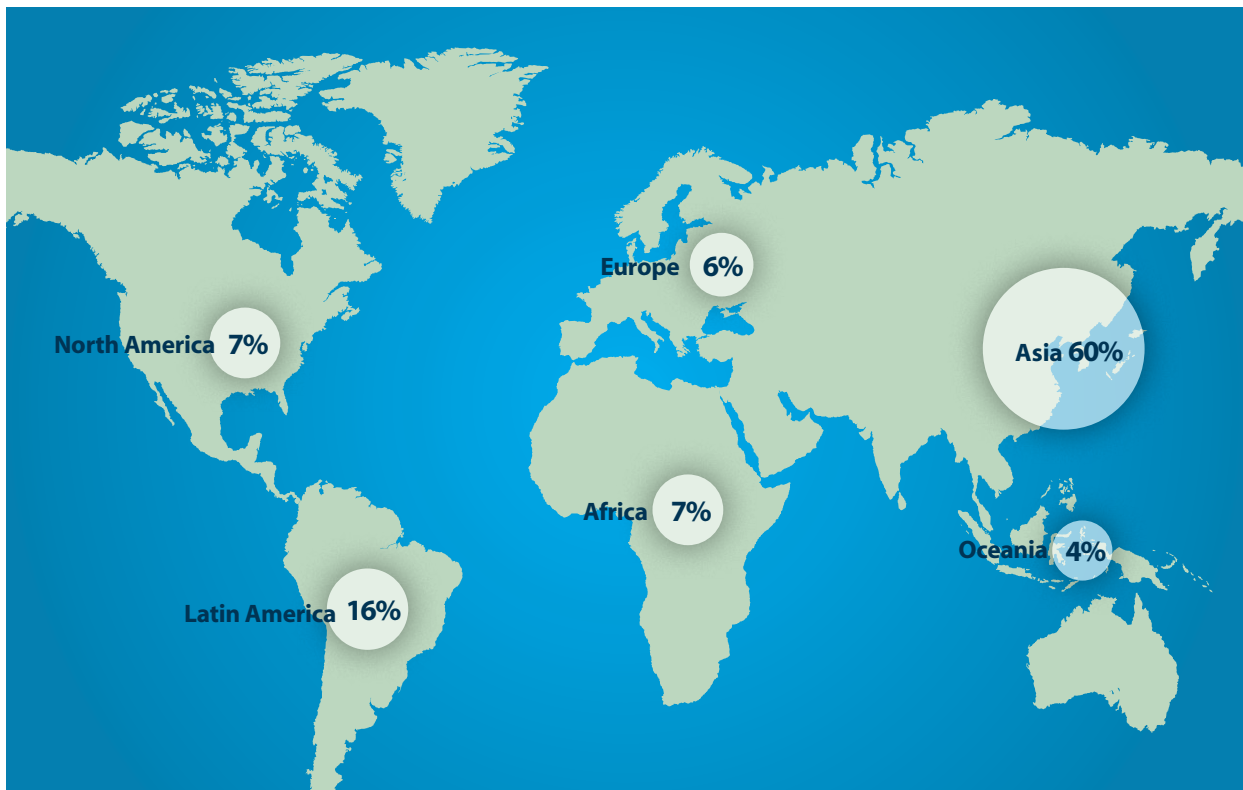
²⁸The title of Colin Gray’s book on the future of war in the Twenty-First Century.

*Know the enemy and know yourself; in a hundred battles you will never be in peril. When you are ignorant of the enemy, but know yourself, your chances of winning or losing are equal. If ignorant both of your enemy and of yourself, you are certain in every battle to be in peril.*²⁹

In the Second World War and the Cold War, victory by the Allies was achieved in part by the thorough understanding of their opponents, who remained relatively ignorant of the United States and its strengths. The Chinese are working hard to ensure that if there is a military confrontation with the United States sometime in the future, they will be ready.

Chinese discussions exhibit a deep respect for U.S. military power. There is a sense that in certain areas, such as submarine warfare, space, and cyber warfare, China can compete on a near equal footing with America. Indeed, competing in these areas in particular seems to be a primary goal in their force development. One does not devote the significant national treasure required to build nuclear submarines for coastal defense. The emphasis on nuclear submarines and an increasingly global Navy in particular, underlines worries that the U.S. Navy possesses the ability to shut down China's energy imports of oil, 80% of which goes through the straits of Malacca. As one Chinese naval strategist expressed it: "the straits of Malacca are akin to breathing – to life itself."

Chinese writers on military and strategic subjects seem to be in agreement that there is a window of opportunity that will last to the 2020s, during which China can focus on domestic economic growth and expanded trade with the world to make it a truly great power. China is investing significantly in human and physical capital. Indeed, skilled Chinese engineers, technicians, and scientists are deeply involved in scientific discovery around the world and in building the infrastructure upon which its future prosperity and global integration might be built. Above all, the Chinese are objective about their weaknesses as well as their strengths and general prospects for the future.



CHINESE OVERSEAS INVESTMENT

SOURCE: Deutsche Bank

²⁹Quoted in Robert Debs Heinl, Jr., *Dictionary of Military and Naval Quotations* (Annapolis, MD, 1967), p.320.

What then are the potential courses that China might follow? The challenges that Chinese leadership confronts at present are enormous, and an unsuccessful China is perhaps more worrisome than a prosperous one. China is confronting major internal problems that could have an impact on its strategic course. The country will face increasing demographic pressures as its population ages. Due to its “one child” policy, China may grow old before it grows rich. Furthermore, a cultural preference for male heirs will create a surplus male population nearing 30 million by 2020. With a birth rate below replacement levels of 2.1 children per mother, China faces a “4-2-1 problem” with four grandparents having two children and one grandchild, a demographic profile that makes inter-generational pension programs impossible to finance.

Urbanization, pollution on a monumental scale, water shortages, and the possible responsibility to protect a growing ethnic diaspora in places such as Siberia or Indonesia represent realities the Chinese leadership cannot easily dismiss. Over the course of its history, internal stability and the threat of foreign invasions have represented the twin political and strategic challenges that Chinese governments have confronted. Moreover, as recent events in Tibet and with the Uyghurs suggest, tensions between the minorities and the central government in Beijing have been building. Yet with China’s approach to strategy, there is considerable sophistication in the leadership’s understanding of its internal problems.

Taiwan is a wild card. Here the picture is unclear. A reunification might bring with it the spread of democratic ideals to the mainland and a weakening of the Party’s grip on an increasingly educated and sophisticated population.

Russia

Russia’s future remains as uncertain as its past has been tragic. The world has watched its decline from one of the world’s most heavily populated nations in 1914. Blessed with overwhelming stocks of natural resources and rapid growth through industrialization, Russia instead tread a path to dissipation and collapse in the catastrophes of World War I (3-4 million military and civilian dead), civil war (5-8 million), man-made famines (6-7 million), purges (2-3 million), and World War II (27 million), accompanied by sixty years of “planned” economic and agricultural disasters. The 1990 implosion of the Soviet Union marked a new low point, one that then-President Vladimir Putin decried as “the greatest geopolitical catastrophe of the century.”

With the collapse of the Soviet Union, Russia lost the lands and territories it had controlled for the better part of three centuries. Not only did the collapse destroy the economic structure that the Soviets created, but the weak democratic successor regime proved incapable of controlling the criminal gangs or creating a functioning economy. Moreover, the first attempt by the Russian military to crush the rebellion in Chechnya foundered in a sea of incompetence and faulty assumptions. Since 2000, Russia has displayed a considerable recovery based on Vladimir Putin’s reconstitution of rule by the security services – a move most Russians have welcomed – and on the influx of foreign exchange from Russia’s production of petroleum and natural gas. How the Russian government spends this revenue over the long term will play a significant role in the kind of state that emerges. The nature of the current Russian regime itself is also of concern. To a considerable extent, its leaders have emerged from the old KGB, suggesting a strategic perspective that bears watching.

At present, Russian leaders appear to have chosen to maximize petroleum revenues without making the investments in oil fields that would increase oil and gas production over the long term. With its riches in oil and gas, Russia is in a position to modernize and repair its ancient and dilapidated infrastructure and to improve the welfare of its long suffering people. Nevertheless, the current leadership has displayed little interest in such a course. Instead, it has placed its emphasis on Russia’s great power status. For all its current riches, the brilliance of Moscow’s resurgence, and the trappings of military power, Russia cannot hide the conditions of the remainder of the country. The life expectancy of Russia’s male population, 59 years, is 148th in the world and places the country somewhere between East Timor and Haiti.

Perhaps more than any other nation Russia has reason to fear the international environment, especially considering the invasions that have washed over its lands. There are serious problems: in the Caucasus with terrorists; in Central Asia where the stability of the new oil-rich nations is seriously in question; and in the east where the Chinese remain silent, but increasingly powerful, on the borders of eastern Siberia. In 2001, Russia and China agreed to demarcate the 4,300 mile border between them. However, demographic pressures across this border are increasingly tense as ethnic Russians leave (perhaps as many as a half million in the 2000-2010 time frame, or 6% of the total population) and ethnic Chinese immigrate to the region. Estimates of the number of ethnic Chinese in Siberia range from a low of about 480,000 (or less than 6% of the population) to more than 1 million (or nearly 12%). Russia must carefully manage this demographic transition to avoid ethnic tensions that could erupt into a cross border conflict with China.

Russia is playing a more active but less constructive role across the Black Sea, Caucasus, and Baltic regions. Russian involvement in each of these areas has its own character, but they have in common a Russia that is inserting itself into the affairs of its much-smaller neighbors. In each, Russia plays on ethnic and national tension to extend its influence in its “near abroad.”

In the Caucasus region, especially Georgia and its Abkhazian and South Ossetian provinces, Russia has provided direct support to separatists. In other cases, such as the conflict between Armenia and Azerbaijan or in the Trans-Dniestrian region of Moldova, Russia provides indirect support to keep these conflicts simmering. These conflicts further impoverish areas in dire need of investment and productive economic activity. They



lay astride new and vulnerable routes to access the oil of the Caspian Basin and beyond. They encourage corruption, organized crime, and disregard legal order and national sovereignty in a critical part of the world. In the future, they could exacerbate the establishment of frameworks for regional order and create a new “frontier of instability” around Russia.

Indeed, while many of its European neighbors have almost completely disarmed, Russia has begun a military buildup. Since 2001, the Russians have quadrupled their military budget with increases of over 20% per annum over the past several years. In 2007, the Russian parliament, with Putin’s enthusiastic support, approved even greater military appropriations through 2015. Russia cannot recreate the military machine of the old Soviet Union, but it may be attempting to make up for demographic and conventional military inferiority by modernizing. Russia’s failure to diversify its economy beyond oil and natural gas, together with its accelerating demographic collapse, will create a Russia of greatly decreased political, economic, and military power by the 2020s.

One of the potential Russias that could emerge in coming decades could be one that focuses on regaining its former provinces in the name of “freeing” the Russian minorities in those border states from the ill-treatment they are supposedly receiving. The United States and its NATO allies would then confront the challenge of summoning up sufficient resolve and deterrence to warn off such a Russia.



RUSSIAN CLAIMED TERRITORY IN THE ARCTIC

SOURCE: University of Durham, UN Marum

The Pacific and Indian Oceans

The rim of the great Asian continent is home to a number of states with significant nuclear potential. China and Russia are members of the Nuclear Nonproliferation Treaty (NPT) and have significant nuclear arsenals at their command. India and Pakistan have demonstrated the capacity to detonate nuclear devices, possess the means to deliver them, and are not party to the NPT, while others such as North Korea and Iran are pursuing nuclear weapons technology (and the means to deliver them) as well. Several friends or Allies of the United States, such as Japan and South Korea are highly advanced technological states and could quickly build nuclear devices if they chose to do so. While the region appears stable on the surface, political clefs exist. There are few signs that these divisions, which have deep historical, cultural, and religious roots, will be mitigated.

Not all of Asia's borders are settled. China, Japan and Russia have simmering territorial disputes over maritime boundaries, while demographic and natural resource pressures across the Siberia/Manchuria border have significant implications for Moscow's control of its far east. If one includes the breakup of the British Raj in 1947-1948, India and Pakistan have fought three brutal wars, while a simmering conflict over the status of Kashmir continues to poison relations between the two powers. The Vietnamese and the Chinese have a long record of antipathy, which broke out into heavy fighting in the late 1970s, and China's claims that Taiwan is a province of the mainland and that scattered islands as far afield as Malaysia are Chinese territory obviously represent a set of troublesome flashpoints.

The continuing dispute between India and Pakistan over Kashmir may be the most dangerous disagreement that exists between two nuclear armed powers. The Chinese have backed up their claims to the Spratleys, which Vietnam and the Philippines also claim, with force. How contested claims in this important sea lane are resolved will have important implications for trade routes and energy exploration, and as an area of growing naval competition. The Kurile Islands, occupied by the Soviets at the end of World War II, remain a contentious issue between Russia and Japan. The uninhabited islands south of Okinawa are in dispute between Japan and China, both drawn to the area by the possibility of oil. Much of the Yellow Sea remains in dispute between the Koreans, Japan, and China, again because of its potential for oil. The straits of Malacca represent the most important transit point for world commerce, the closure of which for even a relatively short period of time would have a devastating impact on the global economy.

There is at present a subtle, but sustained military buildup throughout the region. India could more than quadruple its wealth over the course of the next two decades, but large swaths of its population will likely remain in poverty through the 2030s. Like China, this will create tensions between the rich and the poor. Such tension, added to the divides among its religions and nationalities, could continue to have implications for economic growth and national security. Nevertheless, its military will receive substantial upgrades in the coming years. That fact, combined with its proud martial traditions and strategic location in the Indian Ocean, will make India the dominant player in South Asia and the Middle East. Like India, China and Japan are also investing heavily in military force modernization, particularly with an emphasis in naval forces that can challenge their neighbors for dominance in the seas surrounding the East and South Asian periphery. The buildup of the navies by the powers in the region has significant implications for how the United States develops its strategy as well as for the deployments of its naval forces.

FOCUS: India

India has a special place in the future international environment. Few countries in the world may figure as prominently in future U.S. strategic calculations. As demographic trends indicate, India is on course to be the most populous nation on Earth in the next decade and a half. Furthermore, it shares with the U.S. a domestic political system based on the consent of the governed, and is highly diverse culturally and ethnically. India sits on the rim of an ocean pivotal to U.S. interests, and possesses a navy larger than any other in the region. It borders a troubled Pakistan, a growing China, is in a neighborhood at high risk of nuclear proliferation, is a common target for radical ideological groups using terrorist tactics, and sits astride key sea lanes linking East Asia to the oil fields of the Middle East. Perhaps reflecting the growing importance of India, and the fading of old animosities borne of the cold war, the U.S.-India relationship has been developing very quickly over the past decade. The Joint Force will likely have a role to play as the U.S. encourages the growth of India as a regional and even global power. Several important elements of the relationship of interest to the Joint Force commander include:

- The U.S. India Civil Nuclear Deal – Recognizes the importance of energy to India and provides a concrete platform for economic and technological cooperation between the U.S. and India. It also offers a basis for moving beyond one of the most serious barriers to our political cooperation – the status of India’s nuclear program.
- Economic ties – Bilateral trade between the U.S. and India has doubled from \$21 billion to \$44 billion from 2004 to 2008, and this trade will likely grow – at least in relative terms – over the next several decades. One of the more promising opportunities for deepening economic engagement concerns India’s ongoing development challenge: bridging the gap between its vibrant middle class and its still too persistent urban and rural poverty. An estimated 700 million Indians still earn under \$2 a day.
- Energy – In a country where 500 million people still lack access to electricity, the U.S. and India have a number of opportunities for collaboration on energy generation and infrastructure. The U.S. is committed to working directly with India as a robust partner on civilian nuclear energy.
- Security – Today, the U.S. and Indian navies regularly exercise together. As India continues to develop into one of the world’s leading economic and political powers, cooperation between India and the United States over a number of regional and global challenges may be a significant counterbalance to instability.
- In the 21st Century, the emergence of India as a strong, stable, democratic, and outwardly looking player with global interests has the potential to enhance the effectiveness of the international system and well-being of all, in a positive sum game.

Main points from “Remarks on India, by James B. Steinberg, Deputy Secretary of State, March 23, 2009, opening speech for Brookings Institution Conference “The U.S.-India Nuclear Agreement: Expectations and Consequences.”

Europe

The European Union has solidified Europe economically to a degree not seen since the Roman Empire. For the next quarter century, Europe will exercise considerable clout in economic matters. The Union’s economy as a whole by the 2030s will likely be greater than that of the United States. From a security standpoint, the NATO alliance will have the potential to field substantial, world-class military forces and project them far beyond the boundaries of the continent, but this currently seems a relatively unlikely possibility, given demographic shifts between native-born Europeans and immigrants from the Middle East and Southwest Asia. Europe is undergoing a major cultural transformation, making it less willing to project military power into likely areas of conflict.

Perhaps this will change with the recognition of a perceived threat. The next 25 years will provide two good candidates: Russia and continued terrorism fueled by global violent extremism. Russia has been discussed already in this document. The Baltic and Eastern European regions will likely remain flashpoints as a number of historical issues such as ethnicity or the location of national boundaries, which have led to conflict in the past, continue to simmer under the surface. Russian efforts to construct a gas pipeline to Western Europe under the Baltic Sea rather than a less costly land route through Eastern Europe suggests a deliberate aim to separate the Central and Western European NATO countries from the Baltic and Eastern European members of NATO.

Continued terrorist attacks in Europe might also spark a popular passion for investing in military forces. Should violent extremists persist in using this tactic to attack the European continent with increasing frequency and intensity, there might be a response that includes addressing this threat on a global scale rather than as an internal security problem.

Central and South America

Military challenges in South America and Central America will likely arise from within states, rather than between them. Many internal stresses will continue to challenge the continent, particularly drug cartels and criminal gangs, while terrorist organizations will continue to find a home in some of the continent's lawless border regions. The power of criminal gangs fueled by drug money may be the primary impediment to economic growth, social progress, and perhaps even political stability and legitimacy in portions of Latin America. The cartels work to undermine and corrupt the state, bending security and legal structures to their will, while distorting and damaging the overall economic potential of the region. That criminal organizations and cartels are capable of leveraging expensive technologies to smuggle illicit drugs across national borders serves to illustrate the formidable resources that these groups can bring to bear. Taking advantage of open trade and finance regimes and global communications technologies, these groups attempt to carve out spaces free from government control and present a real threat to the national security interests of our friends and allies in the Western Hemisphere.

Colombia's success against the FARC, drug cartels, and paramilitary death squads is notable. The assault by the drug cartels on the Mexican government and its authority over the past several years has also recently come into focus, and reminds one how critical stability in Mexico is for the security of the United States and indeed the entire region. Mexico has the 14th largest economy on Earth, significant natural resources, a growing industrial base, and nearly free access to the biggest export market in the world immediately to its north.

The U.S. and Mexico must continue to cooperate to cut off the shipment of drugs into the United States and the flow of weapons and bulk cash into Mexico. In addition to conventional bank transfers, syndicates import between \$8 billion and \$10 billion in bulk cash each year. As traditional land routes for smuggling drugs into the US have been shut down, in most of the US there has been an increase in drug price and a decrease in drug purity but as in any conflict, the enemy has adapted, and now the maritime routes have become critical to smugglers. For Mexico the end game is based on:

- Mitigating the violence
- Changing the problem back from a national security problem to public security, law and order problem
- Raising the opportunity costs of doing drug business in Mexico

As Mexico becomes successful, the drug problem will expand into a greater regional problem, so a holistic approach is needed. The economics are shifting as well, with the United Kingdom and Spain now the most lucrative markets and the problem spilling into Japan, Russia, and China.



The Mexican government will remain severely challenged as its primary focus is its fight against these formidable non-state groups. A continuous cooperative effort by the U.S. to both minimize demand for illicit drugs and to defeat criminal elements involved within its borders will be pivotal to Mexico's success in confronting lawlessness and corruption.

South America's improving economic situation suggests that the region could be in a better position to deal with these problems.

Brazil, in particular, appears set on a course that could make it a major player among the great powers by the 2030s. Visionary investments in biofuels as well as the discovery of massive oil deposits off the Brazilian coast will increase its energy independence, while a growing industrial and service-based economy mean that the next several decades will see Brazil's economic and political power grow. Chile, Argentina, Peru and possibly Colombia will also most likely see sustained growth, if they can continue prudent economic policies in the face of the difficult economic headwinds of the global financial crisis.

The potential major challenges to the status quo at present are Cuba and Venezuela. The demise of the Castros will create the possibility of major changes in Cuba's politics. The future of Venezuela is harder to read. The Chavez regime is diverting substantial amounts of its oil revenues to further its anti-American "Bolivarian Revolution," while at the same time consolidating his regime's hold on power by distributing oil wealth to his supporters. By trying to do both, it is shortchanging investments in its oil infrastructure which have serious implications for the future. Unless Venezuela's current regime changes direction, it could use its oil wealth to subvert its neighbors for an extended period while pursuing anti-American activities on a global scale with the likes of Iran, Russia, and China, in effect creating opportunities to form anti-American coalitions in the region.

Africa

Sub-Saharan Africa presents a unique set of challenges, including economic, social, and demographic factors, often exacerbated by bad governance, interference by external powers, and health crises such as Acquired Immune Deficiency Syndrome (AIDS). Even pockets of economic growth are under pressure and may regress as multiple problems challenge government to build the capacity to respond. Some progress in the region may occur, but it is almost certain that many of these nations will remain on any list of the poorest nations on the globe. Exacerbating their difficulties will be the fact that the national borders, drawn by the colonial powers in the Nineteenth Century, bear little relation to tribal and linguistic realities.

The region is endowed with a great wealth of natural resources, a fact which has already attracted the attention of several powerful states. This could represent a welcome development because in its wake might follow foreign expertise and investment for a region in dire need of both. The importance of the region's resources will ensure that the great powers maintain a vested interest in the region's stability and development. If this engagement goes beyond aid to become true investment that supports economic progress beyond elites, then true prosperity, stability and security may emerge. Until that happens, the main driver for Joint Force involvement in Africa will be to avert humanitarian and even genocidal disasters as African states and sub-state tribal groups struggle for power and control among themselves. Also, the Joint Force may have a role in supporting security sector reform to assist African governments in their construction of the capacity to address instability within their own nations. Relatively weak African states will be very hard-pressed to resist pressure by powerful state and non-state actors who embark on a course of interference. This possibility is reminiscent of the late Nineteenth Century, when pursuit of resources and areas of interest by the developed world disturbed the affairs of weak and poverty stricken regions.

The Middle East and Central Asia

The fight against the enemy nearest to you has precedence over the fight against the enemy farther away. . . . In all Muslim countries the enemy has the reins of power. The enemy is the present rulers.³⁰ -Muhammad Abd al-Salam Faraj

Based on current evidence, a principal nexus of conflict will continue to be the region from Morocco to Pakistan through to Central Asia. Across this part of the globe a number of historical, dormant conflicts between states and nations over borders, territories, and water rights exist, especially in Central Asia and the Caucasus. Radical extremists will present the first and most obvious challenge. The issue here is not terrorism per se, because terrorism is merely a tactic by which those who lack the technology, weapons systems, and scruples of the modern world can attack their enemies throughout the world. Radical extremists who advocate violence constitute a transnational, theologically-based insurgency that seeks to overthrow regimes in the Islamic world. They bitterly attack the trappings of modernity as well as the philosophical underpinnings of the West despite the fact their operations could not be conducted without the internet, air travel and globalized financial systems. At a minimum radical Islam seeks to eliminate U.S. and other foreign presence in the Middle East, a region vital to U.S. and global security, but only as a first step to the creation of a Caliphate stretching from Central Asia in the East to Spain in the West and extending deeper into Africa.³¹

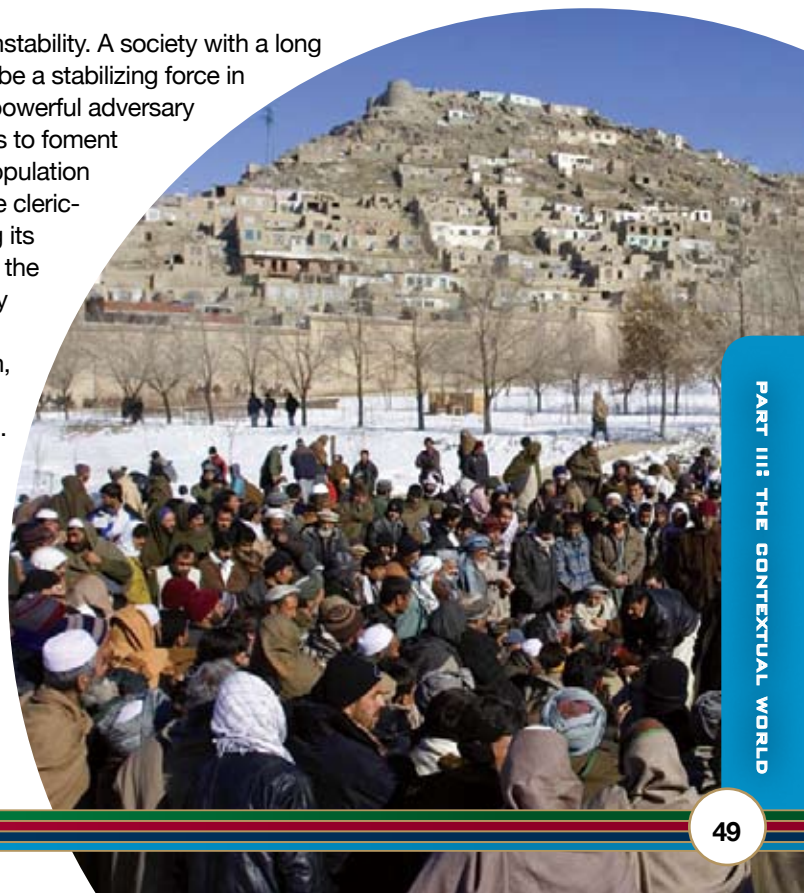
The problems in the Arab-Islamic world stem from the past five centuries, during which the rise of the West and the dissemination of Western political and social values paralleled a concomitant decline in the power and appeal of their societies. Today's Islamic world confronts the choice of either adapting to or escaping from a globe of interdependence created by the West. Often led by despotic rulers, addicted to the exports of commodities which offered little incentive for more extensive industrialization or modernization, and burdened by cultural and ideological obstacles to education and therefore modernization, many Islamic states have fallen far behind the West, South Asia, and East Asia. The rage of radical Islamists feeds off the lies of their often corrupt leaders, the rhetoric of radical imams, the falsifications of their own media, and resentment of the far more prosperous developed world. If tensions between the Islamic world's past and the present were not enough, the Middle East, the Arab heartland of Islam, remains divided by tribal, religious, and political divisions, making continued instability inevitable.

Iran has an increasingly important role in this center of instability. A society with a long and rich history, Iran has yet to live up to its potential to be a stabilizing force in the region. Although the U.S. has removed Iran's most powerful adversary (Saddam) and reduced the Taliban, the regime continues to foment instability in areas far from its own borders. Despite a population that remains relatively favorable to the United States, the cleric-dominated regime appears ready to continue dedicating its diplomatic and military capabilities to confrontation with the United States and Israel, and to cultivate an array of very capable proxy forces around the world. Hezbollah in Lebanon, Hamas in Gaza, various groups in Afghanistan, Yemen, Iraq, and the Caucasus, and other client states will serve to extend and solidify Iranian influence abroad.

Internal dynamics will continue to play a large role in the Iranian leadership's decision-making calculus. The intervention by the Iranian Government in the outcome of the June 2009 Presidential elections has

³⁰Muhammad Abd Al-Salam Faraj, *The Neglected Duty*, sections 68-70, trans. in Johannes J. G. Jansen, *The Neglected Duty: The Creed of Sadat's Assassins and Islamic Resurgence in the Middle East* (New York: Macmillan, 1986), p. 192. Abd Al-Salam Faraj was tried and hanged in connection with the 1981 assassination of Anwar al-Sadat.

³¹Samuel Huntington, *The Clash of Civilizations and the Remaking of World Order*, (New York: Simon and Schuster, 1996).



reinvigorated the Iranian public's widespread disillusionment with their ruling class, and the Iranian leadership will tread an increasingly fine line in maintaining political and social control while satisfying their public's growing desire for democratization and transparency. As one means of maintaining political support and suppressing dissension, Iran will continue to frame the nuclear power issue as a matter of nationalist pride and as the "right" of any sovereign country as a means to its own security. However, the Government of Iran will also have to match its nationalist rhetoric with tangible progress on the economic front. Extreme volatility in oil prices is eroding national revenues due to the failure of the regime to diversify the national economy, which stifles the future prosperity of the Iranian people. Iran must create conditions for its economic viability beyond the near term or face insolvency, internal dissension and ferment, and possible upheaval.

The economic importance of the Middle East with its energy supplies hardly needs emphasis. Whatever the outcome of the conflicts in Iraq and Afghanistan, U.S. forces will find themselves again employed in the region on numerous missions ranging from regular warfare, counterinsurgency, stability operations, relief and reconstruction, to engagement operations. The region and its energy supplies are too important for the U.S., China, and other energy importers to allow radical groups to gain dominance or control over any significant portion of the region.

WEAK & FAILING STATES

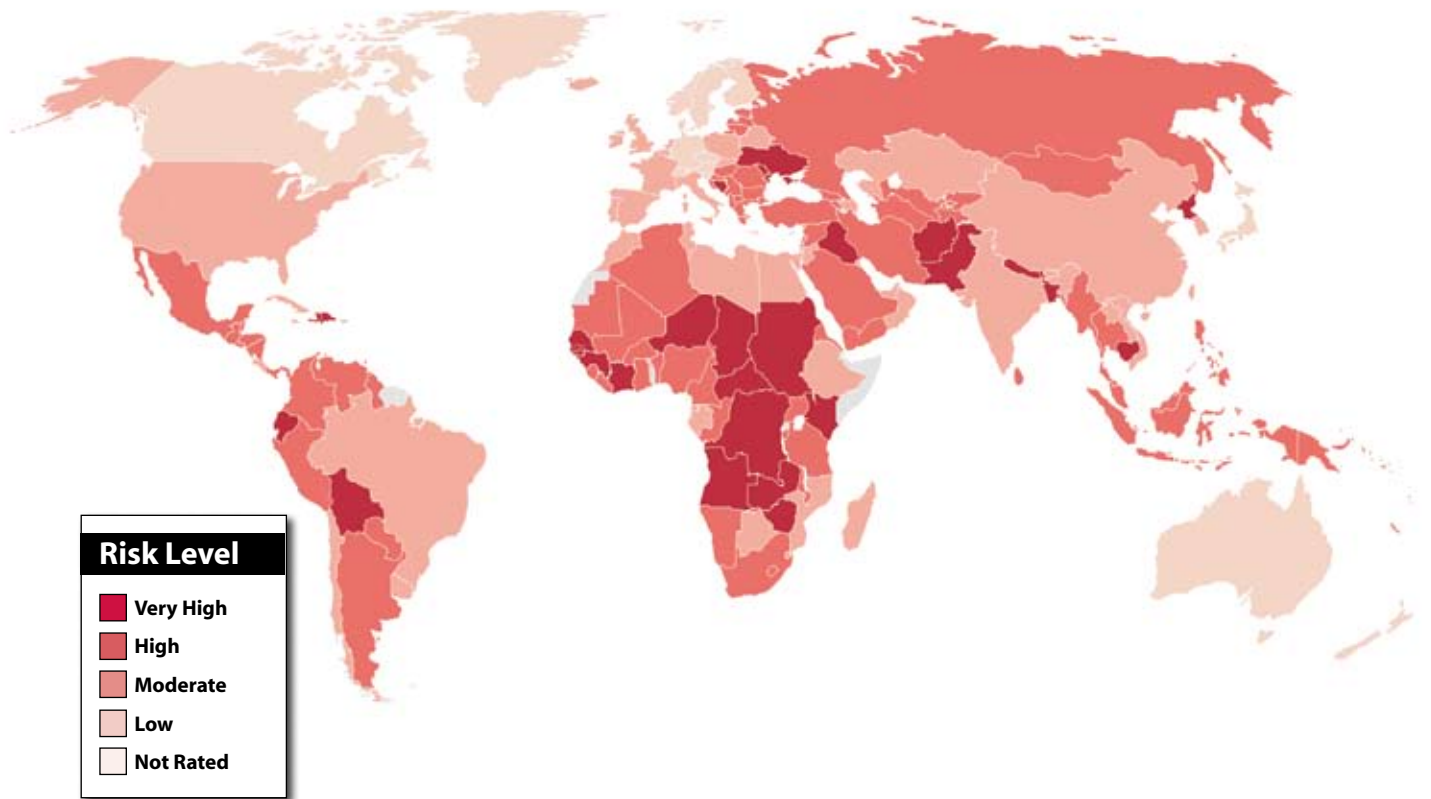
Weak and failing states will remain a condition of the global environment over the next quarter of a century. Such countries will continue to present strategic and operational planners serious challenges, with human suffering on a scale so large that it almost invariably spreads throughout the region, and in some cases possesses the potential to project trouble throughout the globalized world.

Yet there is no clear pattern for the economic and political troubles that beset these states. In some cases, disastrous leadership has wrecked political and economic stability. In others, wars among tribal groups with few cultural, linguistic, or even racial ties have imploded states. This was the case in Africa and the Middle East, where in the Nineteenth Century the European powers divided frontiers between their colonies on the basis of economic, political, or strategic necessity and paid scant attention to existing linguistic, racial, or cultural patterns of the tribal societies. These dysfunctional borders have exacerbated nearly every conflict in which our forces have been involved in these regions.

Many, if not the majority, of weak and failing states will be in Sub-Saharan Africa, Central Asia, the Middle East, and North Africa. A current list of such states much resembles the lists of such states drawn up a generation ago, suggesting a chronic condition, which, despite considerable aid, provides little hope for solution. There have been a number of nations that have escaped poverty, their successes resulting from intelligent leadership and a willingness to embrace integration into the global system. To date, the remaining weak and failing nations have chosen other paths.

There is one dynamic in the literature of weak and failing states that has received relatively little attention, namely the phenomenon of "rapid collapse." For the most part, weak and failing states represent chronic, long-term problems that allow for management over sustained periods. The collapse of a state usually comes as a surprise, has a rapid onset, and poses acute problems. The collapse of Yugoslavia into a chaotic tangle of warring nationalities in 1990 suggests how suddenly and catastrophically state collapse can happen – in this case, a state that had hosted the 1984 Winter Olympics at Sarajevo, then quickly became the epicenter of the ensuing civil war.

The erosion of state authority by extremist Islamist groups bears consideration due to the disastrous consequences for U.S. security such weakness could create. Pakistan is especially under assault, and its collapse would carry with it the likelihood of a sustained violent and bloody civil and sectarian war, an even bigger haven for violent extremists, and the question of what would happen to its nuclear weapons. That "perfect storm" of uncertainty alone might require the employment of U.S. and coalition forces in a situation



POLITICAL INSTABILITY INDEX

SOURCE: Economist Intelligence Unit

of immense complexity with the real possibility that control of nuclear weapons might be lost. In such environments, which include poorly governed tribal spaces and complex border zones, the Joint Force would be required to address a complex set of difficult scenarios and potential adversaries.

One of the most troubling and frighteningly common human disasters that occur as states collapse is that of ethnic cleansing and even genocide. This extreme violence, leading to the death and displacement of potentially millions, is usually traced to three interlocking factors. These include the collapse of state authority, severe economic turmoil, and the rise of charismatic leaders proposing the “ultimate solution” to the “problem” of ethnic or religious diversity or the division of economic or political spoils.

The drive to create ethnically or ideologically pure political entities has been a consistent feature of the era of self-determination and decolonization. The retreat of the European empires followed by the contraction of the dangerous, yet relatively stable U.S.-Soviet confrontation has laid bare a world of complex ethnic diversity and violent groups attempting to secure power while keeping ethnic minorities under heel. As sources of legitimate order have crumbled, local elites compete for the benefits of power. The stakes are particularly high in ethnically diverse regions.³²

Where might we expect to see a similar toxic mix of mismatched political governance, difficult economic circumstances, and aggressive politicians willing to use human differences to further their pursuit of political power? The ethnic confrontations in Europe have been largely solved through wars, including the Second World War and the Balkan Conflict; however, they may reemerge in new areas where migration, demographic decline, and economic stress take hold. Most problematic is the vast arc of instability between Morocco and Pakistan where Shias, Sunnis, Kurds, Arabs, Persians, Jews, Pashtuns,

³²Niall Ferguson, “The Next War of the World” *Foreign Affairs* (September 2006), p. 66.

Baluchs, and other groups compete with one another. Many areas of central Africa are also ripe for severe ethnic strife as the notion of ethnically pure nation states animate old grievances, with Rwanda and the Congo being examples of where this path might lead.

As Lebanon, Bosnia, Rwanda, and current operations in Iraq and Afghanistan have shown, the Joint Force may be called upon to provide order and security in areas where simmering political, racial, ethnic, religious, and tribal differences create the potential for large scale atrocities.

THE THREATS OF UNCONVENTIONAL POWER

While states and other conventional powers will remain the principal brokers of power, there is an undeniable diffusion of power to unconventional, nonstate, or trans-state actors. While these groups have rules of their own, they exist and behave outside the recognized norms and conventions of society.

Some transnational organizations seek to operate beyond state control and acquire the tools and means to challenge states and utilize terrorism against populations to achieve their aims. These unconventional transnational organizations possess no regard for international borders and agreements. The discussion below highlights two examples: militias and super-empowered individuals.

Militias represent armed groups, irregular yet recognizable as an armed force, operating within ungoverned areas or in weak failing states. They range from ad hoc organizations with shared identities to more permanent groups possessing the ability to provide goods, services, and security along with their military capabilities. Militias challenge the sovereignty of the state by breaking the monopoly on violence traditionally the preserve of states. An example of a modern day militia is Hezbollah, which combines state-like technological and warfighting capabilities with a “substate” political and social structure inside the formal state of Lebanon.

One does not need a militia to wreak havoc. Pervasive information, combined with lower costs for many advanced technologies, have already resulted in individuals and small groups possessing increased ability to cause significant damage and slaughter. Time and distance constraints are no longer in play. Such groups employ niche technologies capable of attacking key systems and providing inexpensive countermeasures to costly systems. Because of their small size, such groups of the “super-empowered” can plan, execute, receive feedback, and modify their actions, all with considerable agility and synchronization. Their capacity to cause serious damage is out of all proportion to their size and resources.

RADICAL IDEOLOGIES

In the 1940's the Democratic West faced down and ultimately defeated an extreme ideology that espoused destruction of democratic freedoms: Nazism. Afterward, these same powers resisted and overcame another opposing ideology that demanded the diminution of individual liberties to the power of the state: Communism. We now face a similar, but even more radical ideology that directly threatens the foundation of western secular society. Al Qaeda terrorists, violent militants in the Levant, radical Salafist groups in the Horn of Africa, and the Taliban in the mountains of Afghanistan are all examples of local groups pursuing local interests, but tied together by a common, transnational, and violent ideology. These groups are driven by an uncompromising, nihilistic rage at the modern world, and accept no middle ground or compromise in pursuing their version of the truth. Their goal is to force this truth on the rest of the world's population.

These radical ideological groups have discovered how to form cellular, yet global networks that operate beyond state control and have the capacity – and, most importantly, the will – to challenge the authority of states. Because these organizations do not operate within the international diplomatic systems, they will locate bases of operations in the noise and complexity of cities and use international law and the safe havens along borders of weak states to shield their operations and dissuade the U.S. from engaging them militarily. Combining extreme ideologies with modern technology, they use the Internet and other means of communications to share experiences, tactics, funding, and best practices to maintain a constant flow of relatively sophisticated

volunteers for their effort. Moreover, they have made common cause with other unconventional powers and will use these organizations to shelter their efforts and as fronts for their operations.

These radical groups are constructing globe-spanning “narratives” that effectively dehumanize their opponents, legitimizing in their eyes any tactic no matter how abhorrent to civilized norms of conduct. They believe that their target audience is the 1.1 billion Muslims who are 16 percent of the world’s total population. The use of terror tactics to shock and silence moderate voices in their operational areas includes suicide bombing and improvised explosive devices to kill and maim as many as possible. Most troubling is the possibility, indeed likelihood, that some of these groups will achieve a weapons of mass destruction (WMD) capability through shared knowledge, through smuggling, or through the deliberate design of an unscrupulous state. The threat of attacks both abroad and in the homeland using nuclear devices, custom bio-weapons, and advanced chemical agents intended to demonstrate dramatically our security weaknesses are real possibilities we must take account of in our planning and deterrent strategies.

No one should harbor the illusion that the developed world can win this conflict in the near future. As is true with most insurgencies, victory will not appear decisive or complete. It will certainly not rest on military successes. The treatment of political, social, and economic ills can help, but in the end will not be decisive. What will matter most will be the winning of a “war of ideas,” much of which must come from within the Islamic world itself.

THE PROLIFERATION OF WEAPONS OF MASS DESTRUCTION

A continuing challenge to American security will be the proliferation of nuclear weapons. Throughout the Cold War, U.S. planners had to consider the potential use of nuclear weapons both by and against the Soviet Union. For the past twenty years, Americans have largely ignored issues of deterrence and nuclear warfare. We no longer have that luxury. Since 1998, India and Pakistan have created nuclear arsenals and delivery capabilities. North Korea has on two occasions attempted to test nuclear devices and likely has produced the fissile material required to create weapons. North Korea is likely to attempt to weaponize its nascent nuclear capability to increase its leverage with its neighbors and the United States. Furthermore, the Iranian regime is pressing forward aggressively with its own nuclear weapons program. The confused reaction in the international community to Iran’s defiance of external demands to discontinue its nuclear development programs may provide an incentive for others to follow this path. Unless a global agreement to counter proliferation is successful, the Joint Force must consider a future in which issues of nuclear deterrence and use are a primary feature.

Some state or non-state actors may not view nuclear weapons as tools of last resort. It is far from certain that a state whose culture is deeply distinct from that of the United States, and whose regime is either unstable or unremittingly hostile (or both), would view the role of nuclear weapons in a fashion similar to American strategists. The acquisition of nuclear weapons by other regimes, whether they were hostile or not, would disrupt the strategic balance further, while increasing the potential for the use of nuclear weapons. Add to this regional complexity the fact that multiple nuclear powers will very likely have the global reach to strike other states around the world. These rising nuclear powers may view use of WMD very differently from the U.S. and may be willing to employ them tactically to achieve short term objectives. The stability of relations among numerous states capable of global nuclear strikes will be of central importance for the Joint Force. Assured second-strike capabilities and relations based on mutually-assured destruction may mean greater stability, but may effectively reduce access to parts of the world. On the other hand, fragile nuclear balances and vulnerable nuclear forces may provide tempting targets for nuclear armed competitors.

Any discussion of weapons of mass destruction must address also the potential use of biological weapons by sovereign states as well as non-state actors. By all accounts, such weapons are becoming easier to fabricate – certainly easier than nuclear weapons – and under the right conditions they could produce mass casualties, economic disruption, and terror on the scale of a nuclear strike. The knowledge associated with developing biological weapons is widely available, and the costs for their production remain modest, easily within reach of small groups or even individuals. The U.S. ability to deter nuclear-armed states and non-state actors needs to be reconsidered and perhaps updated to reflect this changing landscape.

TECHNOLOGY

Advances in technology will continue at an exponential pace as they have over the past several decades. Some pundits have voiced worries the United States will lose its lead as the global innovator in technology or that an enemy could make technological leaps that would give it significant advantages militarily. That is possible, but by no means a foregone conclusion.

Technology, Doctrine, and Successful Adaptation

Nothing more clearly illustrates the importance of imagination and an understanding of war in the incorporation of technology into military institutions than the utilization of radar over the course of the first two years of World War II. It was not until the 1930s that scientists in the major powers turned their attention to the possibility that radio waves could spot the flight of aircraft or the movement of ships at sea. The looming threat posed by enemy bombers in a period of worsening international tensions instigated investigations into such possibilities. By the late 1930s scientists in Britain, Nazi Germany, and the United States had all developed workable capabilities for identifying the height, direction, and speed of aircraft, as well as the number of aircraft.

Not surprisingly, the Germans, given their technological prowess, developed the most sophisticated radars, but the incorporation of that technological capability into their weapons systems lagged behind that of the British. It would be in the Battle of Britain that German failure in imagination would show to the greatest extent. The Luftwaffe had incorporated radar into its capabilities in the late 1930s, but only as a series of ground control intercept sites, each of which operated independently with no direct tie to a larger air defense system. It would not be until the catastrophe of Hamburg in Summer 1943 that the Luftwaffe would create an air defense system in which radar formed an integral part of a holistic approach to an air warning system of defense. But the British were already using such a system in 1940. As the scientific intelligence officer, R.V. Jones, recalled in his memoirs:

[The] German philosophy of [air defense] ran roughly along the lines that here was an equipment which was marvelous in the sense that it would enable a single station to cover a circle of a radius 150 kilometers and detect every aircraft within that range.... Where we had realized that in order to make maximum use of radar information the stations had to be backed by a communications network which could handle the information with the necessary speed, the Germans seemed simply to have grafted their radar stations on to the existing observer corps network which had neither the speed nor the handling capacity that the radar information merited.... The British approach... was entirely different. The British radar stations formed the eyes of a systematic approach to the air defense of the British Isles, so that RAF commanders could use their information to guide large numbers of Hurricanes and Spitfires against German bomber formations.³³

As Churchill noted in his memoirs about the Second World War, “it was the operational efficiency rather than novelty of equipment that was the British achievement.”³⁴

³³R.V. Jones, *The Wizard War, British Scientific Intelligence, 1939-1945* (New York, 1978), p. 199.

³⁴Winston Churchill, *The Second World War*, vol. 1, *The Gathering Storm* (Boston: Houghton Mifflin, 1948), p. 156

It is clear that technology, distinct from WMD, will proliferate. As anyone who has purchased a home computer knows, technological advances drive down the overall cost of ever-greater capability. The weapons market is no different. More advanced weaponry will be available to more groups, conventional and unconventional, for a cheaper price. This will allow relatively moderately funded states and militias to acquire long-range precision munitions, projecting power farther out and with greater accuracy than ever before. At the high end, it has already been seen that this reach extends into space with the public demonstration of anti-satellite weapons. Whether a small oil-rich nation or a drug cartel, cash will be able to purchase lethal capabilities. If manpower is a limiting factor, the advances in robotics provide a solution for those who can afford the price. This has the sobering potential to amplify further the power of the “super-empowered” guerilla.

In the globalized, connected world of science and technology, there is less chance that major technological advances could catch American scientists by surprise. In the past, the real issue with technology has not been simply that a particular nation has developed weapons far superior to those of its opponents. Rather, in nearly every case the major factor has been how military organizations have integrated technological advances into their doctrinal and tactical system. It has been the success or failure in that regard that has resulted in battlefield surprise and success. In 1940 French tanks were superior in almost every respect to those of the Germans. What gave the Wehrmacht its unique advantage was the fact that the Germans integrated the tank into a combined-arms team. It was the development of decentralized, combined-arms tactics by the Germans that led to their overwhelming victory – not new, more sophisticated weapons systems.

Thus, what has been unquestionably crucial is the degree of imagination military organizations have displayed in incorporating new technologies into their doctrine and concepts. The fact that the speed of technological change and invention proceeds exponentially will make the ability to adapt new technologies into the larger framework of military capability even more critical in coming decades.

A current example of the kind of technological surprise that could prove deadly would be an adversary’s deployment and use of disruptive technology, such as electro-magnetic pulse (EMP) weapons against a force without properly hardened equipment. The potential effects of an electromagnetic pulse resulting from a nuclear detonation have been known for decades. The appearance of non-nuclear EMP weapons could change operational and technological equations. They are being developed, but are joint forces being adequately prepared to handle such a threat? The impact of such weapons would carry with it the most serious potential consequences for the communications, reconnaissance, and computer systems on which the Joint Force depends at every level.

Other technologies will also serve to reduce the value of some military technologies. For example, directed energy systems may begin making an appearance in the defense against ballistic missiles, artillery, mortars, and rocket systems, and in tactical ground attack roles, perhaps allowing the Joint Force more room to maneuver and widen areas sheltered from attack by ballistic weaponry of all types. Laser systems will provide a potent combination of important capabilities that are not currently available, enhanced by the fact that they are ultra precise; can place focused high energy on a target at great distances; and are stealthy (i.e. largely silent and cannot be seen by the human eye). Laser systems will also have deep magazines and can rapidly retarget and fire multiple times at targets, if required. Thus, early operational development of laser systems will focus on applications where precision, speed, and volume of fire take precedence over sheer destructive power.³⁵ High powered microwave (HPM) weapons will offer both the Joint Force and our adversaries new ways to disrupt, degrade, or even destroy unshielded electrical systems, as well as electronics and integrated circuits upon which command and control, ISR and weapon systems themselves are based. The non-explosive, non-lethal aspects of HPM will prove adaptive against a variety of threats embedded and operating among civilian populations in urban environments.

³⁵Dan Wildt, Status and Operational Implications of Laser Weapons, p. 4.



Additionally, robotic systems are swiftly becoming part of the standard military toolkit and will be present on the battlefields of 2030. Robotics first found wide application in space (satellites are, in effect, rudimentary robotic systems), in the air, and at sea. Industrial robots are beginning to transition from fixed, single-purpose systems to mobile, multipurpose applications. Automobiles have begun to include robotic elements, now in parking applications, later perhaps in “assisted driving” modes in which the car will slow to avoid accidents when drivers are either inattentive or too slow to react. By 2030, multipurpose mobile robotic systems may be common in a wide range of civilian applications and environments, and as such, will be readily adaptable for military purposes by resourceful adversaries around the world. As our experiences in Iraq and Afghanistan illustrate, the process of integrating robots into the force will occur over time as they become ever-more capable having “some level of autonomy - adjustable autonomy, or supervised autonomy, or full autonomy - within mission bounds.”³⁶

At microscopic scale (smaller than 100 nanometers) matter has chemical, physical, and electrical properties dramatically different from those of the materials with which we are generally familiar. The next two decades will see the maturation of nanotechnology and engineering at molecular scales that will result in explosive growth in the ability to precisely and inexpensively control matter, opening a world of new capabilities that can be exploited. The eventual applications of these special purpose manufacturing systems include the ability to build almost any mechanical device cheaply and in large quantity, which could result in entirely new classes of sensors, armor, explosives, computing means, and energy generation and storage.³⁷

Nanoenergetics (NE), for example, has the potential to dramatically increase the power and efficiency of explosives and propellants in a number of military and space-related areas. Nanomaterials have allowed scientists in the lab to improve the yield of explosives and propellants by a factor of between two and ten-fold. The advance of NE-related technologies is constrained by a number of hurdles that, for now, prevent the wide proliferation of NE explosives and propellants. Difficulties remain in the ability to mass produce the materials and they can often be difficult to control and store accurately: however, these technical hurdles are probably surmountable. As such, it is very likely that a number of states will deploy NE technologies over the next two decades. Moreover, the spread of NE-related knowledge to non-state actors may allow the fabrication of crude yet powerful weapons that could be used in more powerful IEDs, missiles, mortars, and car bombs to further complicate U.S. operations.

The introduction of NE-related technologies implies that the U.S. Joint Forces may face familiar difficulties, only amplified by the new technology. Foreign state actors may use NE-related technology to strike at U.S. conventional military advantages. For example, naval mines and torpedoes may be dramatically shrunk, making them harder to detect and forcing ships to stay farther out to sea. More powerful and less costly propellants may allow more nations to access space through the use of NE propellants, possibly increasing the proliferation of anti-satellite capabilities to threaten orbiting assets upon which the Joint Force relies. The compounds required to manufacture NE materials are relatively uncontrolled, creating possible holes in our counter-terrorist efforts both at home and abroad. NE capabilities create opportunities for the Joint Force as well. For example, faster and more precise rockets may improve U.S. ability to negate foreign air defense systems through the use of very small bombs or cruise missiles.

A special class of nanotechnology, biotechnology, is focused on the manipulation and engineering of the substance of life, including such elements as the genetic code, protein engineering, and artificial life. Biotechnology as a field is now bigger than physics in terms of money spent, scientists employed, and discoveries made. The massive research and development effort will likely bear significant fruit over the next two decades as future bio-technological advances will allow human beings to manipulate the structure and function of our own bodies, as well as bend other living processes to do work for human needs. By the 2030's, biologists leveraging the nano-technology field may be able to integrate the “incredible biochemistry of life with the physics

³⁶From P.W. Singer, “Wired for War” (2009) p. 133.

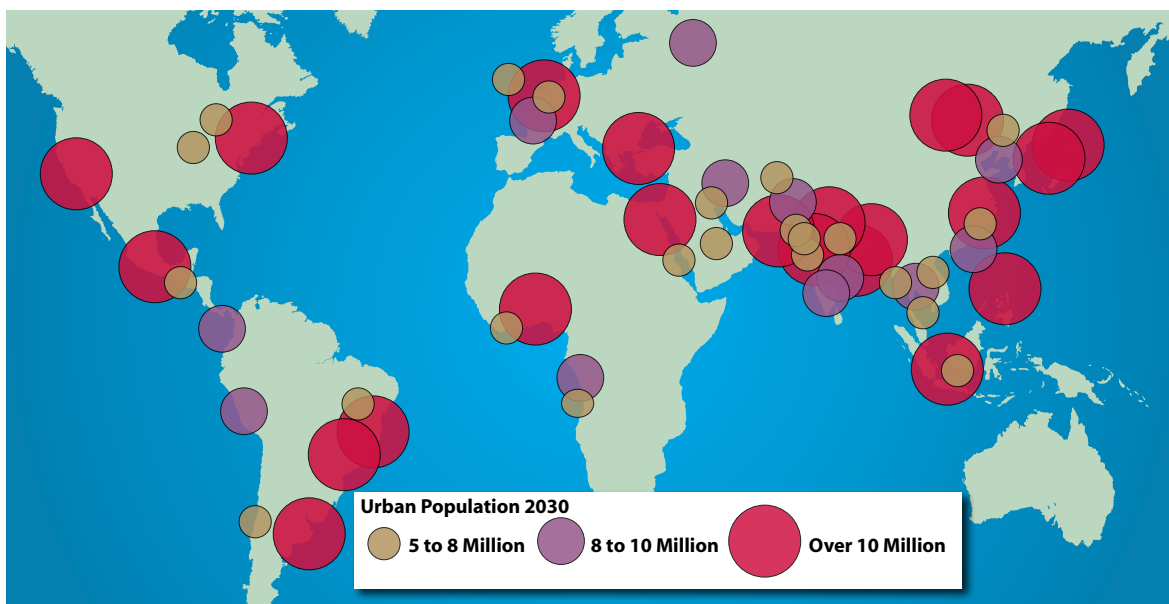
³⁷From Neil Jacobstein, Institute for Molecular Manufacturing, Unpublished Manuscript

of nonliving systems like semiconductors and fiber optics.”³⁸ These techniques could enhance human senses and physical abilities, while hindering the ability of adversaries to maintain a shield of anonymity so critical to their operations. Together, this might allow the Joint Force to better catalog, track, and separate hostiles from local populations.

It is by no means certain that the United States and its allies will maintain their overall lead in technological development over the next 25 years. America’s secondary educational system is declining in a relative sense when compared to leading technological competitors, e.g., India and China. America’s post-graduate educational programs and research laboratories remain the world’s most advanced magnets for some of the best scientific minds in the world. However, although many foreign students remain in the United States, significant numbers are now returning home. Without substantive changes to improve its educational system, the United States will pay a heavy price in the future. Furthermore, any militarily-significant technological surprise is likely to result from the combination of one or more technologies, and the novel use of the resulting combinations.

URBANIZATION

By the 2030s, five billion of the world’s eight billion people will live in cities. Fully two billion of them will inhabit the great urban slums of the Middle East, Africa, and Asia. Many large urban environments will lie along the coast or in littoral environments. With so much of the world’s population crammed into dense urban areas and their immediate surroundings, future Joint Force commanders will be unable to evade operations in urban terrain. The world’s cities, with their teeming populations and slums, will be places of immense confusion and complexity, physically as well as culturally. They will also provide prime locations for diseases and the population density for pandemics to spread.



MAJOR URBAN ENVIRONMENTS

SOURCE: United Nations World Urbanization Prospects

³⁸Freeman Dyson, Our Biotech Future, The New York Review of Books (Volume 54, Number 12), July 2007.

There is no modern precedent for major cities collapsing, even in the Eighteenth and Nineteenth Centuries, when the first such cities appeared. Cities under enormous stress, such as Beirut in the 1980s and Sarajevo in the 1990s, nevertheless managed to survive with only brief interruptions of food imports and basic services. As in World War II, unless contested by an organized enemy, urban areas are always easier to control than the countryside. In part, that is because cities offer a pre-existing administrative infrastructure through which forces can manage secured areas while conducting stability operations in contested locations. The effectiveness of that pre-existing infrastructure may be tested as never before under the stress of massive immigration, energy demand, and food and water shortages in the urban sprawl that is likely to emerge. More than ever before, it will demand the cultural and political knowledge to utilize that infrastructure.

Urban operations will inevitably require the balancing of the disruptive and destructive military operations with the requirements of humanitarian, security, and relief and reconstruction operations. What may be militarily effective may also create the potential for large civilian casualties, which in turn would most probably result in a political disaster, especially given the ubiquitous presence of the media.

As well, the nature of operations in urban environments places a premium on decentralized command and control, ISR, fire support, and aviation. Combat leaders will need to continue to decentralize decision-making down to the level where tactical leaders can act independently in response to fleeting opportunities.

THE BATTLE OF NARRATIVES

*The best thing that mujahidin can offer is a pure jihad, right choices, and mature media. This should raise a generation that carry one banner and initiate jihad.*³⁹ -Al-Maqdisi

*Today's world is of public opinion and the fates of nations are determined through its pressure. Once the tools for building public opinion are obtained, everything that you asked for can be done.*⁴⁰ -Bin Laden

Modern wars are fought in more than simply the physical elements of the battlefield. Among the most important of these are the media in which the “battle of narratives” will occur. Our enemies have already recognized that perception is as important to their successes as the actual events.

For terrorists, the Internet and mass media have become forums for achieving their political aims. Sophisticated terrorists emphasize the importance of integrating combat activities (terrorist attacks) into a coherent strategic communication program. Radical groups are not the only ones who understand the importance of dominating the media message. Russia synchronized military operations with a media offensive during its invasion of Georgia. Within days of the invasion, a small coterie of Russians, well known in the West, was placing editorials in major newspapers in the United States and Europe.

The battle of narratives must involve a sophisticated understanding of the enemy and how he will attempt to influence the perceptions not only of his followers, but the global community. His efforts will involve deception, sophisticated attempts to spin events, and outright lies. As Adolph Hitler himself once commented, the bigger the lie, the greater its influence. No matter how outlandish enemy claims may seem to Americans, those charged with the responsibility for information operations must understand how those who will receive the message will understand it. In this regard, they should not forget that the KGB's efforts at the end of the Cold War to persuade Africans that the CIA was responsible for the spread of AIDS throughout their continent are still reverberating in parts of Africa. Information has been, is, and

³⁹Abu Muhammad al-Maqdisi quote from May 2005. Abu Muhammad al-Maqdisi is the assumed name of Isam Mohammad Tahir al-Barqawi, an Islamist Jordanian-Palestinian writer.

⁴⁰FBIS Report, “Compilation of Usama Bin Laden Statements 1994-January 2004” p. 181.

will continue to be a strategic and political weapon. Its power will only increase as communications technology and the density of global media become more pervasive. At the end of the day, it is the perception of what happened that matters more than what actually happened.

Dominating the narrative of any operation, whether military or otherwise, pays enormous dividends. Failure to do so undermines support for policies and operations, and can actually damage a country's reputation and position in the world. In the battle of narratives, the United States must not ignore its ability to bring its considerable soft power to bear in order to reinforce the positive aspects of Joint Force operations. Humanitarian assistance, reconstruction, securing the safety of local populations, military-to-military exercises, health care, and disaster relief are just a few examples of the positive measures that we offer. Just as no nation in the world can respond with global military might on the scale of the United States, so too are we unmatched in our capacity to provide help and relief across thousands of miles. All of these tools should be considered in this battle to build trust and confidence. In the future, influencing the narrative by conveying the truth about America's intent, reinforced with supporting actions and activities, will become even harder. As communication technologies become more widely available, an ever-wider array of media will influence global public opinion. The U.S. Government and its Joint Forces will always be held to a much higher standard in this area than our adversaries. Joint Force commanders already wrestle with how to deal with a pervasive media presence, widespread blogging, almost instantaneous posting of videos from the battlefield, e-mail, and soldiers who can call home whenever they return to base. In the future they will be confronted with a profusion of new media linked to unimaginably fast transmission capabilities. To add even more complexity, in most situations the U.S. and its allies will have to deal with multiple, competing narratives at the same time. Just as we have already begun to think of every Soldier and Marine as an intelligence collector, we will also have to start considering them as global communication producers. Today, commanders talk about the strategic corporal whose acts might have strategic consequences if widely reported.

U.S. weapons employment in this battle of narratives must be in consonance with the message, even if it means sometimes bypassing tactical targets. Winning the battle has always been important, but in the pervasive and instantaneous communications environment expected in future decades, it will be absolutely crucial. For commanders not to recognize that fact could result in risking the lives of young Americans to no purpose.

Order or disorder depends on organization; courage or cowardice on circumstances; strength or weakness on dispositions... Thus, those skilled at making the enemy move do so by creating a situation to which he must conform; they entice him with something he is certain to take, and with lures of ostensible profit they await him in strength. Therefore, a skilled commander seeks victory from the situation and does not demand it of his subordinates.⁴¹ -Sun Tzu

PART IV: THE IMPLICATIONS FOR THE JOINT FORCE

In an uncertain world, which will inevitably contain enemies who aim either to attack the United States directly or to undermine the political and economic stability on which America, its allies, and the world's economy depend, the nation's military forces will play a crucial role. Yet, war is an inherently uncertain and costly endeavor. As the United States has discovered in Iraq and Afghanistan, there is no such thing as a rapid, decisive operation that does not generate unforeseen second and third order effects.

While the most important mission of the American military has been to fight and win the nation's wars, the ability of U.S. forces to deter conflict has risen to equal footing. Preventing war will prove as important as winning a war. In fact, the two missions are directly linked in a symbiotic relationship. The ability to deter a potential adversary depends on the capabilities and effectiveness of U.S. forces to act across the full range of military operations. Deterrence also depends on the belief on the part of the adversary that the United States will use its military power in defense of its national interests.

Since the fall of the Iron Curtain, the United States has conducted a global repositioning effort, removing forces from forward basing and garrisoning much of its military force structure at home. Simultaneously, the Joint Force has found itself in near-constant conflict abroad, and now forces based at home find themselves in heavy rotation, projecting forward into the Middle East and elsewhere around the world. After protracted action in Afghanistan and Iraq, the force now faces a period of reconstitution and rebalancing which will require significant physical, intellectual, and moral effort that may take a decade to complete. During this time, our forces may be located significant distances from a future fight. Thus, the Joint Force will be challenged to maintain both a deterrent posture and the capacity and capability to be forward engaged around the world, showing the flag and displaying the ability to act in ways to both prevent and win wars.

WAR IN THE TWENTY-FIRST CENTURY

As the discussion of trends and contexts has suggested, the roles and missions of the Joint Force will include: the protection of the homeland; the maintenance of the global commons; the deterrence of potential enemies; reassuring partners and allies; and when necessary, fighting and winning conflicts that may occur around the world. Such challenges are by themselves daunting enough, but they will occur in a period characterized by radical technological, strategic, and economic change, all of which will add to the complexities of the international environment and the use of military force. America's position in the world, unprecedented in almost every respect, will continue to present immense challenges to its military forces.

⁴¹Sun Tzu, *The Art of War*, trans. and ed. by Samuel B. Griffith (Oxford, 1963), p.93.

Shadow Globalization: “Bazaars of Violence”

The globalization of trade, finance, and human travel across international boundaries in the commercial world has an analogous dark side as well. Criminal and terrorist networks are intermingling to construct their own “shadow globalization,” building micro markets, and trade and financial networks that will enable them to coordinate nefarious activities on a global scale. The ubiquity and ease of access to these markets outside of legal structures attract shadow financing from a much larger pool, irrespective of geography. In these markets, rates of innovation in tactics, capabilities, and information sharing will accelerate and will enable virtual organizational structures that quickly coalesce, plan, attack, and dissolve. As they grow, these markets will allow adversaries to generate attacks at a higher level of rapidity and sophistication beyond law enforcement’s capability to interdict. For example, we have seen Somali pirates hiring indigenous spotters to identify ships leaving foreign harbors as prime targets for hijackings. We should expect shadow globalization to encourage this outsourcing of criminality to interface increasingly with insurgencies, such that actors in local conflicts will impact on a global scale, with perhaps hundreds of groups and thousands of participants.

The line between insurgency and organized crime will likely continue to blur. This convergence can already be seen in the connections between the FARC and cocaine trafficking, MEND and stolen oil, and the Taliban and opium production. This convergence means that funding for violent conflicts will interplay and abet the growth of global gray and black markets. The current size of these markets is already \$2-3 trillion and is growing faster than legal commercial trade; it has the potential to equal a third of global GDP by 2020. If so, violent insurgencies will have the ability to trade within this economic regime, amassing financial resources in exchange for market protection, and to mobilize those resources to rival state military capabilities in many areas. This gives them the increased ability to co-opt and corrupt state legal structures.

Shadow globalization may not be merely an Internet phenomenon, as groups are able to buy or lease their own commercial aircraft, fast boats, submarines, and truck fleets, and to move people and cargo across regions outside state-controlled legal trade regimes. Moreover, collaboration among younger generations through ever more powerful social media will likely be globally mainstream by 2025. The sophistication, ubiquity, and familiarity of these technologies will enable faster and more efficient market formation. This means that micro-market interaction will be both natural and habitual to its participants, creating opportunities for “flash micro-markets” and symbiosis between legal and illicit market elements.⁴²

Rapidly changing trends within the contexts described in the previous section will have profound implications for the character of war itself and the methods by which the Joint Force will wage it. Yet at its core, war will always involve a battle between two creative human forces. Our enemies are always learning and adapting. They will not approach conflicts with conceptions or understanding similar to ours. And they will surprise us. No amount of technology, conceptualization, or globalization will change those realities. Moreover, the employment of military force will continue to be conditioned by politics – not only those of the United States and its allies, but by those of its opponents. Above all, Joint Force commanders, their staffs, and their subordinates must have a clear understanding of the strategic and political goals for which they conduct military operations. In almost every case, they will find themselves working closely with partners, a factor which will demand not only a thorough understanding of U.S. political goals, but coalition goals as well.

⁴²Moisis Naim, “Illicit: How Smugglers, Traffickers, and Copycats are hijacking the Global Economy.” Doubleday. 2005

It is in this political-strategic environment that the greatest surprises for Americans may come. The United States has dominated the world economically since 1915 and militarily since 1943. Its dominance in both respects now faces challenges brought about by the rise of powerful states. Moreover, the rise of these great powers creates a strategic landscape and international system, which, despite continuing economic integration, will possess considerable instabilities. Lacking either a dominant power or an informal organizing framework, such a system will tend toward conflict. Where and how those instabilities will manifest themselves remains obscure and uncertain.

Between now and the 2030s, the military forces of the United States will almost certainly find themselves involved in combat. Such involvement could come in the form of a major regular conflict or in a series of wars against insurgencies. And as this document has suggested, the Joint Force will certainly find itself engaged not only against terrorist organizations but also against those who sponsor them. One of the great problems that confronts American strategists and military planners is the conundrum of preparing for wars that remain uncertain as to their form, location, level of commitment, the contribution of potential allies, and the nature of the enemy. The only matter that is certain is that joint forces will find themselves committed to conflict against the enemies of the United States and its Allies, and in defense of its vital interests.

PREPARING FOR WAR

There are two particularly difficult scenarios that will confront joint forces between now and the 2030s. The first and most devastating would be a major war with a powerful state or hostile alliance of states. Given the proliferation of nuclear weapons, there is considerable potential for such a conflict to involve the use of such weapons. While major regular war is currently in a state of hibernation, one should not forget that in 1929 the British government adopted as its basic principle of defense planning the assumption that no major war would occur for the next ten years. Until the mid-1930s the “Ten Year Rule” crippled British defense expenditures. The possibility of war remained inconceivable to British statesmen until March 1939, despite the movement of formerly democratic governments to Fascism.

The one approach that would deter a major conflict involving U.S. military forces, including a conflict involving nuclear weapons, is the maintenance of capabilities that would allow the United States to wage and win any possible conflict. As the Romans so aptly commented, “if you wish for peace, prepare for war.” Preventing war will in most instances prove more important than waging it. In the long term, the primary purpose of the military forces of the United States must be deterrence, for war in any form and in any context is an immensely expensive undertaking both in lives and national treasure. When, however, deterrence fails then the military effectiveness of those forces will prove crucial. Here the efforts that have gone into preparing U.S. forces for conflict at their various training centers must continue to receive the same support and attention in the future that they have had over the course of the past 30 years. As the Japanese warrior/commentator Miyamoto Musashi noted in the seventeenth century:

There is a rhythm in everything, but the rhythms of the art of war are especially difficult to master without practice.... In battle, the way to win is to know the opponent's rhythms while using unexpected rhythms yourself, producing formless rhythms from the rhythms of wisdom. ⁴³

The second scenario of particular significance confronting the Joint Force is the failure to recognize and fully confront the irregular fight that we are in. The requirement to prepare to meet a wide range of threats is going to prove particularly difficult for American forces in the period between now and the 2030s. The difficulties involved in training to meet regular and nuclear threats must not push preparations to fight irregular war into the background, as occurred in the decades after the Vietnam War. Above all, Americans must not allow themselves to be deluded into believing their future opponents will prove as inept and incompetent as Saddam Hussein's regime was in 1991 and again in 2003. Having seen the capabilities of U.S. forces in both regular and irregular war, future opponents will understand “the American way of war” in a particularly detailed and thorough way.

⁴³Quoted in Thomas Cleary, *The Japanese Art of War, Understanding the Culture of Strategy* (Boston, 1992), p. 38.

In Iraq and Afghanistan our opponents have displayed considerable capacity to learn and adapt in both the political and tactical arenas. More sophisticated opponents of U.S. military forces will certainly attack American vulnerabilities. For instance, it is entirely possible that attacks on computers, space, and communications systems will severely degrade command and control of U.S. forces. Thus, those forces must possess the ability to operate effectively in degraded conditions. Conflicts or events beyond the scope of traditional war, such as 9/11, or non-attributable use of WMD, will create demands that will stress the Joint Force.

In planning for future conflicts, Joint Force commanders and their planners must factor two important constraints into their calculations: logistics and access. The majority of America's military forces will find themselves largely based in North America. Thus, the first set of problems involved in the commitment of U.S. forces will be logistical. In the 1980s many defense pundits criticized the American military for its supposed over-emphasis on logistics, and praised the German Wehrmacht for its minimal "tooth to tail" ratio in the Second World War. What they missed was that the United States had to project its military forces across two great oceans, then fight massive battles of attrition in Europe and in East Asia. Ultimately, the logistical prowess of U.S. and Allied forces translated into effective combat forces, defeated the Wehrmacht on the Western Front, crushed the Luftwaffe in the skies over Germany, and broke Imperial Japan's will.

The tyranny of distance will always influence the conduct of America's wars, and joint forces will confront the problems associated with moving forces over great distances and then supplying them with fuel, munitions, repair parts, and sustenance. In this regard, a measure of excess is always necessary, compared to "just in time" delivery. Failure to keep joint forces who are engaged in combat supplied could lead to disaster, not just un-stocked shelves. Understanding that requirement represents only the first step in planning, but it may well prove the most important.

The crucial enabler for America's ability to project its military power for the past six decades has been its almost complete control over the global commons. From the American standpoint, the Battle of the Atlantic that saw the defeat of the German U-boat menace in May 1943 was the most important victory of the Second World War. Any projection of military power in the future will require a similar enabling effort, and must recognize that the global commons have now expanded to include the domains of cyber and space. The Joint Force must have redundancy built in to each of these areas to ensure that access and logistics support are more than "single-point safe" and cannot be disrupted through a single point of attack by the enemy.

In America's two recent wars against Iraq, the enemy made no effort to deny U.S. forces entry into the theater. Future opponents, however, may not prove so accommodating. Hence, the second constraint confronting planners is that the United States may not have uncontested access to bases in the immediate area from which it can project military power. Even in the best case, allies will be essential to providing the base structure required for arriving U.S. forces. But there may be other cases in which uncontested access to bases is not available for the projection of military forces. This may be because the neighborhood is hostile, smaller friendly states have been intimidated, negative perceptions of America exist, or states fear giving up a measure of sovereignty. Furthermore, the use of bases by the Joint Force might involve the host nation in conflict. Hence, the ability to seize bases in enemy territory by force from the sea and air could prove the critical opening move of a campaign.

Given the proliferation of sophisticated weapons in the world's arms markets, potential enemies – even relatively small powers – will be able to possess and deploy an array of longer-range and more precise weapons. Such capabilities in the hands of America's enemies will obviously threaten the projection of forces into a theater, as well as attack the logistical flow on which U.S. forces will depend. Thus, the projection of military power could become hostage to the ability to counter long-range systems even as U.S. forces begin to move into a theater of operations and against an opponent. The battle for access may prove not only the most important, but the most difficult.

One of the major factors in America's success in deterring potential aggressors and projecting its military power over the past half century has been the presence of its naval forces off the coasts of far-off lands. Moreover, those forces have proven of enormous value in relief missions when natural disasters have struck. They will continue to be a significant factor in the future. Yet, there is the rising danger with the increase in precision and longer range missiles that presence forces could be the first target of an enemy's action in their exposed positions.

THE CONDUCT OF MILITARY OPERATIONS IN THE TWENTY-FIRST CENTURY

The forms of future war will each present peculiar and intractable challenges to joint forces. The U.S. will always seek to fight and operate with partners, leading where appropriate and prepared to act alone when required to support our vital national interests. However, there is every likelihood that there will be few lines of delineation between one form of conflict and another. Even in a regular war, potential opponents, engaged in a life and death struggle with the United States, may engage U.S. forces across the spectrum of conflict. Thus, the Joint Force must expect attacks on its sustainment, its intelligence, surveillance and reconnaissance (ISR) capabilities, and its command and control networks. The Joint Force can expect future opponents to launch both terrorist and unconventional attacks on the territory of the continental United States, while U.S. forces, moving through the global commons, could find themselves under persistent and effective attack. In this respect, the immediate past is not necessarily a guide to the future.

Deterrence of aggression and of certain forms of warfare will remain an important element of U.S. national security strategy, and will be profoundly affected by three aspects of the future joint operating environment.

First, U.S. deterrence strategy and operations must be tailored to address multiple potential adversaries. A "one-size-fits-all" deterrence strategy will not suffice in the future joint operating environment. Such an approach assumes that we fully understand the thought processes, strategic culture, and value hierarchy and can precisely ascertain "red lines" of the enemy – as well as transmit to the adversary our own. Deterrence campaigns that are tailored to specific threats and thoroughly evaluate each of these elements ensure that the unique decision calculus of individual adversaries is influenced.

Second, the increased role of transnational non-state actors in the future joint operating environment will mean that U.S. deterrence operations will have to find innovative new approaches to "waging" deterrence against such adversaries. Non-state actors differ from state actors in several key ways from a deterrence perspective. It is often more difficult to determine precisely who makes the key decisions one seeks to influence through deterrence operations. Non-state actors also tend to have different value structures and vulnerabilities. They often possess few critical physical assets to hold at risk and are sometimes motivated by ideologies or theologies that make deterrence more difficult (though usually not impossible). For instance, some supply or support chains within a networked adversary (such as facilitators, financiers, and recruiters) may be deterrable as opposed to the notionally undeterrable suicide bomber. Non-state actors are also often dependent on the active and tacit support of state actors to support their operations. Finally, our future deterrence operations against non-state actors will likely suffer from a lack of well established means of communications that usually mark state-to-state relations.

Third, continued proliferation of WMD will make the U.S. increasingly the subject of the deterrence operations of others. As such, the U.S. may find itself in situations where its freedom of action is constrained by an enemy's threat or actual use of WMD unless it can develop ways to circumvent the enemy's deterrent logic.

U.S. nuclear forces will continue to play a critical role in deterring, and possibly countering, threats to our vital interests in the future joint operating environment. Additionally, U.S. security interests will be advanced to the degree that its nuclear forces are seen as supporting global order and security. To this end, the U.S.

must remain committed to its moral obligations and the rule of law among nations. It must provide an example of a responsible and ethical nuclear power in a world where nuclear technology is available to a wide array of actors. Only then will the existence of powerful U.S. nuclear forces, in support of the global order, provide friends and allies with the confidence that they need not pursue their own nuclear capabilities in the face of growing proliferation challenges around the world.

Unfortunately, we must also think the unthinkable – attacks on U.S. vital interests by implacable adversaries who refuse to be deterred could involve the use of nuclear weapons or other WMD. For both deterrence and defense purposes, our future forces must be sufficiently diverse and operationally flexible to provide a wide range of options for response. Our joint forces must also have the recognized capability to survive and fight in a WMD, including nuclear, environment. This capability is essential to both deterrence and effective combat operations in the future joint operating environment.

If there is reason for the Joint Force commander to consider the potential use of nuclear weapons by adversaries against U.S. forces, there is also the possibility that sometime in the future two other warring states might use nuclear weapons against each other. In the recent past, India and Pakistan have come close to armed conflict beyond the perennial skirmishing that occurs along their Kashmir frontier. Given India's immense conventional superiority, there is considerable reason to believe such a conflict could lead to nuclear exchanges. As would be true of any use of nuclear weapons, the result could be massive carnage, uncontrolled refugee flows, and social collapse – all in all, a horrific human catastrophe. Given 24/7 news coverage, the introduction of U.S. and other international forces to mitigate the suffering would be almost inevitable.

Nuclear and major regular war may represent the most important conflicts the Joint Force could confront, but they remain the least likely. Irregular wars are more likely, and winning such conflicts will prove just as important to the protection of America's vital interests and the maintenance of global stability.

A significant component of the future operating environment will be the presence of major actors which are not states. A number of transnational networked organizations have already emerged as threats to order across the globe. These parasitic networks exist because communications networks around the world enable such groups to recruit, train, organize, and connect. A common desire to transcend the local, regional, and international order or challenge the traditional power of states characterizes their culture and politics. As such, established laws and conventions provide no barrier to their actions and activities. These organizations are also becoming increasingly sophisticated, well-connected, and well-armed. As they better integrate global media sophistication, lethal weaponry, and potentially greater cultural awareness and intelligence, they will pose a considerably greater threat than at present. Moreover, unburdened by bureaucratic processes, transnational groups are already showing themselves to be highly adaptive and agile.

Irregular adversaries will use the developed world's conventions and moral inhibitions against them. On one hand, the Joint Force is obligated to respect and adhere to internationally accepted laws of war and legally binding treaties to which the United States is a signatory. On the other hand, America's enemies, particularly the non-state actors, will not find themselves so constrained. In fact, they will likely use law and conventions against the U.S. and its partners.



The Future Adversary

U.S. forces face a dynamic and challenging operational landscape that requires joint forces able to function and succeed across a wide spectrum of conflict. U.S. defense planning must better address changes in how adversaries approach warfare, the contested nature of the global commons, and the challenges posed by weak and failing states.

Ongoing operations and potential future conflicts are likely to be increasingly multidimensional, as a greater number of state and non-state actors employ a range and mix of military and non-military instruments in order to achieve their objectives. The continued dominance of America's armed forces in large-scale force-on-force warfare provides powerful incentives for adversaries to employ methods designed to offset our strengths. From non-state actors using highly advanced military technology and sophisticated information operations, to states employing unconventional technologies, to the improvised explosive devices that pose grave threats to our troops, smart adversaries will tailor their strategies and employ their capabilities in sophisticated ways.

The term "hybrid" had recently been used to express the seeming increased complexity of war, the multiplicity of actors involved, and the blurring between simple categories of conflict. The use of hybrid approaches is not new. Innovative and learning adversaries have employed unique approaches to unbalance an enemy throughout history. What makes today's hybrid challenges particularly threatening is the combination of lethal technology and the protracted and population-centric nature of contemporary conflicts.

While hybrid approaches constitute the most notable pressing challenge in the contemporary security environment, the Joint Force must anticipate the employment of yet other unique methods. Future adversaries will work through surrogates, including terrorist and criminal networks, manipulate access to energy resources and markets, and exploit perceived economic and diplomatic leverage in order to complicate our plans. Such approaches will be obscure and difficult to detect, placing a premium on broad-based intelligence efforts, as well as our ability to rapidly innovate and adapt.

In light of these trends, the Joint Force must prepare for conflicts in which state adversaries adapt modern military technologies to protracted forms of conflict, including the use of proxy forces to coerce and intimidate, as well as conflicts in which non-state actors use operational concepts and high-end capabilities traditionally associated with state actors. The Joint Force must retain military capabilities across the spectrum of conflict and consider the proper balance among capabilities while encouraging adaptive forces in the face of complex challenges. The overwhelming conventional capabilities within the Joint Force are a stabilizing force in the international system that cannot be overlooked in the process of enhancing and rebalancing our capability in irregular warfare. The future cannot be predicated upon a single or preclusive vision of conflict at one extreme or the other. We face an era of failed states, destabilized elements and high end asymmetric threats. We must be prepared to adapt rapidly to each specific threat, and not narrowly focus only on preferred modes of warfare.



In the end, irregular war remains subject to the same fundamental dynamics of all wars: political aims, friction, human frailties, and human passion. Nevertheless, the context within which it occurs does contain substantial differences. As Mao suggested, the initial approach in irregular war must be a general unwillingness to engage the regular forces they confront. Rather, according to him, they should attack the enemy where he is weakest, and in most cases this involves striking his political and security structures. It is likely that the enemy will attack those individuals who represent the governing authority or who are important in the local economic structure: administrators; security officials; tribal leaders; school teachers; and business leaders among others, particularly those who are popular among the locals. If joint forces find themselves engaged in such situations, a deep understanding of the local culture and the political situation will be fundamental to success.

What past irregular wars have suggested is that military organizations confronted by irregular enemies must understand the “other.” Here, the issue is to understand not just the nature of the conflict, but the “human sea,” to use Mao’s analogy, within which the enemy swims. The great difficulty U.S. forces will confront in facing irregular warfare is that such conflicts require a thorough understanding of the cultural, religious, political, and historical context within which they are being fought. When U.S. interests are threatened and the host nation is incapable of maintaining security, a substantial commitment of “boots on the ground” for sustained periods of time will be required. There are no “rapid decisive operations” in irregular warfare that can achieve swift victory. Instead of short decisive campaigns, U.S. forces can only achieve victory by patient, long-term commitment to a consistent, coherent, strategic, and political approach.

This coherent approach must also take into account the capabilities of other elements of government. Often, interagency cooperation is difficult because of the relative imbalance of resources between the Department of Defense and other agencies. For this reason, the Joint Force can expect tension to exist between tasks that must be completed to accomplish the mission, and enabling the interagency community to engage effectively. Ultimately, insurgencies can be won only by local security forces. As a result, often the most important role the U.S. military will play is not as the chief combatant, but rather as the ally or partner of the local security forces as they defend themselves and their society. Moreover, the indices of success are counter-intuitive: fewer engagements, not more; fewer arms captured, not more; fewer enemy dead, not more.

What is of critical importance in irregular war is the ability to provide security to the local population with the purpose of denying the enemy the ability to survive among the people, allowing local police and military forces to build up sufficient strength to control their area of responsibility. Moreover, the Joint Force should contribute to the development of political legitimacy so that local police and military forces are acting with the support of the local population and not against it. The security side of the mission requires a deep understanding of local culture, politics, history, and language. In all cases the use of firepower will be a necessary feature, but will be balanced with non-lethal activities. Equally important will be the provision of high quality advisors to indigenous forces. Ultimately, U.S. forces can neither win a counterinsurgency, nor ensure that indigenous forces are regarded as the legitimate governing authority. Only the locals can put in place the elements guaranteed to achieve lasting victory.

The current demographic trends and population shifts around the globe underline the increasing importance of cities. The urban landscape is steadily growing in complexity, while its streets and slums are filled with a youthful population that has few connections to their elders. The urban environment is subject to water scarcity, increasing pollution, soaring food and living costs, and labor markets in which workers have little leverage or bargaining power. Such a volatile mixture is a recipe for trouble.

Joint forces will very likely find themselves involved in combat and relief operations in cities. Such areas will provide adversaries with environments that allow them to hide, mass, and disperse, while using the cover of innocent civilians to mask their operations. They will also be able to exploit the interconnections of urban terrain to launch attacks on infrastructure nodes with cascading political effects. Urban geography will provide enemies with a landscape of dense buildings, an intense information environment, and complexity, all of which ease the conduct of operations. Any urban military operation will require a large number of troops which could consume manpower at a startling rate. Moreover, operations in urban terrain will confront Joint Force commanders with a number of conundrums. The very density of buildings and population will inhibit the use of lethal means, given the potential for collateral damage and large numbers of civilian casualties. Such inhibitions could increase U.S. casualties. Additionally, any collateral damage carries with it difficulties in winning the “battle of narratives.” How crucial is the connection between collateral damage and disastrous political implications is suggested by the results of a remark an American officer made during the Tet offensive that American forces “had to destroy a village to save it.” That thought process and suggestion of indiscriminate violence reverberated throughout the United States and was one contributing factor to the erosion of political support for the war.

Terrorists will be able to internalize lessons rapidly from their predecessors and colleagues without the bureaucratic hindrances found in nation states. One must also note the growing convergence of armed groups and terrorist organizations with criminal cartels like the drug trade to finance their activities. Such cooperative activities will make terrorism and criminal cartels only more dangerous and effective.

Operations against terrorists will keep Special Forces busy, with conventional forces increasingly active in supporting and complementary roles. If the Middle East continues on its troubled path, it is likely the war on terrorism will not continue on its current levels, but could actually intensify. Where an increase in terrorist activity intersects with energy supplies or weapons of mass destruction, Joint Force commanders will confront the need for immediate action, which may require employment of significant conventional capabilities.

Finally, we should underline that persistent media coverage, coupled with changing Western attitudes about the use of force, will influence and be influenced by U.S. military operations. What will be of great importance in the situations in which force is being employed will be the narrative that plays on the world’s stage. The Joint Force commander must understand that he should place particular emphasis on creating and influencing that narrative. Moreover, he must be alert and ready to counter the efforts of the enemies of the United States to create and communicate their own narratives. The enemy’s ability to operate within the local cultural and social fabric will complicate such efforts. This puts at a premium the ability of Americans to understand the perceptual lenses through which others view the world.

If the Department of Defense can't figure out a way to defend the United States on a budget of more than a half a trillion dollars a year, then our problems are much bigger than anything that can be cured by buying a few more ships and planes..." -Defense Secretary Robert Gates⁴⁴

PART V: FUTURE OPPORTUNITIES

Despite the uncertainties and ambiguities involved in the future security environment there are four specific areas in which the U.S. military can better prepare its forces and its future leaders to meet the challenges that will come. As this study suggested at the beginning, perhaps the most important cultural attributes military organizations require are the abilities to innovate in peacetime and to adapt in war to the actual realities of the battlefield. Unfortunately, the present cultural and bureaucratic structures of the Department of Defense place major hurdles in the path of future innovation and adaptation.

One can encapsulate those obstacles in simple words or phrases. What needs reform is obvious, but the actual execution, the important "how to," of any effective reform will require sustained efforts against comfortable, deeply entrenched bureaucracies, sub-cultures within the military, and the demands of the present.

PROFESSIONAL MILITARY EDUCATION: THE CRITICAL KEY TO THE FUTURE

The future Chairmen of the Joint Chiefs of Staff of the 2030s and the Service Chiefs of Staff are already on active duty in the rank of Captain or Lieutenant. The Combatant Commanders and all the future flag and general officers of the U.S. military in the 2030s are currently on active duty. The Command Sergeants Major and Command Master Chiefs of the Joint Force in 2030 are in uniform. In other words, preparation of the senior military leaders of the 2030s has already begun!

As Sir Michael Howard once commented, the military profession is not only the most demanding physically, but the most demanding intellectually. Moreover, it confronts a problem that no other profession possesses:

There are two great difficulties with which the professional soldier, sailor, or airman has to contend in equipping himself as commander. First, his profession is almost unique in that he may only have to exercise it once in his lifetime, if indeed that often. It is as if a surgeon had to practice throughout his life on dummies for one real operation; or a barrister only appeared once or twice in court towards the close of his career; or a professional swimmer had to spend his life practicing on dry land for the Olympic Championship on which the fortunes of his entire nation depended. Secondly, the complex problem of running a [military service] at all is liable to occupy his mind so completely that it is easy to forget what it is being run for.⁴⁵

While the preparation of these young officers and NCO's must begin with their training as military professionals, it must also include their intellectual education to confront the challenges of war, change, and differing cultures. In the space of twenty-five years, they must master the extraordinarily difficult tasks of their military specialties as well as those required by joint warfare. But equally important, they must prepare themselves for the challenges presented by war and the projection of military force.

⁴⁴Secretary Gates quoted in Todd Harrison, "Avoiding a DOD Bailout" CSBA Perspective (October 2009).

⁴⁵Sir Michael Howard, "The Uses and Abuses of Military History," Journal of the Royal United Service Institution, 107 (1962), p. 6.

The recent experiences of Afghanistan and Iraq have made clear that in war, human beings matter more than any other factor. There are other dimensions, including technology, that are important, but rarely decisive. Above all, officers who hold the senior positions in the American military in the 2030s must develop a holistic grasp of their professional sphere and its relationship to strategy and policy. At this level of leadership, the skills for building trust that will serve as the foundation for harmonious teams is as important as tactical or operational prowess, perhaps even more so. The future Joint Force must have leaders who can form and lead effective coalitions. Such a preparation will take a lifetime of intellectual pursuit because it demands an ability to understand the “other” in his terms, historically, politically, culturally, and psychologically.

The world of the 2030s will demand more than mastery of the technical and operational aspects of war. The nature of the decentralized operations required by many of the challenges described thus far will require that NCOs must also understand the fundamental nature of war as well as other cultures and peoples as they will undoubtedly confront challenges equivalent to those faced by today’s midgrade officer. Both officers and enlisted leaders will find themselves participating in coalitions in which the United States may or may not be the leading actor, but in which partners will invariably play an important part. All military leaders must be equipped with the confidence to decide and act in ambiguous situations and under conditions where clear direction from above may be lacking or overcome by changing conditions.

This is the fundamental challenge the U.S. military will confront: providing the education so that future leaders can understand the political, strategic, historical, and cultural framework of a more complex world, as well as possess a thorough grounding in the nature of war, past, present, and future. Admiral Stansfield Turner, initiator of the intellectual revolution at the Naval War College in the early 1970s, best expressed the larger purpose of professional military education:

War colleges are places to educate the senior officer corps in the larger military and strategic issues that confront America... They should educate these officers by a demanding intellectual curriculum to think in wider terms than their busy operational careers have thus far demanded. Above all the war colleges should broaden the intellectual and military horizons of the officers who attend, so that they have a conception of the larger strategic and operational issues that confront our military and our nation.⁴⁶

The complexity of the future suggests that the education of senior officers must not remain limited to staff and war colleges, but should extend to the world’s best graduate schools. Professional military education must impart the ability to think critically and creatively in both the conduct of military operations and acquisition and resource allocation. The Services should draw from a breadth and depth of education in a range of relevant disciplines to include history, anthropology, economics, geopolitics, cultural studies, the ‘hard’ sciences, law, and strategic communication. Their best officers should attend such programs. Officers cannot master all these disciplines, but they can and must become familiar with their implications. In other words, the educational development of America’s future military leaders must not remain confined to the school house, but must involve self-directed study and intellectual engagement by officers throughout their careers.

⁴⁶Quoted in Williamson Murray, “Grading the War Colleges,” *The National Interest*, no. 6 (Winter 1986–87), pp. 12–19.

DEFENSE ECONOMICS AND ACQUISITION POLICIES

The Joint Operating Environment has spoken thoroughly about the asymmetric application of power by potential enemies against U.S. military forces. There is also an asymmetry with respect to the defense spending of the United States and its potential opponents, particularly in irregular contexts. One needs only to consider the enormous expenditures the United States has made to counter the threat posed by improvised explosive devices (IED). The United States has spent literally billions to counter these crude, inexpensive, and extraordinarily effective devices. If one were to multiply this ratio against a global enemy, it becomes untenable. While this asymmetry is most dramatic against the low-end threat, it applies to more sophisticated threats as well. Current economics indicate that China likely spends far less than the United States for the same capability. For instance, because of its labor market, the cost of many of the raw materials, and the savings gained by reverse engineering technologies, the Chinese space program costs an order of magnitude less than that of the United States.

There have been justified calls for acquisition reform for decades; and while a number of groups have produced clear, forthright, and intelligent studies, little actual reform has taken place. This is no longer a bureaucratic issue: it is having strategic effects. Given the potential for disruptive technologies in the near future, the crucial issue will not be whether the United States possesses such technologies, but how affordably, how quickly, and how effectively joint forces can incorporate those technologies not only into their concepts, doctrine, and approach to war, but actually into the units and commands that will have to use those technologies on future battlefields.

Without a thorough and coherent reform of the acquisition processes, there is the considerable prospect an opponent could incorporate technological advances more affordably, quickly, and effectively with serious implications for future joint forces.

THE PERSONNEL SYSTEM

Perhaps the greatest difficulty confronting the Joint Force in preparing future leaders has to do with a personnel system that derives its philosophical and instrumental basis from reforms conducted between 1899 and 1904 and laws passed by Congress in 1947, 1954, and 1986. To a considerable degree, these reforms and laws still drive Service approaches to recruiting, training, promoting, and eventually retiring their personnel.

The current personnel and leader development system has its roots in long outdated mobilization systems for mass armies in world wars. And while the United States has had an all-volunteer force for 35 years, the bureaucracy still “thinks” and “acts” from an industrial age, mobilization-based leader development paradigm. That approach continues to shape how the Services approach training and education, often confusing the two. That state of affairs must change.

If we expect to develop and sustain a military that operates at a higher level of strategic and operational understanding, the time has come to address the recruiting, education, training, incentive, and promotion systems so that they are consistent with the intellectual requirements for the future Joint Force.

SIMULATION

Since the Second World War, over 86% of our casualties have been ground forces. Lessons from campaigns in Iraq and Afghanistan have shown that this trend is continuing. The trends and contexts described in the Joint Operating Environment describe a world in which ground forces will face increasing risk of casualties. Just as the United States has invested heavily in simulation capabilities to train aircraft pilots, to simulate naval warfare, and to replicate high intensity ground combat for our armored forces, so we must make similar commitments to simulations for our infantry and their supporting arms. The complex urban and human terrain will demand new approaches to virtual simulations for our ground forces as well. These simulations should replicate the cultural environment as well as the tactical and operational difficulties that the future Joint Force will confront as it engages in combat, stability, relief, and engagement operations around the globe.

Do make it clear that generalship, at least in my case, came of understanding, of hard study and brain-work and concentration. Had it come easy to me, I should not have done [command] so well. If your book could persuade some of our new soldiers to read and mark and learn things outside drill manuals and tactical diagrams, it would do a good work. I feel a fundamental crippling in curiousness about our officers. Too much body and too little head. The perfect general would know everything in heaven and earth.

So please, if you see me that way and agree with me, do use me as a text to preach for more study of books and history, a greater seriousness in military art. With two thousand years of example behind us, we have no excuse, when fighting, for not fighting well...⁴⁷
-T.E. Lawrence to B.H. Liddell Hart, 1933

CONCLUDING THOUGHTS

The ability to innovate in peacetime and adapt during wars requires institutional and individual agility. This agility is the product of rigorous education, appropriate application of technology, and a rich understanding of the social and political context in which military operations are conducted. But above all, innovation and adaptation require imagination and the ability to ask the right questions and represent two of the most important aspects of military effectiveness. The former occurs during peace, when there is time available to think through critical issues. However, in peacetime, military organizations cannot replicate the actual conditions of combat, when a human opponent is trying his best to destroy U.S. forces. Thus, there must be a premium on studying the military from an evidence-based perspective, using history, current operations, wargames, and experiments to better understand the present and future. There must be a connection between lessons learned in the schools and those learned in experimentation. Above all, there must be rigorous, honest red teaming and questioning of assumptions. “All the objectives were met” is a guarantee of intellectual dishonesty as well as a recipe for future military disaster.

Adaptation provides little time for reflection because of the immediate demands of combat. Here the patterns of thought developed in peacetime are crucial because adaptation requires questioning the assumptions with which military organizations have entered the conflict. In the past, military organizations that have ruthlessly examined and honestly evaluated their assumptions in peacetime have done the same in war. Those that have not have invariably paid a terrible price in lives. Those commanders who have listened and absorbed what their subordinates had to say were those who recognized what was actually happening in combat, because they had acculturated themselves to learning from the experiences of others.

The defining element in military effectiveness in war lies in the ability to recognize when prewar visions and understanding of war are wrong and must change. Unfortunately, in terms of what history suggests, most military and political leaders have attempted to impose their vision of future war on the realities of the conflict in which they find themselves engaged, rather than adapting to the actual conditions they confront. The fog and friction that characterize the battle space invariably make the task of seeing, much less understanding what has actually happened, extraordinarily difficult. Moreover, the lessons of today, no matter how accurately recorded and then learned, may no longer prove relevant tomorrow. The enemy is human and will consequently learn and adapt as well. The challenges of the future demand leaders who possess rigorous intellectual understanding. Providing such grounding for the generals and admirals, sergeants and chiefs of the 2030s will ensure that the United States is as prepared as possible to meet the threats and seize the opportunities of the future.

⁴⁷As quoted in Robert B. Asprey, *War in the Shadows, The Guerrilla in History*, vol. 1 (Garden City, NY: Doubleday & Company, 1975), p. 270.



UNITED STATES JOINT FORCES COMMAND