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## **Whither the RMA: Two Perspectives on Tomorrow's Army**

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WHITHER THE RMA:  
TWO PERSPECTIVES ON TOMORROW'S ARMY

Paul Bracken  
Raoul Henri Alcalá

July 22, 1994

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## FOREWORD

In April 1994, the Army War College's Strategic Studies Institute hosted its Fifth Annual Strategy Conference. The theme was "The Revolution in Military Affairs: Defining an Army for the 21st Century."

After fourteen of the nation's leading defense scholars presented papers on the role of technology in warfare, Dr. Paul Bracken and Colonel Raoul Alcala concluded the conference by offering their views of the Army's future.

Professor Bracken contends that the Army of the 21st century will be shaped by domestic concerns as much as by external threats to American security. While economic power has increased in importance in international relations, military power as traditionally conceived remains a dominant factor in determining the status of nations.

Colonel Alcala holds that there is a connection between ideas and principles. He argues that doctrines will provide the basis for force structure, training, and weapons acquisition. Colonel Alcala maintains that the Army's ability to stay intellectually ahead of the technology will be, perhaps, its greatest challenge in the next century.

To contribute to an informed debate about the 21st century Army, the Strategic Studies Institute presents the views of these respected defense intellectuals for your consideration.

JOHN W. MOUNTCASTLE  
Colonel, U.S. Army  
Director, Strategic Studies Institute

## BIOGRAPHICAL SKETCHES OF THE AUTHORS

PAUL BRACKEN is Professor of Political Science and Professor of International Business at Yale University. He teaches in the areas of comparative politics, international relations, and international management, and is coordinator of international studies at the Yale Management School. Before joining the Yale faculty in 1983 he was at the Hudson Institute, New York, for 10 years where he led a broad range of policy and economic studies. Dr. Bracken is the author of *The Command and Control of Nuclear Forces*, and *Reforging European Security* and many journal articles dealing with defense planning, Asian security, and crisis management. He is working on a book, entitled *High Command*, on the evolution of large military organizations and their effects on the state system and international relations over the past 500 years. A member of the Council on Foreign Relations, Dr. Bracken received his B.S. in engineering from Columbia University and his Ph.D. in operations research from Yale University.

RAOUL HENRI (ROY) ALCALA heads a consulting firm, Alcala Enterprises, which specializes in national security and foreign policy issues. He retired from the Army in 1991 after four years in charge of the Army Chief of Staff's Assessment and Initiatives Group. As a White House Fellow during the Ford and Carter administrations, he served as a special assistant to the Federal Energy Administrator and to the President's National Security Advisor. A graduate of the U.S. Military Academy, he holds masters degrees from Yale University in international relations and political science. His most recent publications include a policy paper for The Atlantic Council of the United States: *The United States, NATO and Security Relations with Central and Eastern Europe*; studies for the RAND Corporation, Los Alamos National Laboratory, and Science Applications International Corporation on military strategy, technology, doctrine, training, and force structure, and on Persian Gulf lessons learned. He is a Senior Fellow of Business Executives for National Security.

**FUTURE DIRECTIONS FOR THE ARMY**  
**Paul Bracken**

The best way to think about a Revolution in Military Affairs (RMA) comes from a statement often heard in business strategic planning circles: It is easier to design the future than it is to predict it. To think about a revolution in military affairs as a predictive problem misses many of the most important parts of such an exercise. The responsibility of the national security community is to consider the impact of such a development precisely because it is a national security community. Other nations may move in this direction, and if ours does not, some extremely serious imbalances could follow. Although the end of the cold war is recognized by all, and although the unique conditions of the Gulf War are understood not to characterize all future U.S. conflicts, a considerable gap exists between saying these things and actually absorbing them into our institutions. This conference is about taking a step in this institutional redirection: making the change from talking about revolutionary change to having it influence the Army's day-to-day actions.

In an article published a few months ago I argued that current thinking about national security was too constrained by immediate issues. Downsizing of force structure, budget reductions, Bosnia, and other issues were all very real problems requiring a great deal of leadership and management to properly deal with them.<sup>1</sup> But there was a subconscious tendency to use these immediate issues as signposts of the future, even though little evidence existed to support such a use. From many years of experience in long-range planning at the Hudson Institute came some difficult lessons learned. The hardest single feature in conducting long-range planning and brainstorming sessions for both government and private sector clients was to divorce oneself from current conditions. In the 1960s, for example, a great many planning studies were built around a continuation of the 'youth revolution' of that decade, the introduction of new lifestyles, tastes, and social norms. In the 1970s many planning studies were premised around various solutions and outcomes to the energy crisis. By then the youth movement had been forgotten, just as in the 1980s the energy crisis had been forgotten.

With the end of the cold war it is understandable that immediate issues would be analyzed as future signposts. In the absence of other guidance there is not much else on which to base planning. But if anything seems certain it is that in not too many years a new equilibrium in U.S. military spending will be established, the situation in Bosnia will be accepted, and that new dangers will loom on the nation's horizon.

Yet another aspect of change needs to be emphasized: the inability of people who have been involved in a field for most of their careers to preserve their capacity to be intellectually surprised. A tendency exists in large organizations for members to see the world in terms of an unsurprising repetition of bureaucratic turf grabs, interdepartmental feuds, and self-serving individual behavior. Economist A.O. Hirschman has written that in the field of Latin American economic development too many experts have been unable to see the dramatic changes that have taken place. Instead, they see an out-of-date world defined by government incompetence, civil-military tensions, and technological backwardness. While these exist, important transformations have occurred

in political and economic structures, capital markets, and civil control of the military. If the U.S. Army must maintain one attitude, it is the capacity to accept new ideas and patterns of thinking.

### **Cycles.**

The Army can partly construct its future, but it also must accept certain features of its external environment. Quite often the confluence and superposition of these features of the environment defines the future which actually occurs. For example, in the 1930s the Army found itself in a world where 1) technology in the form of the internal combustion engine created new opportunities for fundamental changes in military strategy and tactics; 2) international relations among states were turning to a more predatory structure with the rise of the communist and fascist dictatorships; and 3) the industrial structure of the United States was changing to permit dramatically new and increased kinds of mobilization, as well as a newly skilled type of soldier who could read, drive a truck, and follow complicated orders.

It is unlikely that had not all three of these developments materialized, the nation would have achieved the success it did in World War II. There is a tendency to want to reduce complex institutional behavior to simple one-dimensional characterizations: "revolutionary technology holds the answer to the future of war," or "without any external threats there is no need for advanced strategic thinking." In fact, something much more complicated takes place involving the interaction of unrelated cycles of trend development. The job of leadership in any institution is to examine the internal and external organizational environments and decide what are the most important cycles affecting them. Strategies must then be formulated to manage the relationship of these, one to the other. The Army leadership in the 1930s had to think not just about the revolutionary implications of the tank, but also of ways to mass produce tanks, train people to repair them, and leverage off other parts of the enormous (relative to Germany and Japan) U.S. industrial base to produce a congruent force structure with a tooth-to-tail ratio that made sense.

With this perspective it is useful to consider 'cycles' in key technical and environmental areas. Cycles do not imply predictable periodicity, but rather significant changes in underlying structures that are in most respects unpredictable.

*Technology.* This probably receives more attention than any other part of the Army's environment. The cold war against the Soviet Union was fought as a virtual war through technological innovation designed to deter military expansion and risk taking. A large technical in-house community has been created. There is a strong tendency for institutional momentum to continue to operate in this manner.

This is not the place for a technical forecast in the dynamic fields of computers, communications, or information technology. Army thinking in this area emphasizes the importance of information, and especially of information dominance over an opponent.<sup>2</sup> Whether this is the right way to look at technology cycles is not clear, but experience in the Gulf War and a perceived likelihood that the United States can exploit such an advantage because of its capacities in computers and telecommunications remains a powerful motivating force, one which, in addition, looks to the future rather than the present.

A key question in this area is whether the current technological defense community created to innovate during the cold war will remain the best way to do so in the future. The Department of Defense is going through the process of an 'acquisition reform,' in which it is estimated that somewhere between 35 - 40 percent overhead rates are attached to the defense acquisition process. With declining defense budgets the overhead costs which once were tolerable are no longer so.

*Industrial Structure Changes.* In the United States, the military can only be as strong as the underlying economy. During World War II the military gained leverage from the industrial economy. During the cold war the Pentagon gained leverage from the strong technical base, both in industry and academia. To the extent that a revolution in military affairs is actually underway, the relationship between it and the rest of the U.S. and world economies must be explored.

Here something of a paradox may be facing the United States. Against a foe whose strategy and technology were well understood, the Soviet Union, there could be clear objectives to optimize against. This meant that a stable research and development infrastructure could be supported and cultivated. This infrastructure contributed mightily to containment of the Soviet Union. But in a different security environment a new set of military-industry relationships must be forged.

Against a more nebulous set of objectives it is not at all clear that the current R&D infrastructure is what is needed. With its large in-house laboratory and arsenal system, and with a relationship to the private sector that goes through specialized prime defense contractors, the current system has an exorbitant set of overhead and transactions costs associated with it. Thus, the present contracting budget climate may present real opportunities to deconstruct and re-engineer the U.S. defense industrial base.

Another way of putting it is that the budget environment may force technological and industrial changes in the Army's relationship to the larger civilian economy that would not otherwise be politically feasible. Rather than decrying adverse impacts of reduced defense expenditures, it may prove to be the case that the creative destruction of these old relationships is a necessary precursor to full Army participation in the revolution in military affairs. There is historical precedent for this viewpoint. In the 1890s and early 1900s the United States was a rising world power, and it took a supply and logistics debacle in the Spanish American war to spur Congress to eliminate the corrupt old bureau system of service supply.<sup>3</sup> But what followed was not so much designed from scratch as superior, as one which intrinsically relied on new capacities of the American economy in administration, professional management, and scale economies. The result was a system that was by no means perfect, but which possessed an ability to respond to large crises, something demonstrated in World War II.

What are some of the new trends in the American economy that could bear on the Army's participation in a revolution in military affairs? One of the most striking features is the increase in efficiency arising from the appearance of tens of thousands of smaller firms, compared to the Fortune 500, which are the incubators of technological innovation. A tendency to think of the familiar giant corporate names as the engines of the U.S. economy remains, but this view is a decade out of date. The



computer revolution has produced a wholesale restructuring of industrial organization, whereby smaller firms have been able to capture economies of scope as well as flexible economies of scale.<sup>4</sup> This has produced a move toward strong regional economies, places where these smaller firms thrive for reasons of infrastructure availability, concentration of technical personnel, and flexible relations among actors.<sup>5</sup>

In a related trend the main arena of technical innovation has shifted to the commercial from the government sector. In the 1950s it was the government, principally in DoD but also in other agencies like NASA, that produced the early jet aircraft, computers, and materials breakthroughs. It is now well appreciated that the U.S. Government is a much smaller consumer of these than the private sector. However, it is less well appreciated that the main source of innovation has shifted to the private commercial sector. The U.S. Government, at least currently, maintains a large collection of laboratories and research facilities which it seeks to convert to other purposes. The existing defense industrial base cannot keep up with the private market in producing innovative solutions to problems. But the real question has less to do with the proper disposal of the cold war defense industrial base and everything to do with creating something new. Military planners are confronted with the difficult issue of thinking about a new industrial era, just as planners were in the early part of this century as they confronted their industrial era. This is probably the area in which the revolution in military affairs is in greatest need of thinking.

There are cycles in the relationship between public and private sectors. At certain times government research leads the private sector, and at other times it lags behind it. By all indications we are in a period of private sector leadership, and this is the location of innovation that all of the services must look to for the future. This represents a cultural shift for the services which during the cold war could rely on in-house research establishments to keep them supplied with weapons, ideas, and innovations. A considerable change in outlook will be needed for the Army and for the other services if they are to relate to this different shape of the U.S. economy.

Associated with this trend is what in business schools is referred to as *true* multinational companies, companies where national borders represent little more than lines on a map. Companies like GE, Siemens, Philips, and, increasingly, even Japanese firms, disperse their skills and research around the globe. Old notions, such as the need to source domestically, may be hard to change, but they are no longer meaningful in today's global economy. As one example, the most advanced battery research in the world doesn't take place in any one national facility. Rather, it is dispersed in joint venture consortia with specialists from many countries working together in Europe, Japan, and the United States, sharing information among firms. For the U.S. government to try to beat this with an in-house government laboratory, hampered by civil service and acquisition rules, and not exposed to the competitive pressures of the marketplace, is well nigh hopeless.

Organizing the mass of technical capability in today's world will be very different than dealing with a handful of defense and industrial giants as prime contractors. The services' entire approach to acquisition will have to be changed, something which will include standard notions of acquisition reform, but which will go far beyond them. The essence of the problem is to open up the Army (and all of the

services) to these new industrial structures. Army people will have to be expert on what is going on in the private sector in many different areas, and can no longer become specialists in compliance to outdated and inefficient congressionally mandated purchasing rules. There are several different ways to go about this, and a great deal of experimentation will have to occur to reach a comfort level acceptable to the Army. No one has the answer to these new relationships. But it seems clear that there will be far more outsourcing of research and development and that a new cadre of industrial specialties will have to be created.

The reason for outsourcing research and development will not be to save scarce dollars per se, but rather to revitalize existing organizations by introducing new sources of information and new ways of looking at problems. The Army will need to develop "architectural knowledge teams"--in-house specialists who are experts in the latest technical developments, but who understand that to get something done they do not have to do it themselves in a government controlled laboratory. Rather, they can save money, time and get a better result by using the private sector. In a few years, the idea of posting Army officers to commercial establishments will be routine, even though these establishments seemingly have nothing directly to do with military research or production. Strategic sourcing will be elevated to a much higher status than it currently has, and a thorough overhaul of training and education in the methods of strategic alliances, outsourcing, fluid contracting, and preservation of architectural knowledge will be necessary.

It may be useful in this respect to suggest a long-term Army issue related to these industrial trends, but one which requires immediate decisions. At the present time the Army is actively participating in a congressionally mandated base realignment and closure (BRAC) review. The way this is conceived is similar in all of the services: what they can dispose of with least pain. What is not considered is what structure the Army should move toward, rather than what it should move away from. The Army should think through one of the trends mentioned above, the emergence of regional economies built on innovation and attainment of a critical mass of technical personnel. These private sector "sticky regions"<sup>6</sup> are very likely to be the "Ruhr Valleys" of the next century, and the Army must consider ways to have some presence in them if they are to harness the potential of the new industrial era to the revolution in military affairs.

*Strategic and International Trends.* Whether classified as future "threats" or as part of the emerging security environment, strategic and international trends clearly have a profound impact on the Army as an institution. Here an especially strong tendency exists to view current problems as indicators of what the long-term future will hold. A tension exists today between conceiving future conflicts as being variants of the war against Iraq, or in terms of more likely contingencies which, while quite different from one to the next, entail a more politically-controlled use of force, emphasize special low-intensity operations, and have as their goal the restoration of order in disintegrating nations and states.

There can be little doubt that these latter contingencies, exemplified by Somalia and Bosnia, are very likely to continue in other parts of the world. The disintegration of the Soviet empire and the

extraordinary momentum of Third World population growth promise no shortage of crises. Rather than predicting where crises might occur it is better to stipulate that they *will* occur somewhere, and that it is not possible to consider them as lesser included cases of larger regional military contingencies.

Although different perspectives exist about whether the United States should build its military planning on threats of a regional character (North Korea, Iraq, Iran, etc.) or so-called peace keeping operations (Bosnia, Somalia), another kind of competitor now receives only scant attention, with little more than a dismissal of it as a possibility. This is a peer competitor in the sense of a major power which could threaten the security of the United States by challenging us in important parts of the world. Over the past 100 years we have faced five such competitors: Britain in the last century, and then Imperial Germany, Imperial Japan, Nazi Germany, and Soviet Russia.

An issue that needs considerably more thought is how the collapse of communism has created a situation where a replacement world ideology of capitalism will change the structure of international relations. While at first glance the triumph of capitalism seems like a victory for the United States, a broader perspective is needed in thinking this through. The question can be asked "Will a capitalist China, or India, or Russia, or whatever, create more problems for the United States than did their communist or socialists predecessors?" An unwarranted assumption is that capitalism *means* democracy, and that because democracies do not fight one another the United States will be a long-term beneficiary of this trend. But the relationship between these economic and political concepts is highly complex. The Soviet Union, in fact, is the distinctive exception to the rule that America's previous peer competitors had important aspects of capitalism associated with their economic systems. Large private business enterprises dominated the political landscape of Japan, Germany, and Britain when they were in competition with the United States. This contributed to their dynamism.<sup>7</sup>

The issue could as easily be looked at another way: capitalism means that once poor countries will become rich, and they will do so in a way that uses modern technology supported by market allocations that is likely to be more efficient than the Soviet Union was. Capitalism does not equate with democracy, it only equates with private ownership and use of markets. Indeed, the very gap between capitalism and democracy has been the principal source of tension in modern Europe since before World War II.

The world is now going through the greatest expansion of bringing new people into the world marketplace than at any time in history. Adding the populations of Russia, China, and India two billion people once excluded from capitalism are now being thrust into it in a very short time. When this transformation has occurred in other places it has produced enormous upheavals. Consider the history of 19th and early 20th century Europe when enormous class and national tensions were catalyzed and manipulated for strategic ends and led to the disasters which took place in Europe before 1945. There are no necessary reasons why this should occur again, but there are reasons to take this trend as a good one for constructing signposts about the character of America's strategic future. The argument that the extension of capitalism to most of Asia will produce comparable change to what its extension to Europe did is at least as plausible as the argument that history is at an end

because of a consensus that liberal democracy is the best way to develop in the future.

What are the signposts? Several different indicators might be worth looking for. Change in the focus of Asian military institutions from an *inward* to an *outward* orientation is one, a change that is arguably taking place today.<sup>8</sup> Were this to occur there would also follow an evolution of strategic thought of a kind very different than what we in the United States now think about. In terms of doctrine for employing new military technologies, the United States today considers it inconceivable than anyone could match us. The lesson of the cold war is thought to be that the Soviet Union proved this point, for even they could not compete against us. But the extent to which their economic deficiencies contributed to their defeat suggests that other more flexible economic actors could mount a different kind of challenge to America. We would do well to recall the effects of very different operational strategies employed by nations such as Japan in the 1890s, Vietnam in the 1960s, and Germany in the 1930s, which all pursued their objectives with different approaches than anticipated.

Finally, another signpost comes from what have been referred to as B+ countries, that is, countries which start out as relatively minor B league military actors, but who gradually learn how to operate modern military forces in a way that while it does not turn them into peer competitors with the United States does create military potential for quick wins in regional conflicts. We have become used to thinking about B powers as being unable to manage modern forces, and for the wars they fought to be long duration battles of attrition. The Iran-Iraq war has come to symbolize for many people what their military capacities allow them to do: get many people killed through high level strategic incompetence, wherein each side proves incapable of decisive breakthrough attacks--thus an absence of quick wins in Third World conflicts.<sup>9</sup>

This has characterized such conflicts in the past two decades. But it may not do so in the future. It would be dangerous indeed to assume that all Third World countries are incapable of learning how to operate modern forces. American industry once made the mistake of assuming that Japanese, and later Korean, industry could not manage the modern commercial enterprise. No one in American business believes this any longer. The Korean economic miracle, and the current Chinese economic miracle take place with an absence of democracy in Korea of a kind we think of, and not at all in the case of contemporary China. If industrialization can cross borders regardless of political systems, so too can military modernization.

The first developing country which can master minimal improvements in national command and control of their armed forces will obtain a tremendous military advantage over its neighbors. To the extent this change is also accompanied by acquisition of weapons of mass destruction--nuclear, biological, and chemical--an overnight change in regional stability will take place. It is not that there will actually be an overnight change in military capacities. Rather, it will appear that way to the world, and especially to the countries in the affected region because it is so unexpected. It will be extremely important for the Army to monitor these changes and to develop signposts so that it is not surprised as an institution.

The evolution of B to B+ countries is not something that is part of the long distance future. It is a development with near and immediate prospects. Many countries are studying the lessons of DESERT STORM, not just the United States. Not all will be able to draw the appropriate lessons, and not all will be able to execute needed changes even if they are properly recognized. There will most likely be a differential adaptation, as there is in any competitive situation, with great benefits to the first mover. With the present distribution of world power there will be great pressure on the United States to take the lead in dealing with such a problem, and this pressure would be a reversal from the one which sees a declining use for military power. For the Army this means that for several years there may be little support for seeing the world in terms of rising dangerous threats. But this could change to a sharp reversal in national and international attitudes. The Army would have to deal with these kinds of ups and downs in national policy, but realistically this may be a part of the Army's environment.

Although it gets into immediate particulars, the case of North Korea's nuclear weapons and her additional military power illustrates one of the dynamics that shapes the Army external environment. For the first years after the collapse of Soviet power it was widely argued that economic power had become more important than military power. This is still widely argued both in the United States and elsewhere. Yet North Korea with less than 15 kilos of plutonium and a few reworked SCUD missiles is now profoundly reshaping the security landscape of Northeast Asia. North Korea has one of the weakest economies in the world. Yet she is being treated with circumspection and caution, sending a message to many other states that expansion of military capacities, far from being obsolete, is one of the best ways to generate increased international status.

#### **Synopsis and Conclusion.**

The viewpoint offered in this paper deals with issues badly in need of greater attention. Current conceptions of national security in the United States have placed far too much attention on immediate problems, which although large and important, are not necessarily the ones which will dominate the future. More importantly, current problems are poor signposts for what to expect and prepare for.

Clearly, Army thinkers need to dwell on the immediate world of base closings, peace keeping, and reduced force structure. The key is to not think *solely* about these issues, but instead to create a forum for attention to longer term issues. Two examples developed in this paper illustrate that it would be quite incorrect to conclude that because an issue is long term it does not require immediate attention. North Korea was a B power which is quickly developing into a B+ regional military force, one very likely armed with weapons of mass destruction. In the United States itself, Army participation in the BRAC process is shaping the long-term future of the Army relationship to the future U.S. economy. Yet if experience is any guide, this issue is most likely being conceived of in more narrow terms of compliance with procedures and as a way to reduce short-term expenditures.

The Army has to become a learning organization, one which in addition to its immediate national requirements must also seek new frameworks and open a dialogue among its best officers with outside sources of innovation and thinking. One avenue for increasing this type

of organizational learning is to encourage it in the formal parts of the Army charged with this responsibility. New ideas need to be emphasized at the U.S. Army War College, in the testing and simulation centers, and in ways that Army senior leaders are comfortable with. Judged from a distance the Army does not appear to be doing a bad job in these areas already. If there is a need that an outsider *can* discern, it lies in establishing an interlinkage between areas that are not usually thought about as being related. Nothing is self-evident in the relationship of cycles in technology, industrial structure, and strategic and international relations. Yet in the confluence of events in these three separate areas lie real dangers--as well as real opportunities-- for the Army.

If one conclusion can be drawn from this discussion, it is the need to become better at learning--not just learning about the process of war, but also about the changes in the industrial structure of the United States and about new dangers to American security emerging in the international system. It is not too soon to start thinking about how to do this.

Notes:

1. Paul Bracken, "The Military After Next," *Washington Quarterly*, Vol. 16, Autumn 1993, pp. 157-174.
2. In particular, the U.S. Army Training and Doctrine Command has held several seminars and meetings on this subject.
3. James L. Abrahamson, *America Arms for a New Century*, New York: Free Press, 1981.
4. John Case, *From the Ground Up: The Resurgence of American Entrepreneurship*, New York: Simon & Schuster, 1992.
5. See Charles Sabel, "Flexible Specialization and the Re-Emergence of Regional Economies," in P. Hirst and J. Zeitlan, eds., *Reversing Industrial Decline*, Oxford, U.K.: Berg, 1988.
6. This term is used to characterize regional economies like Silicon Valley, Baden-Wurtenburg in Germany, and Kakamigahara in Japan. See also the description of technological development in Utah as a "sticky region," in "Software Valley," *Economist*, April 23, 1994, pp. 69-70.
7. See Clive A. Trebilcock, "British Armaments and European Industrialization, 1890-1914," *Economic History Review*, Vol. 26, 1973, pp. 254-272; Michael Mann, *States, War and Capitalism*, Oxford: Basil Blackwell, 1988; and Anthony Giddens, *The Nation-State and Violence*, Oxford: Polity Press, 1985, for different expressions of this argument.
8. Paul Bracken, "The Military Crisis of the Nation State: Will Asia be Different From Europe?" *British Political Studies*, forthcoming 1995.
9. Anthony H. Cordesman and Abraham R. Wagner, *The Lessons of Modern War II: The Iran-Iraq War*, Boulder, CO: Westview Press, 1990.

## GUIDING PRINCIPLES FOR REVOLUTION, EVOLUTION, AND CONTINUITY IN MILITARY AFFAIRS

Raoul Henri Alcala

### INTRODUCTION

*Whither is the revolution in military affairs going?*

This essay focuses on the nexus between ideas and actions. It explores how concepts and doctrine shape three major areas of military affairs that define military power: the design of forces including organizations and materiel, the preparation of forces for war including training and leader development, and the allocation of national resources to provide for current and future forces. The author's basic premise is that principles--acknowledged or tacit--guide action. Moreover, widely held coherent collections of principles, that is, doctrines, guide classes of actions in these three areas of military affairs.

Today's actions and processes will have a significant effect on the shape of the next generation of military forces, perhaps in the second decade of the 21st century. This essay begins with a general assessment of contemporary aspects of military affairs that have particular significance for the future.

A prominent contemporary example of the primacy of doctrine is the Army's *AirLand Battle*. Conceptualized in 1976,<sup>1</sup> it was a seminal element of the renaissance--perhaps future historians will consider it a revolution--experienced by the U.S. Army following the war in Vietnam.<sup>2</sup>

It was formally promulgated in 1982. The principles embodied in the doctrine have unambiguously guided the Army's preparation of forces to deal with present and projected missions, roles, and functions. For almost two decades, *AirLand Battle* has shaped the design of the Army's forces; the preparation of Army forces for operations in peace and war; and, to a significant extent, the allocation of scarce Army resources among the various claimants. *AirLand Battle* doctrine has been the bedrock upon which the Army built every aspect of its professional being.

*AirLand Battle* doctrine evolved through the years that witnessed the end of the cold war, and combat and peacetime operations from Grenada and Panama to the Persian Gulf and Somalia. This evolution was itself the product of a process that permitted maintaining continuity in areas that were adequately addressed in the doctrine while changing it to incorporate lessons learned from a variety of sources, domestic and foreign. The 1993 publication of FM 100-5, *Operations*,<sup>3</sup> began the projection of this doctrine from the rapidly changing post-cold war environment into an uncertain and challenging future.

The example of FM 100-5 has relevance for what has been dubbed the "revolution in military affairs" that today is shaping tomorrow's American military capabilities. This is not to say that without change the latest iteration of FM 100-5 is the answer to all--or any--of the unforeseeable circumstances ahead. Rather, the primacy of ideas that is the essential lesson of FM 100-5 is likely to continue to dominate military affairs for the foreseeable future.

Following the Army's lead by 20 years, the other services have now established their own doctrine commands. At the interservice level, joint doctrine development is moving forward at an unprecedented pace. As stated in the new Joint Pub 1:

Military leaders understand the nature and utility of doctrine. Military doctrine presents fundamental principles that guide the employment of forces.... Joint doctrine offers a common perspective from which to plan and operate, and fundamentally shapes the way we think about and train for war.<sup>4</sup>

<pre> General Colin L. Powell, USA, CJCS, 1991  
</pre>

Although it is premature to conclude that *joint* doctrine shapes the way the *services* think about and prepare their forces for war, it is indisputable that joint doctrine shapes the way the combatant commands prepare for operations and train their assigned forces for those operations.

While technology races ahead at a dizzying and apparently ever increasing pace, and world events unfold in ways that challenge our imaginations and shatter our preconceptions, it is organized ideas including military doctrine that dominate and rationalize the processes by which the U. S. military services conceive of and shape future military capabilities. As the United States develops new ways of war, moving into perhaps a new revolution in military affairs, doctrine will surely be a key constituent.

Current doctrine and new concepts for developing future doctrine (abbreviated as "futures concepts" in the remainder of this essay) play a central role in the paradigms that provide the framework for analysis of future force options. Two elements that define the paradigm are the projections of the future circumstances in which military force will be needed, and the manner of determining which military force capabilities will be needed to assure success.

### **Contemporary Projections of Alternative Futures.**

Conceptualizing the future entails the projection of trends and the selection of a manageable number of circumstances-- scenarios--from a larger set of possible alternatives. The cold war in the past simplified this task. The increasing uncertainties and instabilities evident in the international environment since the end of the cold war are at least as challenging as those the United States experienced in the last major revolution in military affairs, at the advent of the nuclear age.<sup>5</sup> Selecting planning scenarios from the set of plausible alternatives is now a relatively more difficult task. Nevertheless, to continue to provide adequate guidance for the development of future military capabilities, doctrine and futures concepts must accommodate an appropriate set of alternative futures.

Today's perceptions are catalysts and at the same time present obstacles in choosing alternative futures. For instance, the speed and relative ease with which U. S. forces executed DESERT STORM have produced claims of a new way of war<sup>6</sup> and expectations about similar successes in future combat situations.<sup>7</sup> To be sure, the focus on new realities helps us shed irrelevant residues of the past. The Clinton



administration and its "Bottom-Up Review"<sup>8</sup> ushered in the latest reassessment of strategy, forces, and resources. It emphasized the new circumstances created by the collapse of the Soviet Union, substituting a set of regional conflict scenarios for the East-West conflict scenarios of the past.<sup>9</sup> However, the planning horizon for the Bottom-Up Review and the scenarios it employed are limited to the near term, not projecting beyond the end of the decade. There is no new set of longer-range scenarios that would be appropriate for the Defense Department, the Joint Staff, and the services to use for future force development.

In stressing the latest realities, the new conventional wisdom also simultaneously makes it increasingly difficult to see what has not changed. Military organizations under continuous threat of employment cannot afford the discontinuity that would result from taking time out to reshape themselves as they experiment with and eventually adopt new doctrines, organizations, and equipment. Armed forces in today's circumstances must maintain continuity of capability while they simultaneously prepare for the future.

The process of conceptual and doctrinal change, therefore, should incorporate today's range of plausible futures, as the Bottom-Up Review does, as well as other scenarios that provide insurance against futures that today appear to be unlikely or possibly even implausible. The process must be flexible, allow for reassessments and periodic corrections, so that future forces may be capable and versatile enough to cope with the unexpected.

#### **Should Threats or Capabilities Guide Force Development?**

Developing tomorrow's forces calls for a major change in the cold war force development paradigm. The point estimates of future Soviet developments and the accompanying threat-based analyses of the past are no longer relevant. Rather, the new paradigm should focus on developing needed capabilities for use in challenging but uncertain future environments.<sup>10</sup> Therefore, the new paradigm calls for new measures of merit, not based entirely on the "force-on-force" algorithms of the past. The new measures of merit that apply to the future should include the efficiency, effectiveness, and interoperability of the new capabilities contemplated.

Efficiency relates to the resources (funds, time, people) needed to produce a particular capability. Effectiveness relates to the ability (range, probability of kill, survivability of combatants and their equipment) to produce the needed effect or end state. Interoperability relates to the ability to exercise the capability, even extemporaneously,<sup>11</sup> in a joint and combined force. The baseline for comparison becomes our own current capability rather than a presumed or projected "threat" force's capability. Because these new measures are in themselves valuable and can be quantified, in time they should be widely accepted, even by the adherents of the obsolete threat-based force development paradigm.

In a fundamental sense, a paradigm that focuses on making U. S. forces as good as they can be, as survivable as they can be, evokes values that are at the core of American culture. Such a calculus also makes the future of the volunteer force more secure. Rather than enlisting in a force whose capabilities and size are just good enough

theoretically to beat the current world villain, the high quality youth needed for all our services would arguably be more attracted by a force that is demonstrably superior and challenges them to be all that they can be. There is substance for the future behind the time-honored Army advertising slogan.<sup>12</sup>

The transition of the force development paradigm, from threat-based to capabilities-based, will have major effects on the development of doctrine and futures concepts. In the Army's case, the basic assessments of the sufficiency of current doctrine and the force capabilities it shapes will shift from defeat of the presumed threat to meeting the new measures of merit. Rather than focusing on "battlefield deficiencies," assessments and analyses will shift more to identifying opportunities for more efficient, effective, and interoperable ways of conducting operations.

### **Fielding Future Forces.**

The end of the cold war and the dissolution of the Soviet Empire have produced an understandable but dangerous trend. Stripped of their principal former adversary, the armed forces have begun a rapid decline in size and capability. Measured against the remaining contemporary bad actors, even much smaller forces appear to be adequate. Nevertheless, it takes much longer to reconstitute or create new forces than it does to inactivate them. If there is a relevant lesson in our past on this matter it is that we have uniformly appreciated new threats too late. The processes we set in place to guide the transition to the future, including developing new doctrine and futures concepts, should heed this lesson.

Even small forces need the field laboratories in which to experiment with alternative future capabilities. Moreover, innovations that involve changes in doctrine, organization designs, and training cannot be developed in theory and put on the shelf in the way that a more efficient engine or longer-life battery possibly can be. Therefore, the full spectrum of combat development activities, from thinkers through the most sophisticated computer simulations to the ultimate tests with units in the field, should remain in place regardless of the reduction in the overall force size.

In planning today for fielding tomorrow's forces, it is therefore vital to provide for the time needed to effect a transition to different types of forces or larger force structures. It is similarly vital to be certain of the capabilities the new forces will have before beginning the process of replacing the old forces. In large, complex, and highly interdependent organizations such as land combat units, high confidence based on solid field testing is essential.

### **Assessing the Future.**

In assessing the ongoing revolution in military affairs, this essay will concentrate on the processes by which ideas guide actions, against the background of the development paradigm and planning considerations outlined in this introduction. It will examine how concepts and doctrine can properly shape future U.S. military capabilities in the three major areas of force design, training and leader development, and resource allocation.

The point of departure is a review of the three services' operating environments. These environments provide the context within which service professionals (officers and noncommissioned officers) develop their mindsets and learn to define their unique expertise. Doctrine and futures concepts in each of the services respect the biases that the operational environments produce.

The second element in the assessment is a review of the characteristics of the three major areas and how concepts and doctrine influence them. Of special importance is the inclusion of defense agencies that provide capabilities for the entire defense establishment and are controlled directly by the Defense Department, not by the individual services or the Joint Chiefs of Staff.

The final section summarizes and offers thoughts on the process by which the principles that guide action in military affairs are developed. It offers a perspective on the limits of revolution, evolution, and continuity in military affairs.

### **UNIQUE SERVICE ENVIRONMENTS**

The environments within which the combat elements of each of the services operate are the major socializing influences on their members, particularly their career professionals. The dominant characteristics of air, land, and sea combat environments are significantly different from each other.

The environments described in this essay are based on the author's assessment of how combat against regional adversaries would be conducted in the period extending from the present to the 2020s. In the past, during the height of the cold war, the risk levels for all services' combat forces were admittedly higher. The descriptions of each environment include, where applicable, the implications of these risk differentials.

#### **Air Combat Environment.**

The air combat environment described in this section is for fixed-wing aircraft. The operational environment in which combat (attack, rescue, reconnaissance) helicopter units operate is essentially the same as the land combat environment and is therefore included there.

Combat aircraft and their crews are in harm's way for relatively short periods of time. Limitations of the aircraft themselves and the nature of air-to-air and air-to-ground combat define this environment and its short employment periods. Air combat units and their crews are launched from and recover to relatively protected and comfortable areas.

The central process that directs air forces' employment in most types of operations is the air tasking order (ATO). While the more comprehensive joint campaign plan and force component plans and orders establish the specific missions and desired end states over time, the ATO is the central driving process that dominates air crews' lives. The ATO ensures the sustainment over time of the principal air functions which include: attack of point or area targets on land, control of aerospace from aircraft, protection of the aircraft aloft with other aircraft aloft, and reconnaissance over land areas.

This repetitive cycle of intense risk and relative comfort is likely to be the dominant characteristic of air crew combat environments for the foreseeable future. In addition, the limitations on air functions imposed by periods of extreme weather and restricted visibility on land--which limit further the periods of intense risk for air crews--are also likely to continue to moderate the air crew combat environment for some time.

During the cold war, the Soviet adversary possessed roughly equivalent conventional air combat capabilities, significantly larger air forces, formidable air defense forces, and a very high nuclear capability. For American air combat crews, the risks during air operations were significantly higher than they are against any current or foreseeable regional foe. During the cold war, the nuclear threat was high at main operating bases. Projecting ahead, the main threat against operating bases is from weapons of mass destruction (chemical and biological, primarily) that may be delivered by aircraft, ballistic missiles, and cruise missiles. While these current risks are certainly not negligible, they are significantly lower than the risk levels during the cold war for air combat crews in operations and during periods of rest and recovery.

#### **Land Combat Environment.**

In contrast to the air crew combat environment, armies must place their combat soldiers continuously in harm's way, most often directly in contact or in imminent probability of contact with a lethal adversary. The operational environment of amphibious (or "marine" infantry) forces is essentially identical to armies once the force is projected ashore. In peacetime, the training environments of army and marine land combat units are essentially identical.

Land combat forces engage in continuous operations to attack and destroy forces and facilities, to control territory, and to protect friendly areas and their populations; while ensuring their own survival and freedom of action. Continuous and often high risk from enemy action characterizes the daily existence of combat soldiers. Maintaining combat capability during operations, and the versatility to adapt it to the exigencies and opportunities of the situation without interruption, comprise the central operational process for which the ATO is the equivalent for air combat crews.

Once engaged, land combat units normally maintain contact to assure battlefield dominance through control of information and maneuver. They break contact only in extreme circumstances. Crew rest is organized in a staggered fashion to permit continuous operations, day and night, regardless of the weather. While risk is reduced during rest periods, it remains continuously high in contrast to the relatively risk free areas which air combat crews occupy between their periods of combat engagement. For prolonged operations, land combat units are rotated to secure areas for short periods of more comfortable and risk-free rest, recuperation, and force reconstitution.

As in the case of air combat crews, the risks associated with the cold war were higher for land combat forces. However, the relatively high risk in combat against plausible foes does not significantly change the combat operational environment for land combat. Moreover, the vulnerability of land combat formations to weapons of mass destruction

even from relatively primitive adversaries is significantly higher than that experienced by air or naval combat units.

#### **Sea Combat Environment.**

Naval forces operate in a combat environment that lies between the operational environments of air and land combat forces. Sea combat units are, typically, in harm's way for relatively short periods of time. The naval force functions include destruction of targets at sea and on land, control of selected sea areas, and facilitating and protecting force deployments by sea and projection of those forces onto land for combat or other operations.

Air combat units that operate from aircraft carriers experience essentially the same operating environment as do air combat crews. Submarine combat units, while more isolated for longer periods of time than many surface combat units, are now operating in an environment of low risk which is likely to continue well into the next century.

During the cold war, naval forces of all types experienced much higher risk levels than they do now against plausible adversaries. Among the services, sea combat units have experienced the most significant reduction in the risks associated with their operational environments as a result of the collapse of the Soviet Union.

#### **The "Bureau" Environment.**

Rather than being a facetious consideration, the operating environment of the numerous "bureaus" in the defense establishment merits consideration as a separate category. Much of the combat power of the U.S. Armed Forces is based on organizations that never deploy to any battlefield, never experience air or sea combat, and indeed are never really at risk from the adversary. Excluded from this category are the thousands of civilians who work directly for U.S. Government entities or contractors and who routinely deploy with uniformed combat units to operational theaters. This latter set of individuals shares exactly the risks of the forces they support.

The denizens of the bureaus have a "combat" environment that is dominated by two types of "actions." One is the numerical analyses of budgetary data. The other is the analysis of an item or program against qualitative criteria, including such sources as presidential campaign promises and local congressional interests. Literate, interpersonal, and cerebral skills are most relevant in this environment. Quantifiable dimensions of analysis are particularly prized.

The bureaus have essentially no characteristics in common with the operating environments that shape the uniformed professionals. It is not by accident that uniformed professionals so often shun service in the bureaus. Neither is it by accident that bureau denizens often have a difficult time appreciating the implications of essentially unquantifiable aspects of combat operational environments. The author recognizes that many bureaucrats have had substantial military service in combat units; and that many combat veterans occupy at least temporary positions in bureaus. It would be inaccurate to overstate the limiting effects on the products of the bureaus--policies and budgets in the main--as a consequence. Nevertheless, these different environments do make a difference in the acculturation of civilian and military

professionals in the American defense establishment, and these differences should be taken into account in assessing substantive matters that bring civilians and the military together as they do in every aspect of the revolution in military affairs that many assert is underway.

#### **Basic Implications of Unique Service Environments.**

Understanding the operational environments is key to understanding the service cultures, the military values of their professionals, and therefore the ways in which they develop their doctrines and futures concepts. It is important to acknowledge that there is no "joint" operational environment. Deployed headquarters share, in the main, the operational environments of air or sea combat units. Those headquarters in the United States share the bureau environment.

The admirable initiatives to expand each service professional in progressive and sequential joint education and operational experiences have not changed service cultures. These joint episodes certainly serve to expand mutual understanding but they in themselves cannot affect the operational environments of each service's combat units and therefore cannot change the dominant nature of their cultural influence.

#### **ASSESSMENT OF MAJOR DEFENSE AREAS**

In assessing the nexus of ideas and actions in the major areas of military affairs, the author has implicitly based his judgments on the principles outlined in the introduction to this essay in light of the unique environments that shape professional attitudes across the American defense establishment. The starting point is a brief review of the status of joint and service doctrine and futures concepts efforts.

#### **Service and Joint Doctrine.**

In the seventh year following enactment of the Goldwater-Nichols Act,<sup>13</sup> there has been considerable progress in developing doctrine to guide joint military action, although a substantial amount of work remains. Authoritative joint publications have been promulgated for 51 of the 100 subject areas selected for joint doctrine development. Of the remainder, in 43 areas a publication is under development. In only six areas is there nothing under development.<sup>14</sup>

There are joint manuals to guide the armed forces at the highest levels of all major functional areas except plans, for which a manual is under development (Joint Pub 5-0, *Plans*).<sup>15</sup> The areas in which doctrine development has not begun include:

- Interagency Coordination (Joint Pub 1-06),
- Employment of Selected Weapon Systems (Joint Pub 1-09),
- Counterair Operations (Joint Pub 3-01),
- Joint Engagement Zone (Joint Pub 3-01.6),
- Humanitarian Assistance (Joint Pub 3-07.52), and
- Domestic Support Operations (Joint Pub 3-07.53).

In these six areas, progress has been frustrated by a combination of insufficient agreement on fundamental principles, insufficient time, and higher priority doctrine development projects for the Joint Staff, services, and combatant commands concerned. In one area, previously set aside<sup>16</sup> as the domain of "basic national defense doctrine," early drafts proved inadequate and there has been no further progress.

In all, in spite of obvious progress, there is no joint publication that harmonizes all major functional areas in the way that FM 100-5 and AFM 1-1<sup>17</sup> provide the doctrinal capstones for the Army and Air Force, respectively. Each joint publication has had unique guidance without the benefit of an overarching doctrinal concept. A variety of entities, principally the services and combatant commands, have been responsible for developing the initial drafts. As a consequence, even after all 100 joint manuals now planned have been completed, they will have to be harmonized within and between functional areas. Moreover, whereas the Army's system specifically guides force development, the joint system does not.

To illustrate the difference between the authority vested in Army and joint doctrine, below are the operative statements from the Army's latest version of FM 100-5 and the latest of the major functional area manuals in the joint system.

FM 100-5 furnishes the authoritative foundation for subordinate doctrine, force design, material acquisition, professional education, and individual and unit training.<sup>18</sup>

Joint Pub 2-0 is the keystone document of the joint intelligence series. This publication sets forth doctrine to govern the joint activities and performance of the Armed Forces of the United States in joint operations as well as the doctrinal basis for US military involvement in multinational and interagency operations. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders and prescribes doctrine for joint operations and training. It provides military guidance for use by the Armed Forces in preparing their appropriate plans.... In applying the doctrine set forth in this publication, care must be taken to distinguish between distinct but related responsibilities in the two channels of authority to forces assigned to combatant commands. The Military Departments and Services recruit, organize, train, equip, and provide forces for assignment to combatant commands....<sup>19</sup>

The Army's guidance is clear and direct. Joint doctrine, on the other hand, neither directly nor through the combatant commanders has the status to guide the fundamental activities reserved to the services under Title 10, United States Code. The implications of this difference will be outlined in the discussion of force development.

It is important to acknowledge the impact of lessons learned, particularly from the Persian Gulf War, on doctrine. In the immediate aftermath of the war, motivated by the desire to attenuate service differences and to begin to provide top-down doctrinal guidance, General Colin L. Powell commissioned (and to a significant extent personally

wrote) a wholly new publication, *Joint Warfare of the U. S. Armed Forces*.<sup>20</sup> Stressing the imperatives of joint action, it advertised on its front cover that, "*Joint Warfare is Team Warfare*." This manual sought to give impetus to a post-war spirit of interservice cooperation, to energize all concerned to eliminate the large joint doctrine development backlog, and to incorporate as rapidly as possible the lessons of DESERT STORM.<sup>21</sup> A formal Defense Department report on the conduct of the Gulf War contained many useful findings and lessons.<sup>22</sup> Not to be left without comment on this matter, the then Chairman of the House Armed Services Committee commissioned and published his own report on the war.<sup>23</sup> Taken together, the Defense Department and congressional reports contain findings and observations that are useful input for joint and service doctrine and futures concepts development. Standing alone, however, neither report adds anything significant to the existing body of guiding principles that determine the military power of the United States.

For its part, the Army incorporated lessons learned from DESERT STORM with its ongoing futures concepts process to produce the 1993 edition of FM 100-5, *Operations*.<sup>24</sup> This edition of the manual included significant aspects of the previous Army futures concept, *Airland Operations*.<sup>25</sup> The Army also completed a one-volume assessment of lessons learned in all areas, including doctrine, publishing the result in 1993.<sup>26</sup> The Army Chief of Staff promulgated a general vision statement to guide the development of doctrine and other future-oriented activities, also in 1993.<sup>27</sup>

The Air Force published a White Paper, *Global Reach--Global Power*,<sup>28</sup> and a new edition of its capstone manual, *Air Force Manual 1-1, Basic Aerospace Doctrine of the United States Air Force*.<sup>29</sup> It also commissioned an extensive "Gulf War Air Power Survey" that presented its findings and recommendations in 1993.<sup>30</sup> The Air Force sought to give doctrine development additional emphasis by upgrading its activity to a Doctrine Command, although its commander remains a colonel. The Navy seized the opportunity presented in the aftermath of the Gulf War to emphasize its role in projecting power (including armies and naval infantry) ashore. The Navy's concept was published in a White Paper entitled *From the Sea*.<sup>31</sup> The Navy also established its own Doctrine Command. In contrast to the Army's long established doctrine and futures concepts development process, and its comprehensive Training and Doctrine Command, the Air Force and Navy efforts in these directions are embryonic. In due course, they will mature and acquire reputations based on the value their respective services accord to their products.

### **Service and Joint Futures Concepts.**

The Army has a well-established process for developing futures concepts. These concepts provide for a disciplined exploration of alternative futures to permit development of doctrine for the future. This process resulted in the revisions to FM 100-5 promulgated in 1986<sup>32</sup> and 1993. At present, the Army's Training and Doctrine Command is completing work on the latest such futures concept which will be promulgated in a new TRADOC Pamphlet 525-5. When approved,<sup>33</sup> this pamphlet will become the authoritative basis for projecting ahead all the Army shaping activities, including doctrine; operational concepts for organizations and major weapon systems; the design of organizations; materiel; and training and leader development programs. The new futures concept will also influence the overall allocation of resources for



other future development activities.

Among the services, the Army's doctrine and futures concepts development system is the most comprehensive and mature.<sup>34</sup> Neither the other services nor the joint doctrine system have concepts in place to explore alternative futures. The joint doctrine system has no provision for such developments. Moreover, there is no process or product in the Defense Department to provide guidance or direction from the level of the Office of the Secretary of Defense (OSD) on futures concepts.

Two current initiatives within OSD and the Joint Staff could in the future provide policy and doctrinal guidance for futures concepts and future doctrine. One is sponsored by the Office of the Undersecretary of Defense for Policy. It seeks to revitalize the long-range planning system and provide general guidance to the uniformed military establishment and the service secretariats for completing the transition to capabilities-based force planning and for improving the integration of defense-wide planning activities. This initiative could provide policy direction for a joint process of futures concepts development to include the selection of a relevant family of planning scenarios that go beyond those contained in the Bottom-Up Review.<sup>35</sup> The most recent Defense Department Annual Report acknowledges that: "The requirements process must be more closely integrated with the operational concepts and objectives."<sup>36</sup> This planning initiative could be helpful in this regard.

The second initiative is being undertaken within the Joint Staff under the auspices of the Vice Chairman. It entails revising the terms of reference for the Joint Requirements Oversight Council (JROC) to improve the way in which it can influence the definition of military requirements for materiel systems as well as other dimensions of military capability. Under the JROC's current mandate, it has the responsibility for articulating military needs and validating performance goals and program baselines for consideration by the Defense Acquisition Board (DAB).<sup>37</sup> In view of the JROC's position atop the uniformed military requirements process and its role in advising the DAB, if the OSD policy planning and JROC mandate revision processes are synchronized, these combined initiatives could give impetus to a proper joint futures concepts development process that could, in turn, shape future joint force development. At present, however, because of the absence of futures concepts development systems outside the Army, there is no capstone vision statement for future development except in the Army.

As an indicator of the emphasis given to doctrine and its development, it is revealing that in the *DOD Annual Report*, only the Army and Air Force commented at all on this subject. Neither the DOD nor Navy sections of the report has any reference to doctrine. The Army asserted the importance of the new FM 100-5:

The Army recently revised the intellectual foundation for its operations. We published a new FM 100-5, Operations, both to accommodate new strategic realities and to ensure continuity.<sup>38</sup>

The Air Force asserted that:

Our doctrinal contribution to the ever-developing role of

aerospace power in recent joint operations is also important. For example, in theater air defense, we are studying the evolving aircraft, cruise missile, and ballistic missile threats....<sup>39</sup>

These comments reveal, as well, the context in which these two services typically view doctrine. The Army sees doctrine as a coherent set of broad guidelines that reach out to all aspects of the its operations. The Air Force at times views doctrine as an instrument for achieving specific purposes in specific functional areas, as well as asserting in the most general terms the role of "aerospace power" in military affairs.<sup>40</sup>

Doctrine will have to be a central feature in any revolution in military affairs. A significant obstacle to such a revolution is the lack of any overarching OSD or joint vision statement or guidance for futures concepts. The discussion of force development will highlight the negative consequences that this creates for future force planning.

### **Service and Joint Force Development Processes.**

Force development, as the term is used in this essay, comprises the design of organizations and materiel to accomplish combat and peacetime tasks. It is the function that creates the military potential needed to carry out the tasks. By contrast, training and leader development convert that potential into actual military capabilities.

Doctrine and futures concepts provide the sets of principles that guide the force development process. They distill and interpret the lessons of the past. They accommodate the central values and mores of national culture and the unique aspects of the services' operating environments. Futures concepts, in particular, posit alternatives for the future that merit detailed analysis and experimentation.

In the process of force development, doctrine and technology interact. Technology developed without the benefit of doctrine may serve no useful military purpose. Doctrine established without understanding the promise and limitations of technology cannot accomplish its principal purpose. The issue is not which comes first, but how they should relate to each other.

At this point in the post-cold war period, force development and the absolute size of the armed forces are, so to speak, under siege. It is difficult for the defense establishment to be persuasive about needed new capabilities with the Soviet threat gone. Similarly, the defense structure and its funding have become the principal source of resources in Government-wide budget and deficit reduction initiatives and "reinvestment" programs. Development of future forces under these circumstances encounters obstacles that are the most severe that they have been since the end of World War II.

It is, of course, entirely appropriate to insist that the proponents of new capabilities make their case. It is also obviously essential to assure the vitality of the American economy now and for the future. Nevertheless, while reducing defense budgets and downsizing and reshaping forces are essential, there is a lesson concerning the size and composition of the armed forces that should be appreciated when contemplating future force development. In this tumultuous period of

global instability and uncertainty, it is especially important for the U.S. Armed Forces to have a robust capability to cope with unanticipated but definable challenges in combat and noncombat situations.

Individual units must be versatile enough to adapt to a range of potential types of employment against a wide variety of adversaries--including a potential peer competitor at some point in the next century. Forces developed for the challenging period ahead cannot be expected to succeed if they are designed as lean organizations specialized to perform a single task or a small set of tasks against a small and defined set of potential adversaries. Forces in being today were designed during the height of the cold war. Because their organizational designs and materiel were inherently robust and versatile, they can with little difficulty adapt to post-cold war challenges. Operation DESERT STORM provides the most obvious evidence.

In assessing current force development efforts, two "lessons" from the Persian Gulf War and more recent exercises have seminal importance. These are the lessons of precision in the attack of distant targets on land, and of simultaneous operations throughout the battle area.

In the area of precision, some of the lessons are almost too obvious. If a target can be located, it can be destroyed at relatively low risk to our own attack forces with a very high level of confidence. Attack means include manned aircraft and stand-off missiles launched from land, sea, or airborne platforms. The probabilities are very high for penetrating enemy defenses, definitively locating a previously identified target, delivering the lethal or nonlethal "warhead" where and when it is needed, achieving the desired end state (destruction, suppression, immobilization), and recovering the attacking force with little or no damage or casualties.

Not as obvious in the lessons of precision attack are three major unresolved issues. These are the nature and location of the real intended target, the timing of the attack, and limiting unwanted "collateral" damage.

Not all targets are what they appear. Some prime targets are not obvious, not easy to distinguish from areas of little or no value. It remains much easier to hit what can be seen than it is to be sure what it is that is seen or actually has been hit.

Even if the target is indeed what it appears to be, it matters when it is attacked. Some targets have values that vary over time. Destroying an empty building may be useful but not as useful as destroying it and the function it performs when that best assists our forces to achieve important objectives. The destruction of some targets will only have the desired effect within relatively narrow time limits. At this point in service and joint force development, we have perfected neither a method for determining the optimal time for attack nor the mechanisms to utilize fully all available capabilities of all services and allies at that time.

The issue of unwanted collateral damage continues to be serious in spite of the significant increases in accuracy of many of our latest warheads. As a consequence, the relative efficiency of long-range stand-off attack may be inappropriate in important cases, possibly necessitating foregoing the attack altogether. The cases of aircraft

placed next to archaeological monuments and difficulties of destroying objects such as bridges located in populated areas are illustrative.

These three issues are likely to characterize the precision attack task for the foreseeable future and, therefore, should be taken into account by future force development initiatives.

In the area of simultaneous operations, it is now possible to operate in depth to attack key combat functions and their control and support means in a way that can achieve the end state without the need for a prolonged sequence of close operations. When combined with the effects of precision, simultaneity can substantially shorten the length and costs associated with campaigns on land, facilitating an early and favorable conclusion of hostilities.

The major issues concerning simultaneity appear to be controlling information and intelligence, and synchronizing the operations of all force providers. The major force development initiatives in the Army center on the first of these issues. The Army is striving for near perfect distributed situational awareness through the proliferation of digital data processing capabilities in its principal combat platforms. It is also seeking to ensure it has near perfect intelligence and information provided to all who can use it in near real time, while denying the same to the adversary and even actively deceiving the adversary with false information. In both cases, the Army has in place the basic doctrinal principles in the new FM 100-5 to begin to master these two issues. It also is completing a new futures concept, as mentioned above, to develop further these and other areas to achieve "full-dimensional operations."<sup>41</sup>

These Army initiatives are typical of the force development process. Each service has derived parochial lessons from combat against Iraq. There is no joint mechanism to enforce a doctrinal basis for moderating this normal but inefficient parochialism. Neither is there joint future force development guidance that addresses these and other basic questions of military affairs.

There is no guidance on the degree of robustness needed, much less how to achieve it. Rather, there is ample guidance and forced budget cuts on programs that originally were focused on the Soviet Union. The exception to this rule is triggered when the civilian industrial base appears in jeopardy, but not when combat functions could be at risk if optimistic estimates of the future<sup>42</sup> prove invalid. The operating assumption is that "overlap" is unnecessary, except possibly in the case of the nuclear triad.

Service operating environments are vital in developing guidance for future force development. If future operations are assessed to be essentially comprised of precise target attack and destruction or neutralization (best rationalized in air and sea cultures), then the other functions in war and peace will pay the bills. At the other extreme, if future military operations are assessed as requiring largely humanitarian and other assistance to civil authorities and peace keeping operations, sophisticated air and sea precision attack forces become irrelevant, as do forces that project combat power (rather than noncombat assistance) from the sea.

Current processes and guidance provide no alternative to

independent and uncoordinated service force development activities moderated at the last stage in the development process by the DAB, JROC, and political budget pressures. In technical fields there is, on the other hand, perhaps too much detailed near-term technical development guidance. Even a cursory review of the *DOD Annual Report*, the latest congressional authorization and appropriation bills, and the latest OSD program and budget guidance will adequately illustrate this conclusion. For longer-term science and technology developments, after casting aside the previous Administration's strategy and technology thrusts, the current Administration has not yet developed a replacement.<sup>43</sup>

A disciplined long-range planning process that included a range of plausible (even if currently improbable) scenarios, and guidance for developing futures concepts and future doctrine, would be the first step in the establishment of a long overdue joint force development process.

### **Service and Joint Training and Leader Development.**

Service training is continuous, intense, and expensive. Joint training is episodic and expensive. Neither service nor joint peacetime training adequately prepares forces for future contingencies. At the nexus of ideas and actions in this major area of military affairs are doctrine, which is adequate, and funding priorities, which are inappropriate.

Services typically approach joint training as a necessity to be addressed after the fundamental service core competencies at individual and unit levels have been achieved. In the Army, the mission essential tasks that guide each unit typically ignore or inadequately stipulate the requirements for integrating the unit into a joint or combined formation. The notable exceptions, of course, are Army airborne units and their habitually associated Air Force airlift units. Even in the most sophisticated and intense training environments, the National Training Center and the Battle Command Training Program in the Army's case, joint dimensions such as air-ground integration are underdeveloped and underutilized.

The traditional Defense Department budget and program practices have left largely to the individual services the establishment of training priorities and funding. The standard auditing mechanism consists of self-reported readiness indicators that remain service-specific. Absent are indicators of the achievement of joint training objectives which can be derived from joint doctrine.

To be sure, the provisions of the Goldwater-Nichols Act have enabled joint commanders to establish readiness and capability objectives for their assigned service forces. However, the services control the allocation of the overwhelming majority of training funds and determine training standards. There is no institutional, procedural link between joint doctrine, joint command requirements, and allocation of funds across and within services to support training.

Leader development is predominantly a service function, although it also is affected by the Goldwater-Nichols Act. Services correctly view leader development as the most important function for ensuring near-term success in combat and for properly shaping the forces of the future. Leaders are the services' most important legacies from generation to generation.

In their programs of formal leader education and training, development through successive operational assignments, and encouragement of individual self-development, the services adopt priorities that mirror their training priorities. The highest priority is accorded to developing the basic service and specialty core competencies. These basic leader development building blocks include solid acculturation in the unique service operating environment. The joint dimension of leader development becomes an added element, not an inherent element, in leader development programs.

As a result of the Goldwater-Nichols Act, much more intrusive joint requirements are placed on the formal education and promotion systems. Nevertheless, as in the case of joint training, the preponderance of guidance and funding for leader development programs rests with the services without overarching joint guidance. There are no institutional, procedural links between joint doctrine, the substance of leader development programs, and the amount and priority of funding for the preponderance of the functions that remain within the services.

The major point in this assessment of the joint dimensions of training and leader development programs is not that they should be taken from the services. It is, rather, that the services should be given better guidance to make these joint dimensions integral to leader development and training rather than the thin veneer that they are today. As simulations assume a greater proportion of training and leader development programs, it may become easier to integrate joint dimensions. However, without adequate joint guidance for futures concepts and force development, this major area of military affairs will continue to be underdeveloped. It will not produce the maximum joint combat capability from the potential of all the services' unit designs and materiel.

#### **Service, Joint, and OSD Programming and Budgeting.**

By contrast to other major areas of military affairs, there is no lack of guidance to the entire defense community for budget and program formulation. In this area the guidance ranges from general priorities in functional areas to specific directions for individual items.

The formal Defense Department Planning, Programming, and Budgeting System (PPBS),<sup>44</sup> and the day-to-day practices that give it life, have two characteristics that inhibit a true revolution in military affairs. The first is the lack of an institutional, procedural link to joint doctrine. The second is the prevalence of threat-oriented marginal analysis.

To be sure, the principal guidance documents and procedures relate all elements of national military power to strategy and policy and include all relevant participants. Because funds are never adequate to provide for all needed military capabilities, PPBS does establish priorities that transcend the services. Moreover, to a significant degree, operational concepts and joint doctrine have a role in selected functional areas, particularly within individual parts of the research and development bureaucracy.

What is absent in PPBS is an overall joint doctrinal template by which to rationalize current programs, including acquisition. Similarly,

there is no joint futures concept or force development vision by which to rationalize research and development. No procedure is in existence that would permit developing joint doctrinal measures of merit for examining the sufficiency of funding within and across functional areas, or within and across the services and defense agencies. Because there is no joint futures concept, a number of attempts at overarching guidance such as the "science and technology thrusts" have been developed.<sup>45</sup> While these provide direction for selected areas considered of high value by OSD, they are neither comprehensive nor helpful in establishing priorities between current and future capabilities, between services, or within services.

The second obstacle, threat-based marginal analysis, may be removed if the changes in long-range planning under consideration by the Undersecretary of Defense for Policy<sup>46</sup> are put in place. The problems that the old procedure creates are an inability to find a suitable substitute for the Soviet threat to use in research and analysis, and an inability to develop options that consider trade-offs between functional areas and services. If PPBS indeed completes the transition to capabilities-based force planning and a joint futures concept is developed, analysis and decision making based on and rationalized by joint doctrine and joint concepts would be possible.

#### CONCLUDING OBSERVATIONS

*Returning to the opening refrain, whither goes the revolution in military affairs? The short answer is that there is more evolution than revolution in evidence.*

The tables below provide an impressionistic summary of the author's assessment of the current and potential future processes of change in the three major areas of military affairs. The assessment relates to the armed forces as a whole.

<PRE>

| MAJOR AREA   | REVOLUTION | EVOLUTION | CONTINUITY |
|--------------|------------|-----------|------------|
| Force Design |            | X         |            |
| Training     |            | X         |            |
| Resources    |            |           | X          |

Table 1. 1994 Assessment

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| MAJOR AREA   | REVOLUTION | EVOLUTION | CONTINUITY |
|--------------|------------|-----------|------------|
| Force Design | X          |           |            |
| Training     | X          |           |            |
| Resources    |            | X         |            |

Table 2. Future Potential

</pre>

Clearly there are elements in all the services that will have

profiles that differ significantly from this overall assessment. For instance, revolutionary change is possible within this decade in the manner of conducting close operations in high-intensity warfare if the Army experiments currently underway to "digitize" succeed. Similarly, if current initiatives to improve the timeliness and precision of the attack of distant high value targets on land succeed, the resulting synergy between deep and close operations can significantly enhance the effectiveness and speed of theater campaigns. In the main, for the armed forces of the United States, there is no obvious revolution in military affairs on the horizon of the sort that resulted from the introduction of the internal combustion engine or nuclear weapons. What revolutions there may be are more akin to the introduction of "stealth" which resulted in a significant improvement in a few battlefield functions, but hardly revolutionized warfare.

Focusing on the major defense areas, revolution in doctrine will be possible only to the extent that significantly different futures concepts or their equivalent drive the process. There are no such revolutionary concepts, service-unique or joint, in existence or under development. The revolution, if it occurs, will be in the processes for developing futures concepts within the defense establishment. The introduction of concepts-based planning with policy direction from OSD and force development directly linked to doctrine and concepts could produce a revolution within, perhaps, a decade.

In the area of force design, revolution is possible provided current initiatives to use distributed simulations expand within and across services and are stimulated by truly innovative futures concepts. The slow part of the process will, of necessity, be the field testing phase. For complex organizations and materiel systems, this phase will remain unavoidable regardless of how revolutionary the design phase becomes.

In the area of training and leader development, revolution is clearly possible. This will require the correct mix of joint and service-unique elements, distributed simulations and field exercises. Taken together, the revolutionary potentials that exist in force design and training and leader development open the possibility for much more rapid improvements in the American way of war than at any time in the past. Whereas it took a generation to reshape the forces following Vietnam, it could take perhaps half that time in the future to effect a comparable renaissance.

Turning to resources, there is no alternative to evolution as the upper limit to change. It is simply impossible to terminate activities overnight. Moreover, however revolutionary the process of change becomes at the design end, it will be necessary to maintain current capabilities in being until a transition can be effected. The armed forces are likely to remain too small to permit rapid major transformations that significantly decrease near-term readiness.

History alone will judge what it means to have a revolution in military affairs. The uncertainties that have always surrounded warfare have a profound effect on the military profession, inclining it to conservatism, setting evolution as the normal upper limit of the rate of change. That characteristic is likely to remain central to the profession.



## Notes:

1. *AirLand Battle* first appeared in its entirety in the 1982 edition of FM 100-5. See: Headquarters, Department of the Army, Field Manual 100-5, *Operations*, Washington, DC: U. S. Government Printing Office, August 20, 1982. This edition replaced the first post-Vietnam edition published on July 1, 1976. The 1976 edition reflected the beginning of a process of doctrine revitalization and embraced a concept known widely as the *Active Defense* which stressed maximizing firepower and tailoring forces for maneuver. By contrast, *AirLand Battle* stressed the tenets of agility, initiative, depth, and synchronization--emphasizing the employment of these interrelated aspects of combat to maximize the ability of the force to win.

2. A central part of the Army's post-Vietnam reorganization and renaissance was the creation of the Training and Doctrine Command. This organization became the principal agent for developing the Army's combat capabilities and preparing the Army for war, as well as being its architect for the future. For a description of the organization and its central role see: John L. Romjue, Susan Canedy, and Anne W. Chapman, *Prepare the Army for War: A Historical Overview of the Army Training and Doctrine Command, 1973-1993*, Fort Monroe, VA: Office of the Command Historian, U.S. Army Training and Doctrine Command, 1993.

3. Headquarters, Department of the Army, Field Manual 100-5, *Operations*, Washington, DC: U.S. Government Printing Office, June 14, 1993.

4. Office of the Chairman, Joint Chiefs of Staff, Joint Pub 1, *Joint Warfare of the US Armed Forces*, Washington, DC: National Defense University Press, November 11, 1991, pp. 5, 6.

5. In thinking about changing military institutions under conditions of uncertainty and instability, it is inspiring to recall the Army's transition to the nuclear age. See: Maxwell D. Taylor, *The Uncertain Trumpet*, New York: Harper & Brothers, 1960.

6. These are widely held perceptions among experts and attentive publics.

7. While we should not overstate the case, especially in light of the October 1993 combat losses in Somalia and the early 1994 appreciation of how difficult combat on the Korean Peninsula could be, DESERT STORM is likely to remain a powerful model for shaping expectations.

8. Les Aspin, Secretary of Defense, *Report on the Bottom-Up Review*, Washington, DC: Department of Defense, October 1993.

9. It is important to acknowledge that the plans put in place at the end of the Bush administration, including the Base Force, had already made the transition to regional conflict scenarios. See: Lorna S. Jaffe, *The Development of the Base Force, 1989-1992*, Washington, DC: Joint History Office, Office of the Chairman of the Joint Chiefs of Staff, July 1993.

10. The shift within the military services from threat-based to capabilities-based forces is well underway. While this is the reality,

it was not reflected in the rationales and scenarios of the Bottom-Up Review. Many participants in national security decision making and resource allocation processes hold to the obsolete threat-based paradigm.

11. While habitual association and intensive training of joint and combined forces should be the norm, the U. S. armed forces should be flexible and versatile enough to permit effective integration of unfamiliar units. It is prudent to plan for a range of potential coalition warfare and peacetime operations in the future at least as challenging as the wide array present in this early post-cold war period.

12. *"Be, ... all that you can be, ...."*

13. *The Goldwater-Nichols Department of Defense Reorganization Act of 1986* (10 USC 161 et. seq. PL 99-433).

14. These data are excerpted from a graphic status report of the Joint Publication System, dated March 31, 1994, Joint Staff J-7.

15. *Ibid.*

16. In 1992, a draft of a proposed manual on this subject received extensive reviews by experts inside and outside the defense establishment. No further work has been undertaken on this topic since that time.

17. Office of the Chief of Staff, United States Air Force, *Global Power, Global Reach*, Washington, DC: Headquarters, Department of the Air Force, 1991.

18. FM 100-5, p. iv.

19. Office of the Chairman, The Joint Chiefs of Staff, Joint Pub 2-0, *Joint Doctrine for Intelligence Support to Operations*, Washington, DC: Joint Staff, October 12, 1993, p. iii.

20. Joint Pub 1.

21. The "lessons" in this case relate to those the Chairman himself believed to be clear. At that time, joint, combatant command, and service lessons learned assessment teams were far from finished with their work.

22. Department of Defense, *The Conduct of the Persian Gulf War: Final Report to Congress Pursuant to Title V of The Persian Gulf Conflict Supplemental Authorization and Personnel Benefits Act of 1991 (Public Law 102-25)*, Washington, DC: Department of Defense, April 1992.

23. Representative Les Aspin, Chairman, and Representative William Dickinson, Ranking Republican, House Armed Services Committee, *Defense for a New Era: Lessons of the Persian Gulf War*, Washington, DC: U.S. Government Printing Office, 1992.

24. FM 100-5.

25. United States Army Training and Doctrine Command, TRADOC

Pamphlet 525-5, *Airland Operations*, Fort Monroe, VA: U.S. Army Training and Doctrine Command, August 1, 1991.

26. Brigadier General Robert H. Scales, Jr., DESERT STORM Study Project Director, *Certain Victory: The US Army in the Gulf War*, Washington, DC: Office of the Chief of Staff, United States Army, 1993.

27. General Gordon R. Sullivan and Lieutenant Colonel James M. Dubik, *Land Warfare in the 21st Century*, Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, February 1993. This monograph was presented at the U.S. Army War College's Fourth Annual Conference on Strategy in February 1993.

28. Office of the Chief of Staff, United States Air Force, *Global Reach- Global Power*, Washington, DC: Headquarters, Department of the Air Force, 1991.

29. Air Force Manual 1-1.

30. Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Summary Report*, Washington, DC: U.S. Government Printing Office, 1993. The full survey is a set of ten reports. See also: Eliot A. Cohen, "The Mystique of U.S. Air Power," *Foreign Affairs*, Vol. 73, No. 1, January/February 1994, pp. 109-124.

31. Office of the Secretary of the Navy, ... *From the Sea*, Washington, DC: Headquarters, Department of the Navy, 1992.

32. For the period 1982-1990, the Army's futures concept was termed *AirLand Battle-Future*, and produced a family of studies that were helpful in refining FM 100-5, assisting in the production of the 1986 edition, and in shaping the subsequent futures concept, *Airland Operations*, that was published in 1991. See relevant notes, above.

33. TRADOC developed preliminary drafts of the new Pamphlet 525-5 early in 1994. A final version may be available after mid-year. The working title of this pamphlet is "Future Full-Dimensional Operations."

34. The Army disciplines and rationalizes its concepts and doctrine with all other areas of force shaping by a combination of the Training and Doctrine Command's Concept Based Requirements System and the Department of the Army's long-range planning process. The definitive documents for both processes are: U. S. Army Training and Doctrine Command, TRADOC Regulation 11-15, *Concept-Based Requirements System*, Fort Monroe, VA: U.S. Army Training and Doctrine Command, June 11, 1989 (currently under revision with the new version likely to be completed by mid-1994); and U.S. Department of the Army, AR 1-1, *Planning, Programming, Budgeting, and Execution System*, Washington, DC: Department of the Army, January 30, 1994.

35. This effort, which is being undertaken by the Undersecretary's Policy Planning staff, is in its early stages and there are not yet any definitive documents that outline it.

36. Les Aspin, Secretary of Defense, *Annual Report to the President and the Congress*, Washington, DC: U.S. Government Printing Office, January 1994, p. 106.

37. The Chairman of the Joint Chiefs of Staff, *CJCS Memorandum of Policy No. 7 (CJCS MOP 7): Joint Strategic Planning System (JSPS)*, Washington, DC: Chairman of the Joint Chiefs of Staff, January 30, 1990; including 1st Revision, March 17, 1993. This document is likely to be revised in due course as a consequence of changes underway in the Joint Requirements Oversight Council, *inter alia*.

38. *Annual Report*, p. 259.

39. *Ibid.*, p. 281.

40. Air Force Manual 1-1 takes this broad view.

41. Forthcoming TRADOC Pamphlet 525-5.

42. Many critics, including this author, claim this is precisely the case with the Bottom-Up Review.

43. According to the Defense Department's Office of the Director of Research and Engineering, science and technology guidance for the longer term will be completed by mid-1994 and will be based on the Joint Staff's expression of essential future military capabilities.

44. Department of Defense, Department of Defense Directive 7045.14, *Planning, Programming, and Budgeting System (PPBS)*, May 22, 1984; with Change 1, July 28, 1990; and Department of Defense Instruction 7045.7, *Implementation of the Planning, Programming, and Budgeting System (PPBS)*, May 23, 1984; with Change 1, April 9, 1987, Washington, DC: Office of the Secretary of Defense. Each of the services maintains its own implementing directive. In the Army, it is AR 1-1.

45. As mentioned above, no new science and technology guidance document has yet been developed by the Clinton Defense Department. The section dealing with science and technology in the latest DOD *Annual Report* focuses mainly on the reorganizations within OSD and the Advanced Research Projects Agency. It leaves entirely unstated all but the basic policy directions such as the emphasis on dual-use technologies (those having both military and civilian applications). However, ample guidance remains in place from the previous administration and has been reflected in the services' research, development, and acquisition programs. The most mature and comprehensive of these service efforts is the Army's Science and Technology Master Plan. For FY 1994, see: Department of the Army, *Army Science and Technology Master Plan, Fiscal Year 1994*, Washington, DC: Office of the Assistant Secretary of the Army (RDA), November 1993.

46. As noted earlier, this is a recent initiative for which there are no public documents available. See: Aspin, *Annual Report*, p. 106.

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