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Issue Paper

Exploring Topics of Interest to the Policy Community

APRIL 1993

DoD Centralization: An Old Solution for a New Era?

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In response to enormous pressures to economize, the Department of Defense has set out to reform the logistics and acquisition system. During the last months of the Bush administration, high-level decisionmakers discussed the possibility of consolidating all military R&D and acquisition into a single civilian DoD agency, with additional DoD agencies for Science and Technology, and Test and Evaluation. Under such a plan, the military services would still generate weapon system requirements, but from then on all R&D, development, and testing would be the responsibility of the centralized civilian agencies. The goal of centralization would be to reduce overhead, improve management, eliminate duplication, increase economies of scale, and tighten controls to minimize cost growth and schedule slippage.

The new administration might also be considering this path. Before it proceeds, however, it should carefully examine whether centralization truly can achieve these benefits. This paper offers a three-part discussion of the issue: a summary of the history of U.S. acquisition reform, a review of the centralized acquisition bureaucracies of some of our allies, and a discussion of current management theory and industry practice and how they might apply to defense acquisition. Our findings suggest that centralization is a traditional solution that may be ill suited to the new era. The most effective path to reform may, in fact, lie in the opposite direction: toward nonhierarchical and highly

integrated organizational structures that promote trust rather than conflict and maintain close ties to the military customer.

U.S. Experience with Centralization

The effort to centralize military acquisition under civilian control is not new: it has been under way in the United States since 1947, when the National Security Act was passed. Almost every amendment, reform, and high-level commission on the subject since then has increased administrative control over the military acquisition process in order to relieve the problems of waste, cost overruns, delays, duplication, lack of interoperability, and interservice rivalry. In most cases, however, the desired efficiencies have not been realized.¹ Although President Bush streamlined the development and procurement bureaucracy through the Blue Ribbon Commission on Defense Management (Packard Commission) and the Goldwater-Nichols legislation that led to the establishment of the office of Undersecretary of Defense for Acquisition (USDA), the underlying problems and a general lack of trust persist.

The stated purpose of the Packard Commission's recommendations was to alleviate the distrust that permeated the acquisition system. The commission called for "a new spirit of cooperation" and "a sense of shared purpose . . . between the Executive Branch and

the Congress, and between government and industry as well.”² The goal was to cut the 10- to 15-year acquisition cycle in half by streamlining the acquisition organization and procedures. The commission based its recommendations on the best business practices known at that time: those emerging from Japan that involved “above all, trust in people” and “the participation of all of the people in the organization deciding among themselves how the job can best be done.”

The Packard Commission focused on the procurement bureaucracy only and left science and technology, concept exploration, and concept demonstration largely untouched. Moreover, David Packard made it clear in congressional testimony that the commission’s underlying philosophy was “centralized policy control and decentralized acquisition”:

We do think the plan to keep the implementation decentralized to the services is a very important aspect, and that would be anticipated under our recommendations. The other fundamental part of our recommendation is to try and develop some short and unambiguous lines of authority and communication between program managers and the top level acquisition executives. Rather than create more centralization, that proposal is designed to enable program managers to operate independently in a decentralized way to give them control of their programs and not have everybody and his brother looking over their shoulder.³

This recommendation for balance notwithstanding, the Bush administration called for much greater centralization of activities and responsibilities than the commission ever considered. Although Packard’s understanding was that the services would still make weapon recommendations and the new USDA would choose among them, the Defense Management Review broadened the scope of USDA authority to control all phases of the acquisition process, including the beginning of a development and acquisition program.

Furthermore, the DoD proceeded to issue a series of Defense Management Review Decisions (DMRDs) to further consolidate and centralize the logistics and acquisition system. Almost all the previous consolidation attempts and all the DMRDs examined in a recent RAND study failed to create cost savings.⁴ They have, however, increased oversight and centralization. Ironically, these reforms may have proliferated what David Packard subsequently referred to as “a myriad of unrealistic rules and regulations enforced by . . . ‘police state’ tactics.”⁵ Thus, the lack of trust the Packard Commission sought to eliminate remains as strong as ever.

Foreign Models: How Well Do They Work?

For years, advocates of greater centralization of the U.S. acquisition process have pointed to the highly centralized civilian acquisition bureaucracies of many of our major allies in Europe and elsewhere as possible models. Probably the foreign model most often mentioned is the French system, which is dominated by the centralized acquisition agency called the *Délégation Générale pour l’Armement*, or DGA.⁶ Considerable attention has been devoted to examining the British acquisition system as well, although it is somewhat less centralized than the French. Other centralized weapons-procurement organizations that have occasionally spurred interest among U.S. reformers include those of Germany, Israel, and Japan.

The advantage of the foreign approach most often cited by U.S. reformers is greater efficiency. As the reasoning goes, the presence of a unified professional procurement agency separate from the armed services makes the foreign organizations more effective at avoiding costly duplication of R&D efforts, curbing wasteful interservice rivalries, and rationally coordinating equipment procurements with national military, budgetary, and industrial-base requirements. Furthermore, the French and other foreign systems are staffed by a specially trained corps of military technologists and career acquisition managers who, it is claimed, bring a level of professionalism, independence, and long-term experience that is often lacking in the U.S. system.

Are these foreign centralized agencies indeed more efficient? Unfortunately, there is little reliable data to indicate clearly that foreign organizations manage their limited military R&D resources more efficiently. On the other hand, there is considerable data, as well as anecdotal evidence, to suggest that weapon systems developed by centralized acquisition agencies experience persistent cost overruns, are less capable than U.S. systems, and are not necessarily responsive to military requirements.

Cost Growth and Schedule Slippage

Most procurement programs in France, Great Britain, and other allied countries are subjected to far less legislative and public scrutiny than is typical in the United States. In an unprecedented move several years ago, however, the chairman of the Committee on National Defense and the Armed Forces of the French National Assembly published a voluminous study reporting on a detailed legislative analysis of the 1990–93 Defense Program Law.⁷ This report devoted consider-

able attention to the problem of persistent shortfalls in equipment procurement numbers experienced in earlier French five-year defense program laws, particularly after 1976. To help determine the cause, the committee carefully examined the record of cost growth during the development and production of five recent major strategic and tactical nuclear systems, five army systems, seven navy systems, and six air force systems.

The committee determined that weapon system R&D cost growth was a significant problem for the French acquisition system. Of the 23 systems examined, only three experienced no cost growth. Three more encountered cost increases of under 10 percent. The remaining 17 programs, or nearly three-quarters of the total, suffered cost growth ranging from 11 percent to 146 percent. Naval fighter aircraft programs averaged 55 percent R&D cost growth, while air force fighters came in at 25 percent. Army self-propelled artillery averaged about 100 percent cost growth, with naval frigates at around 15 percent. The widespread problem of R&D cost growth inevitably led to reduced equipment production runs, contributing to a persistent inability to meet the inventory procurement goals established in the five-year plans. As the result of this data, the committee criticized DGA's cost-effectiveness record and called for improvements in equipment planning, cost estimation, and cost reduction.⁸

The conclusions of this legislative study are not unique. Past academic assessments have also determined that chronic problems with cost growth resulting in reduced procurement numbers have plagued the French system since the early 1960s, when it was first established.⁹

The centralized British acquisition system has not been immune to such problems. In the mid-1980s, mounting criticism over inefficiency in military R&D and production, combined with major procurement scandals such as the *Nimrod* Airborne Early Warning aircraft program—canceled in early 1986 because of cost overruns of 160 percent and inadequate performance capabilities—led to a series of wide-ranging acquisition reforms.¹⁰ One of these was even greater centralization of the procurement system, since responsibility for developing equipment requirements was further concentrated in a joint military staff organization, while actual equipment acquisition remained the responsibility of the centralized Procurement Executive of the Ministry of Defense. Many of the reforms have received considerable praise, particularly those aimed at promoting greater competition and shifting greater technological responsibility and risk to industry.

However, the move toward greater centralization does not appear to have solved Britain's procurement problems. For example, in April 1990 the Public Accounts Committee of the House of Commons issued a critical report listing 11 major defense programs that were experiencing cost growth of 25 percent or more. Nine of these programs were from two to five years behind schedule. They included such systems as the EH101 helicopter, which at the time was experiencing an R&D cost overrun on the order of 120 percent and a schedule slippage of five years.¹¹

None of the data discussed above proves with certainty that the highly centralized organizations of European acquisition systems directly result in less efficiency and cost-effectiveness than the U.S. system can muster. However, they do demonstrate that centralized systems do not necessarily rid the European acquisition process of serious problems with cost escalation, schedule slippage, and performance shortfalls. Other evidence, discussed below, also shows that the European systems do not necessarily produce superior or even equivalent equipment at less cost.

Meeting User Requirements: A Low Priority

The debate over this issue is hardly new to Congress. As recently as 1989, several members of Congress introduced bills aimed at centralizing and rationalizing the U.S. military acquisition process along European lines. Prominent among them was a bill sponsored by Senator William Roth (R-Del.) that proposed establishment of a "Civilian Acquisition Agency" loosely patterned after the French DGA. In response, the Subcommittee on Investigations of the House Armed Services Committee launched an extensive study of the French and British systems, focusing on what could be learned from them about the issue of centralization. The subcommittee's 60-page final report, submitted to and approved for printing by the committee chairman, Les Aspin, in July 1989, unequivocally concluded that the United States should not copy the centralized model of either the French or British systems because of "differences in culture, national objectives, acquisition policies, and weapon system performance goals," and because in the U.S. context "centralization is not practical."¹²

According to the subcommittee, a key problem with applying the European model to the American context is that, compared to the current U.S. system, foreign centralized systems place considerably lower priority on the legitimate military requirements of the uniformed services. Instead, they tend to elevate the importance of

such nonmilitary considerations as the promotion of arms exports and the pursuit of broad technological and industrial objectives.

This view is widely held among scholars. For example, the most thorough academic English-language analysis of the French DGA in recent years notes that a 1986 reorganization "strengthened the DGA's industrial and commercial roles." The study argues that the powerful Delegate for Industrial Policy within the DGA has "the largest weight among an array of less organized and endowed governmental bodies responsible for France's industrial growth." It operates in accordance with "a long-term vision of France's industrial needs, emphasizing industrial development and trade expansion rather than immediate arms production," and "is clear about its industrial bias over immediate service needs." DGA's focus on industrial policy has led to "a protected domestic market of monopoly suppliers" which "is the most highly regulated among the liberal democracies," and this has resulted in the "suppression of competition in domestic and foreign markets."¹³

This problem is caused in part by the dramatically reduced role played by the military services in most foreign centralized acquisition organizations, compared to the U.S. process. As the study cited above shows, "The initial definition of French military requirements begins with the military services, but rarely does it end with them." Besides the political leadership, three other principal actors exercise enormous influence over French military equipment requirements: "The arms engineers dominating the DGA," who are themselves divided between "those oriented more toward the military or toward the economic missions of the DGA"; the "industrial elites"; and "foreign decision-makers responsible for cooperating with France." The result is often the procurement of equipment that from its inception was not designed primarily to meet the military requirements established by the armed services.¹⁴

This emphasis is found in most other foreign centralized acquisition organizations. In Japan, for example, the civilian Equipment Bureau of the Defense Agency oversees military procurement. It is assisted by the Defense Agency's Technical Research and Development Institute and staffed by service engineers and military technologists, who work closely with industry. However, the senior posts in the Equipment Bureau are filled by bureaucrats from the Ministry of International Trade and Industry. As a result, most scholars agree that broad national industrial, commercial, and technological objectives are accorded

much higher priority than the military requirements of the Japanese Self-Defense Forces.¹⁵

Some advocates of centralization may applaud DGA's emphasis on broad national industrial policy at the expense of military requirements as established by the services. But the costs of such a policy should not be lightly dismissed. As pointed out by a recent study conducted by the Office of Technology Assessment, this policy has often led to French military systems that "cost more, perform less well, or take longer to procure" than U.S. and other countries' systems.¹⁶ Indeed, other studies have argued that on average, fighter aircraft produced by all the European countries with centralized procurement agencies are considerably less capable and less cost-effective than U.S. fighters.¹⁷ The ultimate price is paid by the soldier in the field, as illustrated by the "negative consequences" for French military effectiveness experienced during the recent Gulf War.¹⁸

German authorities were acutely aware of the need to avoid such problems when they reformed their procurement system in the early 1970s. At that time they further centralized acquisition planning in the Armaments Division of the Ministry of Defense, but delegated greater implementation authority to a separate body, the Federal Agency for Military Technology and Procurement (BWB). The reformers were greatly concerned, however, about a fundamental problem of the earlier system concentrated in the Ministry of Defense: "insufficient consultation of the military in the choice of equipment." Consequently, a key objective of the reform was to place "primary responsibility for development and procurement unequivocally on the Service Staffs."¹⁹ However, this objective was not successfully implemented. Through at least the mid-1980s, political, diplomatic, and other factors remained dominant in the selection and development of German military equipment.²⁰ Further, following major political scandals involving equipment budget shortfalls and cost overruns in the early 1980s, it became clear that the more centralized planning system implemented in 1971 had not brought about a significantly more efficient and cost-effective military acquisition system.

Lessons from the Business World

The emergence of new theories in organizational management and recent experience in the business sector support the conclusion suggested by the record of foreign procurement systems: highly centralized management may not result in greater efficiency or other benefits anticipated by its advocates.

The move toward centralization is based on classical scientific management theory: increasing specialization and centralization improves efficiency. The problem is that the old management paradigm rests on assumptions that may not apply in today's dynamic business environment.²¹ The mechanistic model of management assumes the capacity to analyze trends accurately, asserts the ability to predict future demand and preferences, and attempts to control organizational and market outcomes from the top. In recent years the failures of these classical scientific management principles to cope with the demands of turbulent markets and global commerce have stimulated a revolutionary re-evaluation of management theories.

In the new managerial paradigm, organizations are designed around self-managed teams, flexible specialization, and cooperative networks of suppliers and customers. Learning by the organization and by its individual members becomes the highest cultural value. As one CEO put it, "The rate at which individuals and organizations learn may become the only sustainable competitive advantage."²² Harvard professor Shoshanna Zuboff, the author of *In the Age of the Smart Machine*, explains, "The 21st-century company has to promote and nurture the capacity to improve and innovate. That idea has radical implications. It means learning becomes the axial principle of organizations. It replaces control as the fundamental job of management."²³

As learning is the primary cultural value in the new paradigm, cooperative integration—internally across functions and externally with suppliers and especially customers—is the principal objective. The companies making this revolution are restructuring toward flatter internal organizations and operations that are integrated with external networks of partner alliances, suppliers, and customers. Frank Ostroff and Douglas Smith, writing in *The McKinsey Journal*, assert that

enough companies have moved away from their vertical past, at least in part, to convince any responsible managerial jury that significant performance gains do follow the shift to a horizontal organization. In the two years since Motorola's Government Electronics Group supply management organization made the change, for example, deliveries and requisition cycle time have fallen by a factor of 4, supplier quality has increased by a factor of 10, and headcount [the required number of employees] has plunged by 30 percent. At the same time, there has been a dramatic growth in a wide variety of both individual and team based skills. These results are not unique. Kodak, IDS, General Electric, Knight Ridder, and others have had much the same kind of experience.²⁴

For such reform to be effective, traditional organizations must make fundamental changes and seek a balance between hierarchy and the horizontal form.²⁵ Global operations and all work processes must be redesigned for the requisite integration. Included in the required changes are self-managed teams of employees operating in a culture of trust, an emphasis on managing business processes and installing efficient information technologies for rapid dissemination of knowledge, accountability, and results throughout the organization,²⁶ and a sharp focus on the needs of the customer. Besides increasing customer satisfaction, such integration accelerates responsiveness and consequently increases productivity substantially.²⁷

For these reasons, many leading-edge firms have replaced the linear model of R&D innovation with a demand-driven, tightly linked network model that emphasizes learning the customer's needs and moreover involves the customer directly in the development process. In some cases entire organizational structures have been reformed to match the innovation and customer-interaction process.²⁸

Integrating the Acquisition Process

Some may argue that because there are many differences between global commercial markets and the regulated military acquisition system, we should not try to apply any lessons from the business community. The single monolithic buyer, the limited suppliers who are often forced to compete on risky leading-edge technology development projects, the myriad of regulations, and the adversarial congressional and DoD oversight, micromanagement, and multiple audits and reviews all distinguish military acquisition. These arguments have some merit. In fact, the military business market is so distinct, most contractors who serve it establish separate divisions and separate R&D labs—complete with separate accounting systems, management, employees, and lobbyists—to compete for military contracts.

But their similarities should not be overlooked. Although military customers are not buying goods and services in a commercial marketplace, their demands for weapons and equipment do shift, sometimes rapidly and radically, in response to revised political objectives, varying operational conditions, changes in the threat, and technological advances. Military customers also put a premium on quality and technological sophistication: they want the highest capability, the most reliability in hostile environments, the easiest maintainability, and the friendliest user interfaces. A contractor that is closely

related to the military customer is better able to respond quickly to changing demands and technological opportunities, with consequent cost savings and greater weapon effectiveness.

In the military acquisition context, the principle of developer-user integration is most violated in two phases: the up-front planning phase and the back-end testing and evaluation phase—domains where distrust has been most evident.

Up-Front Planning

Collaboration between users (in this case, military operators) and developers is frequently missing in the current approach to defining requirements. The result is often paralysis. When users generate requirements in isolation and then communicate them to developers, the developers often find they cannot design a viable program to meet those requirements. Similarly, when developers belatedly seek user support in converting a project from a demonstration effort to a development program, they often find that the proposed technology has little practical use.

A recent RAND report recommends a new process to help avoid such failures: direct cooperation of users and developers in defining, evaluating, and selecting new technology options for a given operational objective.²⁹ This concept was recently put to its first test. In an unusual collaboration, the Commanders in Chief of the Strategic and Tactical Air Commands created a Concept Exploration Group (CEG) that consisted of both users and technical experts to evaluate the most promising concepts for improving the attack capabilities of bombers, particularly the B-2, armed with conventional weapons. The experiment demonstrated two clear advantages: the options derived met the needs of both the users and the developers, and the process saved time. In contrast to the established practice of defining operational requirements, which takes about a year and a half, consensus was reached within a few months.

The Office of the Secretary of Defense could restore broader service responsibility for up-front planning by

- Institutionalizing the separation and equality of science and technology, concept exploration, and system acquisition.
- Making it clear that the role of OSD is, for the most part, *oversight*, not conduct.
- Strengthening the role of military departments in fulfilling operational requirements of commanders.

The services, on the other hand, could seek closer links to the acquisition process by

- Establishing the concept that military departments maintain a continuum of actions, from exploring concepts, through acquiring systems, to organizing, training, and equipping force elements.
- Implementing CEGs to promote the interaction of users, scientists, analysts, and acquisition experts.

Another reform that would contribute to greater integration would be to reconstitute the Joint Requirements Oversight Council (JROC), the organization that represents the military interests in acquisition matters, by adding to it the Commanders in Chief of the Unified Commands. Such a change is certainly feasible with today's interactive electronic communications, and it would bring the military customer directly into the final deliberations on acquisition decisions.

Clearly, these reforms would be only a first step toward the kind of integration occurring in the business world. But they would be moves in the right direction. A centralized DoD acquisition agency, on the other hand, with responsibility for concept exploration, demonstration, development, procurement, and testing would reduce the flow of information between developers and users precisely because of its distance from front-line military operations and its lack of expertise at the junction of technology, operations, and military tactics and strategy. Moreover, top-down centralization of acquisition would tend to harden existing rivalry among the services, a rivalry that must be overcome if the integration of missions and roles is to take place.

Test and Evaluation

A salient example of the distrust found throughout the acquisition system is the testing arena. Because of longstanding dissatisfaction with the way test results are reported and used in overall acquisition management, Congress established the Director of Operational Test and Evaluation within the Office of the Secretary of Defense (OSD) in 1983. The director has approval authority over all operational test plans and must report the test results directly to Congress.

The distrust of the services, however, goes much deeper than operational testing. At the level of initial development testing, Congress has been concerned that the services have delayed reporting data or twisted test results to hide problems and failures, delay oversight, and to prolong troubled programs until solutions to

technological or systemic problems can be devised, often at great cost. Program managers, on the other hand, have resisted early disclosure because test results often require considerable technical sophistication to evaluate properly. Managers also fear the data will be misinterpreted and lead to cuts in programs that are in the normal process of refinement. Exacerbating the problem is the systemic failure to provide time or money to “fix” problems that will inevitably arise. These tendencies have, in fact, led to situations where truly serious problems have taken a long time to reach the attention of upper management.

These inherent problems have led some observers to argue that all testing—development and operational—should be managed by a central agency that would report directly to the senior executive level, thus strengthening OSD’s ability to obtain and utilize test results as weapon systems evolve. Such a change, however, would further remove the influence of the military customer and the acquisition program manager over the acquisition process. Continuous involvement of the customer can prove crucial to the testing and refinement required for effective development of new platforms and modifications of existing systems. Completely removing the testing process from the domain of the customer—the military CINCs and the military services as their representative—makes customer inputs much less likely.

There are other risks as well. During development testing, problems are to be expected. The testing is intended to expose the problems and provide data necessary for corrective designs and improvements. It is vital that no centralized administrative barriers be erected between the developers and the test activities during this stage of the process. Centralized management could seriously hinder the rapid and effective utilization of test results. Centralized management would also do nothing to correct one of the main causes of the reluctance to report test results: the fact that there is no room in either the schedule or the budget for developmental problems.

The results of operational tests should be readily available to senior executives. However, the current arrangement, in which the Director of Operational Test and Evaluation must approve all operational testing and report test results directly to Congress, sends to the services a clear message: “We don’t trust you to honestly evaluate your own systems.” Centralizing all testing would add insult to injury with the message: “Or to intelligently develop your systems.”³⁰ Worse yet, complete centralization would remove the management of

operational testing from service control, further isolating the military customer from the acquisition process.

Some savings in the current drawdown can be reasonably expected with consolidation of underutilized test facilities. For all of the above reasons, however, we recommend exercising considerable caution before creating a more centralized management structure for Test and Evaluation. On the one hand, it is not clear how centralization alone would lead to noticeable improvement. On the other hand, such centralization could introduce new problems and make the overall process much less effective than it is today. We believe the proponents of centralization bear the burden of identifying how such changes would lead to important benefits without incurring significant costs. In light of the lessons from the business world, such a burden appears difficult to meet.

Implications for Acquisition Reform

Despite its flaws, the current acquisition system is basically sound. The recent war in the Persian Gulf demonstrated that the United States is producing the world’s most capable military equipment. No government subsidies are needed to achieve good foreign military sales. With the acquisition of systems now under the control of the Secretary of Defense through the office of the undersecretary for acquisition, no existing condition justifies additional centralized bureaucratic management. As the experience of our European allies suggests, there is little evidence to suggest that centralized bureaucracies are managing their limited military R&D resources more efficiently.

Nevertheless, the acquisition process needs to adapt to shrinking budgets and uncertain threats. The challenge calls for innovative ideas. New cooperative relationships should be fostered among the theater commanders in chief and the services themselves. Cross-service and cross-functional teams with members from all levels of the military and acquisition hierarchies could be given responsibility to make integrating recommendations, as they have in the recent Concept Exploration Group.

Instead of pursuing traditional centralization, the acquisition system should be reformed to encourage self-managed teamwork, efficient information technologies, flatter internal organizations, and integrated external networks of like-minded suppliers—all focused on meeting the rapidly changing needs and demands of the customer. Such reforms would not only improve efficiency and increase military capability, the examples

from the business world suggest they would begin to generate the degree of trust envisioned by the Packard Commission when it called for "a major institutional change" and "a new spirit of cooperation." Indeed, nothing less is required in today's complex environment.

¹Each new reform was preceded by reports and studies detailing the failures of prior reforms to control the acquisition system. See, e.g., *The Need for Change*, Staff Report of the Senate Committee on Armed Services, October 16, 1985.

²President's Blue Ribbon Commission on Defense Management, *A Quest for Excellence: Final Report to the President*, June 1986, pp. 2-3, 42.

³*Acquisition Reform—1986: Hearings Before the Acquisition and Procurement Policy Panel of the Committee on Armed Services*, 99th Cong., 2nd Sess., 126 (1986).

⁴Marygail K. Brauner and Jean R. Gebman, *Is Consolidation Being Overemphasized for Military Logistics?* RAND, IP-103, 1993, and Michael Kennedy, "Report on DMRD Direct Assistance Effort," RAND Briefing (December 1992) and forthcoming White Paper, *Improving the DoD Management Reform Process*.

⁵Testimony of David Packard, "Defense Acquisition Process," Hearings before the Committee on Armed Services, Senate, 100th Cong., July 27, 1988.

⁶For example, see Philip Revzin, "Paris Cuts Costs, Limits Corruption in Arms Purchasing: Washington Is Looking to Learn If France's System Is Worth Adopting," *Wall Street Journal*, July 26, 1988.

⁷Jean-Michel Boucheron, *1990-1993 Programmation Militaire*, Economica, Paris, 1989.

⁸*Ibid.*, pp. 172-196.

⁹For example, see David Yost, "French Defense Budgeting: Executive Dominance and Resource Constraints," *Orbis*, Vol. 23, No. 3, Fall 1979.

¹⁰See William Walker and Philip Gummett, "Britain and the European Armaments Market," *International Affairs*, Vol. 65, Summer 1989, pp. 420-422; and "Cost Overruns, Delays Cited In Britain's Military Programs," *Aviation Week & Space Technology*, February 18, 1985, p. 17.

¹¹"Equipment Programmes Criticised," *MILAVNEWS*, No. 343, May 1990, p. 13.

¹²Committee on Armed Services, House of Representatives, *A Review of Defense Acquisition in France and Great Britain*, U.S. Government Printing Office, Washington, D.C., August 16, 1989, p. 10. The subcommittee did conclude, however, that the United States could learn much from other aspects of the French and British systems, including their professionalism, stable budget environments, and clear chains of command.

¹³Edward A. Kolodziej, *Making and Marketing Arms: The French Experience and Its Implications for the International System*, Princeton University Press, Princeton, 1987, pp. 236, 237, 258, 259, 260, 261.

¹⁴*Ibid.*, pp. 272, 275.

¹⁵For example, see Arthur Alexander, *Of Tanks and Toyotas: An Assessment of Japan's Defense Industry*, RAND, N-3542-AF, 1992.

¹⁶U.S. Congress, Office of Technology Assessment, *Lessons in Restructuring the Defense Industry: The French Experience—Background Paper*, U.S. Government Printing Office, Washington, D.C., June 1992, p. 16.

¹⁷Jacques S. Gansler, *Affording Defense*, The MIT Press, Cambridge, Mass., 1989, pp. 224-226.

¹⁸U.S. Congress, Office of Technology Assessment, *Lessons in Restructuring the Defense Industry*, op. cit., p. 17.

¹⁹Quotes from Regina Cowen, *Defense Procurement in the Federal Republic of Germany*, Westview Press, Boulder and London, 1986, pp. 49, 115.

²⁰A detailed critique of the politicization of Luftwaffe procurement programs and the low priority accorded to military requirements through the late 1970s can be found in Alfred Mechttersheimer, *MRCAs Tornado: Rustung und Politik in der Bundesrepublik*, Osang Verlag, Bad Honnef, 1977.

²¹McKinsey consultants Frank Ostroff and Douglas Smith summarized the problem in this manner: "Years of experience have shown that the crucial advantage of vertical organizations is functional excellence. But their central defect is coordination—across tasks, across departments, across functions. Because so many of today's competitive demands appear to call even more on coordination than on functional excellence, it is no surprise that vertical organizations have a hard time responding." Ostroff and Smith, "Redesigning the Corporation: The Horizontal Organization," *The McKinsey Quarterly*, 1992, Number 1, p. 148.

²²Ray Stata, "Organizational Learning—The Key to Management Innovation," *Sloan Management Review*, Spring 1989, p. 63.

²³As quoted in Thomas A. Stewart, "The Search for the Organization of Tomorrow," *Fortune*, May 18, 1992, p. 92.

²⁴Ostroff and Smith, "The Horizontal Organization," op. cit., p. 167.

²⁵See Michael E. McGrath and Richard W. Hoole, "Manufacturing's New Economies of Scale," *Harvard Business Review*, May-June 1992, p. 94.

²⁶See Stewart, "The Search for the Organization of Tomorrow," op. cit., p. 92.

²⁷A recent study by the Boston Consulting Group of 50 business organizations implementing the new nonlinear paradigm found an average four-fold decrease in throughput times (order-to-delivery), combined with three- to four-fold simultaneous improvements in capital productivity, complexity, and quality over a mean transition period of four years. During this period, labor productivity averaged 16 percent annually, doubling over four years. Ruyard L. Istvan, "A New Productivity Paradigm for Competitive Advantage," *Strategic Management Journal*, Vol. 13, 1992, pp. 525-537.

²⁸For example, Xerox, as described in Elizabeth Corcoran, "Redesigning Research," *Scientific American*, June 1992, p. 102; and Wayne G. Walker, *Recovering the Fumbles and Organizing for the Future: Xerox Integrates R&D into Corporate Strategy and Restructures To Become a Learning Organization—With Lessons for Military Acquisition*, RAND, P-7802-AF, 1992.

²⁹Glenn A. Kent, *A Framework for Enhancing Operational Capabilities*, RAND, R-4043-AF, 1991.

³⁰The ultimate irony is that we do trust the military to place their lives at risk using the systems in combat. No centralized DoD testing agency will ever be asked to do the same.

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