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Military Reengineering Between the World Wars

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Prepared for the Office of the Secretary of Defense

NATIONAL DEFENSE RESEARCH INSTITUTE

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Summary

Introduction

Incorporating new technological innovations into military organizations has always subjected senior leadership to high degrees of risk, as exemplified by the advent of gunpowder, the steam engine, the telegraph, the radio, or the nuclear bomb.[1] The question is whether comparative historical study can illuminate successful strategies to mitigate such risk as well as caution against problematic approaches. This is a relevant policy question given the perceived military opportunities currently suggested

[1] For an in-depth discussion of gunpowder, see Bert S. Hall, *Weapons and Warfare in Renaissance Europe: Gunpowder, Technology, and Tactics*, Baltimore and London: Johns Hopkins University Press, 1997; and Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800*, Cambridge: Cambridge University Press, 1988. On the subject of steam, see Dennis E. Showalter, *Railroads and Rifles: Soldiers, Technology, and the Unification of Germany*, Hamden, Conn.: Archon, 1975. For nuclear power, refer to such classic studies as A. J. Bacevich, *The Pentomic Era: The U.S. Army Between Korea and Vietnam*, Washington, D.C.: National Defense University Press, 1986; and Harvey M. Sapolsky, *The Polaris System Development: Bureaucratic and Programmatic Success in Government*, Cambridge, Mass.: Harvard University Press, 1972. For more generalized studies associated with the Revolution in Military Affairs campaign, see Andrew Krepenevich, "Cavalry to Computer: The Pattern of Military Revolution," *National Interest*, fall 1994, pp. 30–42; and Richard O. Hundley, *Past Revolutions, Future Transformations: What Can the History of Revolutions in Military Affairs Tell Us About Transforming the U.S. Military?* Santa Monica, Calif.: RAND Corporation, 1999; as well as the numerous other studies done for, or influenced by, Mr. Andrew Marshall, OSD's Director of Net Assessment. Some of these studies, including the work of Michael Vickers, have apparently not been formally published.

While this essay is not directly confronting the notion of "revolutionary" military change, it is implicitly arguing that *reengineering* may be a less problematic term, given the warnings that institutional economists have made about the dangers of seeking revolutionary change in complex organizations. See Douglas C. North, *Institutions, Institutional Change, and Economic Performance*, Cambridge: Cambridge University Press, 1990.

by the rapid growth of computer networks and processing power. Yet while fundamental combat strategies of attrition, annihilation, and counterinsurgency have persisted despite the particular technology involved, fundamental approaches to risky technological incorporation also exist.[2] To address these approaches, this work analyzes the contrasting military responses to the internal combustion engine between World War I and World War II through the lens of reengineering.

Reengineering, as the term is used here, denotes a fundamental change in an organization's processes. Such change results from a reasonably "managed" effort that is made possible by two conditions: the technology required either exists or is within reach, and the goals are reasonably well perceived.[3] Military forces can change, and even transform, in widely contrasting ways. Reengineering has particular relevance because it typically relates to near- and mid-term planning. Some reengineering campaigns are highly planned (i.e., the solutions are worked out in advance), whereas others are accomplished through more iterative innovation, experimentation, and full-scale operational testing. In the latter case, there may be many studies and rigorous analyses, but solutions are more often "discovered" than deduced a priori. It is also possible to start reengineering an organization's processes with a prototype effort that is relatively insulated from the organization as a whole. Its diffusion throughout the organization is only permitted when local success is assured.

The purpose of this work is to assess the military strategies for incorporating the internal combustion engine during the interwar period. Adopting the familiar point that it is one thing to adopt new technology and quite another to change an organization's basic pro-

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[2] For the classic analysis of strategies of attrition and annihilation, see Hans Delbruck's three-volume series *History of the Art of War,* Lincoln, Nebr.: University of Nebraska Press, 1990. For a more recent analysis of counterinsurgency strategies, see Max Boot, *The Savage Wars of Peace: Small Wars and the Rise of American Power,* New York: Basic Books, 2002. For a comparative discussion of technological innovation strategies, see Brett D. Steele, "An Economic Theory of Technological Products," *Technological Forecasting and Social Change,* Vol. 48, No. 3, March 1995, pp. 221–242.

[3] For further discussion and definition, see Paul K. Davis, *Planning Force Transformations: Learning from Both Successes and Failures*, Santa Monica, Calif.: RAND Corporation, unpublished, 2001.

cesses and overall structure, this survey considers the following three sets: (1) nations that adopted technology but did not change their processes; (2) nations that both adopted technology and changed their processes (i.e., reengineered) but got the vision wrong; and (3) nations that both reengineered in response to new technology and got the vision largely right. Each set of national experiences offers basic strategic insights into the benefits and risks of reengineering in response to new technological opportunities.

In the interwar years, few disputed the need for tanks and motorized transport. The controversy concerned whether such machinery could be assimilated within established doctrines and processes or whether more fundamental changes were needed. Those advocating deeper changes faced the immense challenge of proving that the new technology, coupled with uncertain new processes, offered vast improvements in system performance. All of this should sound familiar in light of current debates about military transformation in response to new technological realities.

Military change in the interwar era is a popular topic in institutional military history. Historians, including Williamson Murray, Allan Millet, David Johnson, MacGregor Knox, and Timothy Foy, have generated a substantial body of knowledge in this domain. This monograph seeks to synthesize some of that literature by focusing on institutional responses to new internal-combustion-engine technology. It will in turn cast such familiar developments as the German Blitzkrieg tactic and the Soviet Operational Art in a different light, relative to popular historical perceptions.

Militaries That Assimilated Technology but Did Not Reengineer

Three significant interwar armies willingly adopted the tank while leaving basic military processes intact: the Italian, the British, and the American. The Fascist Italian army proved to be the most conservative: it displayed little formal imagination in developing military processes beyond the massed infantry and artillery tactics of World

War I, in spite of Italian experiments with mechanized and motorized warfare in Ethiopia and Spain. Only temporarily, the British and American armies showed creativity in their experimental studies of new armored-warfare processes. Like their Italian counterparts, the British and American senior commanders largely rejected or misanalyzed the results of their experiments, especially any evidence suggesting the utility of an independent armored division. They were willing to acquire motor-powered vehicles for both transportation and combat, but they were ultimately only willing to use them to marginally improve existing infantry, cavalry, and logistical processes. Surprisingly, such persistence lasted well into World War II, especially in the British army. Nonetheless, the Allied victory clearly shows that weak reengineering efforts in peacetime can be counterbalanced by highly adaptable troops in the field, prodigious acquisition capabilities, and a powerful, if not stoic, political will.

Militaries That Reengineered but Got It Wrong

The second set of forces willingly constructed new military processes (and organizations) but based such work on fallacious strategic assumptions. These included the French army, virtually all of the naval forces, and the U.S. Army Air Corps. The French ultimately procured the most technically superior tanks in Western Europe and incorporated them into their new combat doctrine, Methodical Battle. Informed by French experience on the Western Front in World War I, the doctrine maximized firepower and minimized the exposure of France's largely conscripted interwar army. The doctrine, however, proved to be ineffectual against the German offensive that took France by surprise in the Ardennes.

Both the Axis and Allied navies willingly funded the development of the airplane, the submarine, the assault craft, and other internal-combustion innovations introduced during World War I. Such technologies, though, merely enhanced the traditional primacy of the battleship. Yet it was only after Pearl Harbor (and even later for the Japanese) that carrier task forces were recognized universally as the superior tactical formation.

The U.S. Army Air Corps displayed more enthusiasm towards adopting both revolutionary technology and processes. It acquired the powerful B-17 bomber and pioneered the process of daytime precision bombing. Yet daytime precision bombing without escort proved infeasible, and the task of furnishing escorts proved perplexing. The theory, however persuasive, had been highly misleading. Reengineering in the aircraft industry for the mass production of aircraft and bombers nonetheless proved highly successful and went far to compensate for the shortcomings of the precision-bombing process.

Militaries That Reengineered and Got It Right

Some militaries conducted successful reengineering programs that reflected astute strategic analyses. The Soviet Red Army, under Marshal Tukhachevsky's guidance, was willing to invest heavily in the development and manufacturing of tanks, as well as the organization of independent tank divisions to be used in accord with the Deep Operation doctrine. Not well appreciated, however, was Tukhachevsky's success in convincing Stalin to coordinate his first Five-Year Plan to meet the Red Army's logistical requirements for lengthy attritional warfare. This formed the structure that the Soviets used to crush the Wehrmacht in 1943 and 1944, in spite of the purges of 1937 and their consequential defeats in 1941 and 1942.

By contrast, the Germans got the concepts right only during the initial short campaigns of World War II, which were characterized by an optimized distribution of motor-powered resources, along with combined-arms actions, demoralizing encirclement tactics, and frontline initiative. Nevertheless, they could not restrict their enemies to those easily intimidated by such capabilities; they failed profoundly to prepare for the war they eventually fought and lost—a long, bloody war of attrition in which production and logistics reigned supreme.

Unlike the German Wehrmacht, the U.S. Marine Corps managed to get their reengineering right in the long run. Still saddled with its traditional reputation as secondary naval troops in spite of its valor in World War I, the Marine Corps quickly seized on the seemingly im-

possible process of amphibious assault against active fortified defenses. It adopted this strategy in light of the Allied experience in Gallipoli and its traditional coastal-fortification doctrines. This in turn reflected the Marines' need for a unique combat mission to ensure institutional survival and to prepare for the looming strategic realities of Japanese expansion into the central Pacific during World War I. It also reflected their faith in the development of suitable motor-powered assault vessels. The Marines' strategic vision and reengineering efforts were sound and central to the Pacific campaign, however stressful initial application proved to be at Guadalcanal and Tarawa.

Despite their relatively successful reengineering attempts, the Red Army, the Wehrmacht, and the U.S. Marine Corps all experienced serious shortfalls when their new forces were exposed to combat. Yet, because of effective feedback processes during World War II, they were able to iterate—building heavily upon, but correcting errors of, their peacetime reengineering efforts. For the Germans, however, such feedback came too late to avoid catastrophic defeat.

Lessons to Be Learned: Necessary Conditions?

Based on this comparative overview, five apparently necessary conditions for military reengineering emerge. The first is the willingness to exploit new technological opportunities systematically through research, education, training, and experimentation. The second is the ability to anticipate and prepare for the range of future strategic demands through historical awareness, strategic analysis, and the ability to transcend immediate political pressures in order to comprehend looming threats. The third condition involves securing sufficient resources (financial, material, and human) for the reengineering process—both externally from civilian political authorities and internally from the military ranks. The fourth is the ability to balance the two fundamental military cultures: the skilled yet traditional warrior and the scientific or rational analyst. The perspectives of both are essential for successful reengineering; failure is perhaps guaranteed when one faction dominates. The fifth and final condition is the ability to objectively diagnose weak-

nesses in the reengineered processes and to proceed to correct them expeditiously: getting things right from the start through reason and prior experience alone is difficult, if not impossible.

Running across these five conditions is the need to engage in open, objective debate and analysis, as well as to assess the results: strong leaders often get things wrong, even badly wrong. Another lesson is that large-scale reengineering usually follows years of smaller-scale efforts, because (1) it takes time to understand problems and develop solutions, even when technology is at hand and broad direction is understood, and (2) organizational resistance to change is very strong until necessity is manifested unambiguously or until a new generation of leaders takes over without the same vested interests.