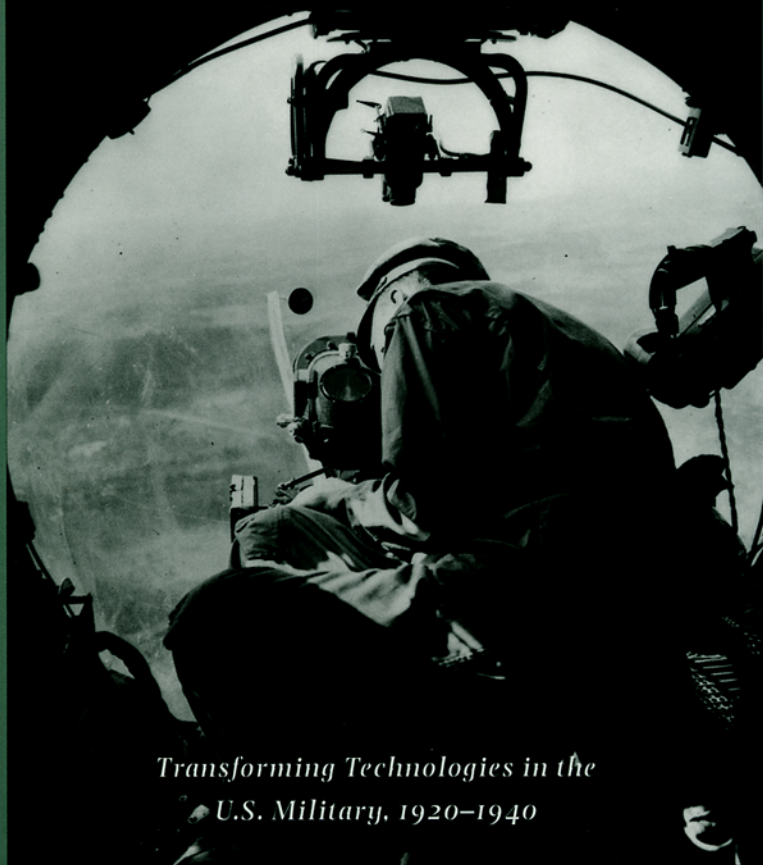


War Machines

T I M O T H Y M O Y



*Transforming Technologies in the
U.S. Military, 1920–1940*

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**Transforming
Technologies
in the U.S. Military,
1920–1940**

TIMOTHY MOY

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Preface

I first noticed these connections as a child. In the midst of a common boy-hood fascination with World War II airplanes, I found that when looking at a photo of an unfamiliar American airplane I could guess with a high degree of certainty whether it had been used predominantly by the Navy or the Army Air Forces. I could not, at the time, explain how I could tell; heavy bombers were easy, of course, but even fighters had distinctions about them that seemed to reflect their services. Some airplanes simply “looked Navy” and others “looked Air Force.”

Only years later did I realize that one big giveaway was the shape of the engine space. Navy planes generally had large, cylindrical cowls to accommodate their big, air-cooled, radial engines; Army Air Forces fighters (with some exceptions) had liquid-cooled, in-line engines that permitted a sleek, pointed nose. But why was this so? Part of the answer, I learned, was that individual airplane companies develop certain design preferences over time. The Navy got most of its fighters from a small set of companies (Grumman, Chance-Vought, and so on), whereas the Army Air Forces got most of its fighters from a different set of companies (Lockheed, North American, Curtiss, and so on). But the look and feel of Navy and Air Force fighters was also shaped by a mundane socio-technical fact: air-cooled engines were easier to maintain and repair. At sea for extended periods, tied to long and sometimes tenuous supply lines, the Navy opted for the simpler and more rugged radial engines, and that is part of what gave the F4F Wildcat, the F6F Hellcat, and the F4U Corsair that barrel-nosed Navy look. The Army Air Forces, on the other hand, unencumbered by trying to maintain an air force for carrier operations, opted for the higher performance but increased fragility of liquid-cooled, in-line engines, thus giving the P-40 Warhawk, the P-51 Mustang, and the P-38 Lightning that sleek Air Force profile.

Once you look for them, it is easy to find these sorts of connections

between the design of technologies and the special characteristics and concerns of the organizations that create them. Such connections can exist even for machines that are theoretically unrestricted by any technical requirements whatsoever. A fellow *Star Trek* fan once pointed out that the 1960s version of the starship *Enterprise* looked like it had been designed by Chevrolet, the early 1980s movie *Enterprise* looked like it had been designed by BMW, and the late 1980s–early 1990s *Star Trek: The Next Generation Enterprise* looked like it had been designed by Mazda.

It goes without saying that their environments shape technologies. Aircraft designers in the 1940s worked within complex technical restrictions, and the various artists at Paramount were, despite their twenty-fourth-century vision, bound to the industrial and aesthetic milieu of the twentieth. But do these connections go farther? Is there more to the relationship between technology and institutions than the shape of an engine cowl or a science-fiction spaceship? Can entire technological systems bear the imprint of the institutional identities that created them?

It was these sorts of questions that brought me, a historian of science and technology, to look at the U.S. Army Air Corps and the U.S. Marine Corps during the years between the world wars. Originally, I had intended to focus on what I thought would be the most fertile historical period for studying the relationships between military institutions and technology: the early Cold War era. However, as I read the literature on science, technology, and the military during and immediately after World War II, I could not shake the feeling that I was already looking at a well-organized political, industrial, and bureaucratic apparatus—something that clearly had not sprung spontaneously into existence in the mad rush after Pearl Harbor. Rather, this machine appeared to have been operating for some time, wanting only fuel. The enormous influx of wartime dollars sent the machine, already extant and carefully tended by skilled operators, into high gear. In search of the genesis of this machine, I began looking back into the 1920s and 1930s.

I quickly found that the interwar decades were a much better period for examining this relationship. The dynamic between technology and institutional identity was easier to see in that era because it was uncomplicated (compared to the Cold War period) by the extraordinary experiences of World War II. In the days before radar, missiles, and nuclear weapons there was much less of a consensus on the relationship between technol-

ogy and war. Consequently, the unique cultures and characteristics of individual institutions were able to play much larger roles in shaping technology for military purposes. The interwar years were uncertain and precarious times, filled with opportunity and risk, and the field was wide open.

The book that has resulted is a somewhat hybrid study. It is about agencies within the U.S. military, but it is not strictly a work of military history. Rather, it is an analysis of the relationships between technology, politics, and culture that happens to focus on military organizations. So, while I hope the book will be useful to scholars of military history, my primary intention has been to illuminate a broader dynamic between institutions and the technologies they envision.

Acknowledgments

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War Machines

Chapter 1

Culture, Technology, and Institutions

It looked like a video game. When the bombs started falling on Baghdad in 1991, Americans by the millions were captivated by nosecone and wing-camera footage of precision-guided “smart” bombs flying down ventilator shafts and through armored doors. They marveled at this latest illustration of American technological wizardry in the service of national security. If some of the wizardry later turned out to include a touch of the charlatan, no matter; technologies, made in America with wonderfully American names like Patriot, Tomahawk, and Maverick had become new American war heroes.

To say that the American military loves technology is to state the obvious. It is difficult to think of a military force, in this century or any other, which has been more intimately tied to its technology than the U.S. military since World War II. But while the American military establishment has had an extremely close relationship with technology, the origins, evolution, and nature of that relationship have varied enormously from one service to the next.

This book is a study of the relationship between technology and institutions. While it focuses on the U.S. Army Air Corps (predecessor of the U.S. Air Force) and the Marine Corps during the period between the world wars, it explores a relationship that is not unique to military agencies. Specific technologies mean different things to different institutions. In the 1980s, the electronic digital computer meant something very different to the blue-suited men from IBM than it did to the sneaker-shod kids at Apple. Although both were computer companies, and both dealt with similar conglomerations of silicon and electrons, they, like their creations, were

instantly distinguishable from one another. For most of the twentieth century, even as uniform and rigid a technology as the baseball bat has meant something different for institutions as similar to one another as the home run-hitting Yankees, the base-stealing Dodgers, and the singles-hitting Red Sox. That single piece of hardware plays a different role in shaping the institutional identities of each of those organizations.

It is also the case that different institutions will shape technologies to their own ends and within the bounds of their individual, institutional cultures. A child can distinguish automobiles designed by different manufacturers. Likewise, the IBM personal computer and the Apple Macintosh, especially in their early incarnations, very much reflected the institutions from which they sprang.

The same is true for the relationships between technologies and military institutions in the twentieth century. The Air Force, for example, evokes images of pilots operating high-tech weaponry, striking swiftly and precisely from out of the blue to lay waste enemy installations and factories. For the Marine Corps, on the other hand, the fundamental icon is Iwo Jima, an image literally cast in bronze as the Marine Corps memorial in Washington, D.C. The vision of marines hitting the beaches in simple but rugged landing craft and then slogging their way ashore under enemy fire defines the Marine Corps as an institution. But much lies beneath these surface manifestations of how different institutions interact with technology. What role does technology play in shaping institutional behavior and serving bureaucratic ends? How do institutional cultures, in turn, shape attitudes about technology and technologies themselves?

The central argument of this book is that while airmen and marines have had different relationships with their machines, they have shared the historical dynamic that created those relationships. The images of precise aerial bombing and grueling amphibious landings both originated in the period from 1920 to 1940. During the interwar years, leaders of both the Army Air Corps and the Marine Corps carefully and deliberately wedded their institutions to visions of warfare that were based on new military technologies, and then staked their institutional survival on those images. Empowered and constrained by technology and culture, they recreated their agencies during the interwar years.

Competition and Culture

Sociologists and political scientists have long noted that institutions behave like organisms. In finite environments, both are driven by their innate penchant for self-preservation to interact competitively with one another. The precise form of that competition, however, can vary enormously. Organisms have many ways to compete for scarce resources. An organism's survival strategies might include killing its rivals, cooperating with them, stretching higher to gather more sunlight, or finding the underside of a slimy (but life-sustaining) rock that somehow went unnoticed by its competitors.

Institutions also compete in different ways. The venue of that competition can be a marketplace, a board meeting, or a congressional appropriations hearing. The form of the competition can be a zero-sum confrontation in which a victor triumphs at the expense of the vanquished, or it can be a remote interaction in which one or both agencies find new institutional niches in which to live and thrive. Throughout this book, the term *bureaucratic* will refer to this sort of institutional stress and competition. In no way should it be read pejoratively; it is exactly analogous to the terms *adaptive* or *selective* for organisms.

For organisms, both the form and content of competition are shaped by the characteristics of the species involved. A species' physical characteristics may enable it to compete extremely well in some ways and in certain environments but may prevent it from competing in others entirely. For example, a cheetah, with its swift legs and sharp teeth, may be a wonderful competitor on a grassy plain, a mediocre one on a mountaintop, or a rather poor one in an ocean. The same holds for institutions in their interactions with one another. As with organisms, the competitive behavior of institutions can be shaped by their material characteristics—how large they are, their command of material resources, and so on. But institutional behavior is also shaped by institutional culture.

Throughout this book, the term *institutional culture* will refer to beliefs, practices, and habits of mind that are shared by members of an institution. Membership in an institution—the Air Force, the Marine Corps, the New York Yankees, or Apple Computer—includes adopting some measure of the culture of the group which has been shaped over time by, among other things, the institution's genesis, its past experiences, and the leader-