Disordered by Design:
Democratic Capitalism and the Warfare State, 1954-1961

Justin T. Winokur

April 4, 2022
University of Virginia, Corcoran Department of History

Introduction

The American government in the 1950s faced a grave challenge. How could the country mobilize for defense while waging an ideological war against Soviet Communism? Its solutions to that problem birthed a uniquely American behemoth: the democratic capitalist warfare state. This was a chaotic chimera that married the demands of war with the routines of America's peacetime politics and economy. It was riddled with contradictions, inefficiencies, and compromises, both political and moral. And it gave rise to a permanent defense establishment never before seen in the American experience.

The Eisenhower administration's ballistic missile program offers a window into that strange system. Between 1955 and 1961, the United States set out to build long-range missiles that could attack the Soviet Union with nuclear weapons traveling outside of the atmosphere and against which there was no defense. For a generation born before the age of the airplane, these were science-fiction technologies that would usher humankind into a new era: the space age. As tools of nuclear war, they were as terrifying as they were amazing. The U.S. accomplished its incredible task in just the span of Eisenhower's second term. It did so by mounting one of the largest research and development projects in American history—not in a wartime effort like the Manhattan Project, but in a new system that fused the Cold War's crash urgency with the pillars of America's democratic capitalist ideology.

The ballistic missile program illuminates four aspects of the political economy of America's warfare state, as well as its core tensions. First, decentralization. The program's leaders prioritized diffusion and competition over hierarchy and control. But they remained anxious that centralization would be the only way to get the job done. Second, privatization. The program collaborated with American industry in a manner that sought to take advantage of free-

market capitalism. But it also cultivated anti-competitive oligopoly, shelled out federal subsidies, and developed obstinate vested interests. Third, normalization. The program integrated defense production into the normal routines of America's peacetime economy. But doing so made the weapons industry a core part of American workers' identities, livelihoods, and communities—disconnecting their professional commitments from foreign policy and subverting their historical aversion to the business of war. Fourth, democratization. The scope and scale of the ballistic missile program was shaped by the demands of America's porous, partisan, participatory democracy. But the demands of that democracy were themselves shaped by the warfare state's anti-democratic secrecy.

Behind these characteristics was one crucial decision: the Eisenhower administration chose to wage the Cold War not just with its weapons, but with the process by which it made them. The men running the ballistic missile program were devoted to American political and economic ideals, and believed the Soviet Union confronted them in a mortal competition over the nature of government. When they made decisions about how to organize a massive scientific and industrial project, they consciously engaged in a war of ideas. They designed methods that would embrace idealized American concepts—decentralization, privatization, and restrained government—while reputing the Soviet model. Yet tensions emerged as their ideals clashed with the emergency measures they considered necessary to win a contest for survival.

If the ideals and structures of American political economy shaped the ballistic missile program, the missile program shaped that political economy in return. Its decentralized, privatized, normalized, and democratized nature gave it a momentum independent of policy or the market. That momentum was powered by the bottom-up forces of bureaucratic rivalry, vested interests, personal and professional attachments, and partisan politics. As the ballistic missile

program embedded itself into the peacetime American system, it retreated ever farther from top-down control. Its history offers a glimpse into the origins of defense programs that often appear to have a life of their own.

This study seeks to build on two literatures. The first is the historiography of America's Cold War political economy. This includes work on American cultures of statism and anti-statism, Cold War ideas and ideologies, the problems of "semi-war" and perpetual readiness, privatization and the power of the state, militarization, the character and history of America's defense establishment, Eisenhower's leadership and the politics of his era, military Keynesianism and the characteristics of the military-industrial-university complex, and the impact of defense spending on economic and social development.[1] The second literature is the

[1] On political culture, see Michael Hogan, *A Cross of Iron: Harry S. Truman and the Origins of the National Security State, 1945-1954* (Cambridge: Cambridge University Press, 1998) and Aaron Friedberg, *In the Shadow of the Garrison State: America's Anti-Statism and Its Cold War Grand Strategy* (Princeton, NJ: Princeton University Press, 2012). On Cold War ideas, see O. A. Westad, *The Cold War: A World History* (New York: Basic Books, 2017) and Melvyn Leffler, *For the Soul of Mankind: The United States, The Soviet Union, and the Cold War* (New York: Hill and Wang, 2007). On semi-war, see Hogan, *A Cross of Iron* and Mary Dudziak, *War Time: An Idea, Its History, Its Consequences* (New York: Oxford University Press, 2013). On privatization and the state, see Friedberg, *In the Shadow of the Garrison State*; Brian Balogh, *The Associational State: American Governance in the Twentieth Century* (Philadelphia: University of Pennsylvania Press, 2015); James Sparrow, *Warfare State: World War II Americans and the Age of Big Government* (Oxford: Oxford University Press, 2013). On militarization, see Michael Sherry, *In the Shadow of War: The United States since the 1930s* (New Haven: Yale University Press, 1997). On the defense establishment, see Ernest May, "Cold War and Defense," in Keith Neilson and Ronald Haycock, eds., *The Cold War and Defense* (New York: Praeger, 1990); Ernest May, "The U.S. Government, a Legacy of the Cold War," *Diplomatic History*, Vol. 16, No. 2 (Spring 1992), pp. 269-277; Douglas Stuart, *Creating the National Security State: A History of the Law That Transformed America* (Princeton: Princeton University Press, 2008); and David Reynolds, *From Munich to Pearl Harbor: Roosevelt's America and the Origins of the Second World War* (Chicago: Ivan R. Dee, 2001). On Eisenhower and his times, see William Hitchcock, *The Age of Eisenhower: America and the World in the 1950s* (New York: Simon and Schuster, 2018); Robert Divine, *The Sputnik Challenge* (Oxford: Oxford University Press, 1993); Ira Katznelson, *Fear Itself: The New Deal and the Origins of Our Time* (New York: Liveright, 2013); and Robert Griffith, "Dwight D. Eisenhower and the Corporate Commonwealth," *The American Historical Review*, Vol 87, No. 1 (1982), pp. 87-122. On the military-industrial-university complex, see Thomas Hughes, *Rescuing Prometheus: Four Monumental Projects That Changed the Modern World* (New York: Vintage, 2000); Alex Roland, *Delta of Power: The Military-Industrial Complex* (Baltimore: Johns Hopkins University Press, 2021); and James Ledbetter, *Unwarranted Influence: Dwight D. Eisenhower and the Military Industrial Complex* (New Haven: Yale University Press, 2011). On defense spending and economic development, see Michael Brenes, *For Might and Right: Cold War Defense Spending and the Remaking of American Democracy* (Amherst: University of Massachusetts Press, 2020); Bruce Schulman, *From Cotton Belt to Sunbelt: Federal Policy, Economic Development, and the Transformation of the South, 1938-1980* (Oxford: Oxford University Press, 1991); and Mark Brilliant and David Kennedy, eds., *World War II and the West it Wrought* (Stanford: Stanford University Press, 2020).

historiography of the ballistic missile program. This scholarship concerns the sources of technological change in the defense establishment, the program's bureaucratic management, and the intellectual and social legacy of ballistic missiles.[2]

Despite the sophistication of both literatures, neither have adequately addressed the relationship between ideas, structures, and the granular details of policy. The scholarship on political economy offers a helpful birds-eye view of big conceptual problems in the Cold War, but in taking a wide lens it tends to overlook how those problems manifested in daily life. Most scholarship on the missile program offers such a microscopic lens that big conceptual questions fall from view.[3] This study aims to marry the two by tracing in detail how the missile program worked its way from decision to fruition, while connecting those details to a broader interpretation of America's warfare state. This brings into focus several issues missed by the missile historiography, like labor, expertise, race, and gender. It adds detail to the political economy literature by emphasizing the conceptual importance of seemingly mundane mechanisms like contracting procedures and workplace environments. And in providing the fullest analysis of the entire ballistic missile research, development, and production process to date, it aims to advance scholarship on the mechanisms of defense policy while clarifying the social, political, and economic origins of humanity's ongoing dilemma over nuclear weapons.

[2] On technological change, see Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: The MIT Press, 1993). On bureaucratic management, see Edmund Beard, *Developing the ICBM: A Study in Bureaucratic Politics* (New York: Columbia University Press, 1976); Neil Sheehan, *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon* (New York: Random House, 2009); Robert Watson, *Into the Missile Age: 1956-1960* (Historical Office, Office of the Secretary of Defense: 1997); and Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force* (Office of Air Force History, United States Air Force, 1990). On the ballistic missile program's legacy, see Hughes, *Rescuing Prometheus* and Gretchen Heefner, *The Missile Next Door: The Minuteman in the American Heartland* (Cambridge: Harvard University Press, 2012).

[3] For good exceptions, see Heefner, *The Missile Next Door*, and Hughes, *Rescuing Prometheus*. However, these scholars are concerned with different questions about a different period.

This study is comprised of four sections. It first analyzes the decision in 1955 to build ballistic missiles and the debates over the program's organization. It then examines how the Pentagon worked with industry to create a network of contractors, factories, and launch complexes around the country. Next, it goes inside of those contractors to explore the experiences of experts and laborers charged with making ballistic missiles a reality. Finally, it assesses Eisenhower's decisions concerning the shape and size of the ballistic missile arsenal, and the ways in which Sputnik affected those decisions. Each section draws on a mix of White House national security documents, a nearly-complete set of monthly progress reports for the ballistic missile program, documents from within the ballistic missile management complex, Congressional documents, and newspapers.

These sources reveal that the ballistic missile program shaped, and was shaped by, an irresolvable collision between ideal American political economy and the demands of security. It was disordered by design; in helping shape the warfare state's sprawling defense economy, it designed new forms of disorder. An essential element in a broader transformation of the United States at the dawn of the Cold War, this program offers a glimpse into a system of defense, economy, and power with which Americans were experimenting for the very first time.

The Decentralized Warfare State

In 1955, Eisenhower approved a sprawling and cacophonous organization to prosecute the ballistic missile program. Other than attaching a "highest priority" label to the missile effort, it did little to alter the peacetime procedures of America's diffuse and rivalrous military. In doing so, it challenged emerging demands for a new Manhattan Project: more centralized, more costly, and placed on a wartime footing. The debate over this organization intersected broader questions about how to govern America's defense economy in the Cold War. Participants engaged issues

about the role of the state in American life, the dilemma over the extent to which the U.S. was at war with the Soviet Union, and the nature of efficiency in the American system. The final decision enshrined a view of America's Cold War that was anti-statist, saw the Cold War as a peacetime struggle, and was wedded to the belief that competition produced better results than control. This choice drew on and reinforced old American political ideals in an open challenge to the Soviet Union's statist, wartime, command system. But lurking beneath the surface remained a gnawing anxiety that this system of ideals could not accomplish its tremendous task.

For Eisenhower, ballistic missiles were inseparable from the thermonuclear revolution that dominated the beginning of his presidency. The U.S. ignited the world's first thermonuclear explosion in the autumn of 1952.[4] The Soviet Union tested its first thermonuclear device less than a year later, in August 1953.[5] The Americans followed in March 1954 with the Bravo test, a thermonuclear explosion twice as powerful as expected and packaged for the first time in a bomb that could travel by air.[6] Debate had raged since 1949 about whether to build these bombs, unlimited in destructive potential and denigrated by opponents as fundamentally different from the fission bomb: immoral, inhuman, un-American, and genocidal.[7] Having completed the journey into a world of such weapons, Eisenhower sought counsel from his scientific advisory board. Pearl Harbor, barely a decade distant, hung darkly over his mind. The president now foresaw a Pearl Harbor of city-killers. How, he asked his scientists, could he prevent such a surprise attack?[8]

[4] Peter Galison and Barton Bernstein, "In Any Light: Scientists and the Decision to Build the Superbomb, 1952-1954," *Historical Studies in the Physical and Biological Sciences*, Vol. 19, No. 2 (1989), p. 328.
[5] Hitchcock, *The Age of Eisenhower*, p. 168.
[6] Galison and Bernstein, "In Any Light: Scientists and the Decision to Build the Superbomb, 1952-1954," p. 330.
[7] *Ibid*., pp. 288-344.
[8] Sheehan, *A Fiery Peace in a Cold War*, p. 273.

In what has come to be called the Killian Report after its lead author, the scientists delivered a report on surprise attack that covered more than deterrence. It diagnosed the entire Cold War relationship. The report warned that whichever country had an advantage in nuclear weapons would be able to call the shots around the world—and that Washington's advantage was slipping away. If nothing changed, a condition of paralyzing mutual deterrence would set in by the early 1960s. To strengthen America's nuclear arsenal and extend its political leverage, it argued that the United States should increase its investments in science and technology.[9] Technological development would help keep America on top. The report requested that a nascent Air Force intercontinental ballistic missile (ICBM) program be designated "highest priority." On top of an ICBM with a 5,500-mile range, it also requested an intermediate-range ballistic missile (IRBM) with a 1,500-mile range capable of being launched from land and sea.[10]

These recommendations ignited America's weak ballistic missile program. Prior to the Killian Report, U.S. progress on ballistic missiles was foundering. Before and during World War II, rocketry had gained importance as an experimental program supported by military funding. The project grew in importance during the war, and, as the Cold War dawned, guided missiles became an important part of the American military establishment.[11] But the program comprised only missiles that flew within the atmosphere. The sole exception was an ICBM project run by the Air Force and the Convair division of General Dynamics. Their task was colossal: no human had ever created a space-faring technology. And the political environment was unwelcoming,

[9] Report by the Technological Capabilities Panel of the Science Advisory Committee, 2/14/1955, *Foreign Relations of the United States (FRUS) 1955-57*, XIX, Document 9; Memorandum of Discussion at the 241st Meeting of the National Security Council, 3/17/1955, *FRUS 1955-57*, XIX, Document 17.

[10] Report by the Technological Capabilities Panel of the Science Advisory Committee, *FRUS*, 2/14/1955; Hitchcock, *The Age of Eisenhower*, p. 170.

[11] Daniel Kevles, "Enlisting the Laboratories: Science, Defense, and the Transformation of the High-Tech West," in Brilliant and Kennedy, *World War II and the West it Wrought*; Watson, *Into the Missile Age*, pp. 157-58.

with the churning machine of the military bureaucracy resistant to major technological change.[12] The Air Force officers who ran this project did not believe they were in a position to achieve a breakthrough anytime soon.[13]

Over the course of 1954, effective lobbying by these officers and their supporters in the scientific community turned the ICBM into a highest-priority program within the Air Force. The Killian Report was a crowning achievement in their mission to reach the top of the national shopping list.[14] Nevertheless, the report still needed presidential approval. To get it, the officers needed powerful allies. They found one in Henry "Scoop" Jackson, the Democratic Senator from Washington who had long been a fierce advocate for a strong nuclear deterrent.[15] Beginning in mid-1955, he secretly colluded with the Air Force ballistic missile program for more funding and higher priority.[16] As the chair of the Military Applications Subcommittee of the Joint Committee on Atomic Energy, a powerful Congressional body responsible for all aspects of atomic power, Jackson used secret Air Force information to press for more urgent missile work.[17] This combination of military officers and civilian officials fueled a revolution from below that aimed to make ballistic missiles America's top priority.[18]

These missile advocates argued that they were running a wartime program which demanded the full backing of the state and special provisions to cut through peacetime red tape. In a May 1955 meeting of the Military Applications Subcommittee, Jackson and his Air Force collaborators stressed that the ICBM program could only succeed if the government took a wartime approach. Trevor Gardner, Assistant Secretary of the Air Force for Research and

[12] Hughes, *Rescuing Prometheus*, pp. 76-78.
[13] Sheehan, *A Fiery Peace in a Cold War*, p. 200.
[14] For the best account of this process, if favorable to the Air Force, see Sheehan, *A Fiery Peace in a Cold War*.
[15] *Ibid*., p. 156.
[16] *Ibid*., pp. 272-73, p. 278.
[17] *Ibid*., pp. 272-73.
[18] MacKenzie, *Inventing Accuracy*, p. 96, p. 163.

Development, told the subcommittee that those who believed a missile could not be operational by 1958 were hamstrung by "a lack of confidence that in a peacetime economy one could manage what in effect would be a crash effort."[19] When Jackson asked how his committee could help accelerate the program, Gardner recommended they "get the kind of procurement and facilities freedom that goes with a wartime economy."[20] John von Neumann, a scientist, missile advocate, and influential Atomic Energy Commissioner, concurred: "None of us have any doubt that in wartime and under the conditions, pressures and conditions of the Manhattan District effort this thing could probably have been done four or five years ago. Further opinions on the date really are expressions of how nearly each individual believes the conditions of the operations of the Manhattan District can be effective under present conditions."[21] Jackson agreed, and went further. The Soviets, he argued, "operate anything they want on a wartime basis…. It is not going to upset our economy if this is put on the same kind of basis, I would not think."[22]

The Air Force boosters communicated this wartime urgency to Eisenhower by drafting a letter that Jackson and his influential colleague, New Mexico Democrat Clinton Anderson, sent the president in June. The letter urged a crash program similar to the Manhattan Project.[23] In comments on a draft, the Air Force advocates clarified that they wanted "vigorous backing of the project by the Congress and by the President in order to assure that the peace-time checks and balances which are necessary in our system of government will not be the cause of costly time

[19] Congress of the United States, Subcommittee on Military Applications of the Joint Committee on Atomic Energy, "Development of Rockets and Guided Missiles With Nuclear Warheads," 5/25/1955, ProQuest Congressional, p. 5.
[20] *Ibid*., p. 35.
[21] *Ibid*., p. 13.
[22] *Ibid*., p. 45.
[23] Memorandum of Discussion at the 258th Meeting of the National Security Council, 9/8/1955, *FRUS 1955-57*, XIX, Document 32; Sheehan, *A Fiery Peace in a Cold War*, p. 278.

delays in the accelerated progress of the program."[24] Their letter coincided with increasing pressure on the White House to do something about apparent shifts in the balance of power. That same month, a panel of outside experts reported that America's military advantage over the Soviet Union would last for only two to three more years.[25] In August, the Killian Report panel revised its conclusions to say that the U.S. would lose its military advantage by the end of 1958.[26] In such circumstances, normal governance of an essential military project would not do.

These arguments, and the Jackson-Anderson letter, worked their way to the National Security Council (NSC) in its September discussion of the Killian Report. The group faced difficult choices. Would the ballistic missile program be a crash effort or follow routine procedures? Would it get a new organization or stay where it was? Undersecretary of State Herbert Hoover, Jr., Vice President Richard Nixon, Special Assistant for Disarmament Harold Stassen, Office of Defense Mobilization Director Arthur Flemming, and—unsurprisingly—John von Neumann advocated creating a program like the Manhattan Project. According to Hoover, the program should pursue "all possible avenues to success," no matter if it entailed "going down certain unproductive avenues." In his view, "when you absolutely have to get a job done, you have to take something of the shotgun approach…even if in so doing waste was involved." [27] Secretary of the Air Force Donald Quarles, Air Force Chief of Staff Nathan Twining, and Treasury Secretary George Humphrey disagreed. The Air Force higher-ups were moved, in part, by a civil war within their service: they were pilots who considered unmanned missiles a "back-up weapon" rather than a "replacement weapon" for Strategic Air Command's (SAC) planes.

[24] "Draft of Proposed Memo to Secretary Quarles," August 1955, Bernard A. Schriever Papers, Library of Congress (LOC), Box 1, Folder 7.
[25] Editorial Note, *FRUS 1955-57,* XIX, Document 26.
[26] Memorandum of Discussion at the 257th Meeting of the National Security Council, 8/4/1955, *FRUS 1955-57*, XIX, Document 30.
[27] Memorandum of Discussion at the 258th Meeting of the National Security Council, 9/8/1955, *FRUS 1955-57*, XIX, Document 34.

Quarles told the NSC that the ICBM would create a "billion-dollar bulge" in the defense budget that chilled his "conservative blood." Twining agreed with Quarles's criticism of those who, in favoring a Manhattan Project-approach, "felt that there were all kinds of other alternative possibilities in the prosecution of the program and wanted another billion or so in order to try out such possibilities." Humphrey concurred, arguing that the program should pursue everything "reasonable"—not everything "possible." If Hoover's was a "crash" plan, Humphrey called his own a "sensible" one.[28]

Eisenhower stood between these sides. He favored an almost unrestricted crash effort but did not want to create a new organization like the Manhattan Project. In his response to Jackson and Anderson, he argued that a new program would disrupt existing research so much that it would cause more delays than simply keeping the program where it was. But he added that the ICBM was "of vital importance to the security of the United States," that "nothing surmountable shall stand in the way of the most rapid progress on this program," and that he would not tolerate the usual delays of a peacetime program.[29] That same day, he approved an NSC Action making the ICBM program "the highest priority above all others."[30]

The fact that ballistic missiles had progressed to this point was reflective of a porous American decision-making process. As Donald MacKenzie has observed, "the initiative for new missile systems came largely from below."[31] Eisenhower set and sorted priorities that did not emerge from his own preferences, but bubbled up from underneath. The missile advocates' machinations were as brilliant as they were devious, but they were only given a chance to work because of their government's scattered power centers. The Army and the Navy took advantage

[28] *Ibid*.
[29] *Ibid*, fn 8.
[30] *Ibid*.
[31] MacKenzie, *Inventing Accuracy*, p. 163.

of that porous process as well, worming their way into the ballistic missile program by influencing the Killian Report and waging bureaucratic war in the Pentagon.[32]

This diffuse system was to be enshrined in the shape of the ballistic missile program itself. In December 1955, the Department of Defense presented its organization for the ICBM and IRBM programs. The U.S. would pursue both weapons simultaneously, but in different management structures dispersed across the services.[33] The Air Force would continue its ICBM program and take charge of a land-based IRBM #1. The Army and Navy would share responsibility for an IRBM #2, which would aim to provide both land- and sea-based alternatives to the Air Force IRBM. Each program would be managed by its own Ballistic Missiles Committee, and the whole structure would be managed by a Ballistic Missiles Committee in the Office of the Secretary of Defense.[34]

Eisenhower, who had discouraged a single organization like the Manhattan Project, was now dubious that the services could handle the project efficiently. The president was "astonished" that DoD had created a separate IRBM program, which he feared would distract from and delay the ICBM. He accused officers at the presentation of "bragging" about their progress, prompting Secretary of Defense Charles Wilson to testify that the services were indeed cooperating. He wondered if squabbling over development programs had caused the services to take so long to agree on the program's structure. He refused DoD's proposal to submit annual reports and demanded that the Secretary of Defense send him reports at least monthly, since he was "absolutely determined not to tolerate any fooling with this thing." And as a threat, he closed

[32] *Ibid*., pp. 135-136.

[33] Report on the Department of Defense Intercontinental Ballistic Missile and Intermediate Range Ballistic Missile Programs, 11/30/1955, *FRUS 1955-57*, XIX, Document 44; Memorandum of Discussion at the 268th Meeting of the National Security Council, 12/1/1955, *FRUS 1955-57*, XIX, Document 45.

[34] *Ibid*.

the discussion with reference to the "mass of letters and telegrams" he had received "insisting that the program…should be placed in the hands of one single individual."[35] He authorized the Pentagon's plan on December 21 with significant reservations, telling Wilson that he disliked the idea of three services with a poor record of collaboration all working on ballistic missiles. He approved the organization on Wilson's guarantee that interservice rivalry would not impede progress, but would instead stimulate the "benefits of competition."[36]

With this authorization, Eisenhower created a ballistic missile program that was neither streamlined nor hierarchical. It spanned three competitive and colossal military bureaucracies. Their programs were all overseen by committee. And those committees were overseen by yet another committee. For those like Eisenhower who feared America's descent into a garrison state, this was a direct riposte to centralized control.[37] It carried the imprimatur of the military unification debates several years prior, which had birthed a weak Department of Defense that reinforced decentralization to defend against the rise of a politically influential general staff.[38] It was also a recognition of realities that Eisenhower had observed over his career, especially since those debates: trying to get the services to collaborate or give away programs might provoke more time-consuming and inefficient arguments than simply letting them continue in their imperfect but functional sprawl.[39] Yet this chaos was also risky if the U.S. wanted to get a ballistic missile soon. By working inside of the military's normal structures, the president did not send a signal that ballistic missiles were unusually important or subject to the exceptions of wartime. All the U.S. government had to go on was Eisenhower's assurance that these programs

[35] *Ibid*.
[36] Memorandum of Discussion at the 268th Meeting of the National Security Council, 12/1/1955, *FRUS 1955-57*, XIX, Document 45, fn. 9.
[37] Hogan, *A Cross of Iron*, p. 387.
[38] Hogan, *A Cross of Iron*, pp. 67-68.
[39] See, for example, May, "Cold War and Defense," especially pp. 46-54.

were highest priority, as well as the assumption that competition promoted rather than inhibited efficiency. Eisenhower's own discomfort reveals his doubt that competition and decentralization could get the U.S. a ballistic missile. His discomfort with loose organizations was not new: he had favored a more centralized military during the unification debates.[40] Nevertheless, Eisenhower chose to work with, rather than against, a peacetime military organization explicitly designed to guard against overwhelming concentrations of power.

Others disagreed with this decision. The two most prominent voices were the hawkish Scoop Jackson and Bernard Baruch, overseer of the War Industries Board during the First World War. Both men expressed a desire for more centralized control of a wartime program. In February 1956, Jackson argued on the Senate floor that "the intercontinental ballistic missile is the closest thing to an 'ultimate weapon' that has ever been projected"—the "H-Bomb of delivery vehicles." If the USSR developed an intermediate-range ballistic missile in 1956, he argued, "the mere existence of such a weapon in the hands of the Kremlin, at a time when we did not have it ourselves, could radically upset the world balance of power." It would unravel NATO and subject the West to "the threat of ballistic blackmail." To avoid this future, Jackson called for the missile program to be placed under a single missile czar and urged that it be given "the kind of urgency that heretofore Americans have reserved for war-time conditions." The program required "a basic change in our defense philosophy" because, in the age of thermonuclear surprise attack, "ultimate survival" demanded the U.S. have a strong deterrent. His philosophy was not "that all our weapons programs be placed on a wartime footing," but instead: "all-out work on critical projects today to avoid all-out war tomorrow."[41] For Jackson, the nuclear age

[40] Hogan, *A Cross of Iron*, p. 34, p. 64.
[41] Henry Jackson speech delivered to the Senate, 2/1/1956, Bernard A. Schriever Papers, LOC, Box 2, Folder 1.

expanded war beyond the moment of fighting. When life and death were determined before any battle had begun, how could ballistic missiles be given anything other than wartime leadership?

Eisenhower received a similar and nearly simultaneous message from Baruch. An expert on wartime mobilization and government-industry collaboration, Baruch told Eisenhower at the beginning of February that victory in the ballistic missile race was essential if America hoped to keep its allies. This victory could be achieved within a year if the U.S. empowered a missile czar who represented the President.[42] The president replied that America could do little more on the missile program. "I tried to show him," he wrote in his diary, "that we are already employing so many of the nation's scientists and research facilities that even the expenditure of a vastly greater amount could scarcely produce any additional results." The only additional room for progress would be in a total reorganization and recentralization of the project. But Eisenhower told Baruch that "I had decided not to make a 'Manhattan Project' out of the research effort," and he reiterated his belief that the program would proceed best if left undisturbed.[43]

Eisenhower took Baruch seriously because of his "standing and reputation in the public mind."[44] On the surface that meant he would listen and engage. But more deeply, it reflected Eisenhower's anxiety that Baruch, Jackson, and even the president's highest-level advisors in the NSC represented a new strand in American thinking that demanded centralized control, limitless spending, and wartime prosecution of defense programs in a moment that was not obviously war. He told his advisors that he was struck by "what large numbers of people shared these views of Mr. Baruch."[45] In response to these pressures, Wilson created a new Special Assistant for Guided

[42] Editorial Note, *FRUS 1955-57*, XIX, Document 55.
[43] Diary Entry by the President, 3/30/1956, *FRUS 1955-57*, XIX, Document 68.
[44] *Ibid*.
[45] Editorial Note, *FRUS 1955-57*, XIX, Document 55.

Missiles the following March to provide more centralized management.[46] But this oversight job was far weaker than the "czar" imagined by Jackson and Baruch.[47]

At stake for Eisenhower were fundamental principles of American government. The Killian Report had recommended a long list of technological programs beyond just ballistic missiles. What would happen if each came to be considered an "ultimate weapon" or the "H-Bomb" of its field? Under Jackson's new defense philosophy, how much of the economy would need to submit to wartime mobilization before the U.S. was secure? How many Manhattan Projects could the U.S. sustain until it slipped, almost unaware, into a garrison state? This sprawling organization reflected an anti-statism that Eisenhower had internalized throughout his life, and which had become embedded in the structure of the military during the unification debates of the late 1940s. It was a product of an old American preference for the diffusion of power. It was a challenge to an emerging view that saw the Cold War as real war demanding wartime means. It held to the American conviction that competition was more efficient than control, and thus staked out ground in the struggle with the Soviet Union for the soul of government. But Eisenhower could not fully convince himself that competition would meet the needs of a program he deemed essential. So, having made his choice, he watched tensely to see if his ideals could overcome the Cold War's challenges. What emerged was a program committed to decentralization and competition, and terrified that those things were insufficient for the demands of the times.

[46] Watson, *Into the Missile Age*, pp. 160-61, p. 170,
[47] Watson, *Into the Missile Age*, p. 182.

The Privatized Warfare State

Through 1955, the Air Force was dismayed at the slow pace of Convair's ICBM work. One report declared that "we would have to put their performance down as marginal at best."[48] The Air Force pointed to issues in Convair's organization, the design of their plants, and the lack of urgency among their executives.[49] Success demanded more focused effort. The Air Force decided that specialized work on specialized components, not domination of the entire Atlas R&D process, would be the key to Convair's success. The privilege to develop a component would be awarded by merit. And to stimulate the company's performance even more, the Air Force considered it essential that Convair face a competitor making an alternate ICBM model.[50]

If competition gave Eisenhower faith in the services running the missile program, competition also gave the services faith in the companies building their missiles. Each branch turned to the aircraft industry for help making its weapons. Millions of dollars flowed from the government to private contractors. Each contract for each missile component was allocated by competition: companies presented their best program to the service, and the service would choose the most attractive option. The market would optimize performance. This was the logic of American economics applied to its most important and daunting task. It was a refutation of federal arsenals, big government, and the Soviet system.[51] Different services privatized their programs to different degrees: the Army made good use of its own design team at the Redstone Arsenal, while the Air Force even contracted out management duties. But they privatized the

[48] L.G. Dunn to Simon Ramo, "Performance of Convair," 3/22/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 3; Simon Ramo to Bernard Schriever, "Attached Memorandum from L. G. Dunn," 3/22/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 3.

[49] Memorandum for File, "Trip Findings – Convair, San Diego 29-30 September 1955," September 1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 9.

[50] G. Dunn to Simon Ramo, "Performance of Convair," 3/22/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 3; Simon Ramo to Bernard Schriever, "Attached Memorandum from L. G. Dunn," 3/22/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 3.

[51] Friedberg, *In the Shadow of the Garrison State*, pp. 245-250.

missile program in every case. That was a dramatic change. For all prior U.S. history, companies had played only an emergency role in defense.[52] Now the government was establishing a new aerospace industry as a permanent pillar in its most critical program. Yet if the superiority of market competition and private business was the ideal, reality crashed against oligopoly, federal subsidies, and the emergence of vested interests. The private warfare state limited the government's role, but it did not necessarily maximize efficiency.

By mid-1956 the services had assembled a team of airframe contractors that would build the airframes for, and assemble, their missiles. The Convair Division of General Dynamics would build one version of the ICBM, Atlas. The Glenn L. Martin Company would build the alternate ICBM model, Titan. Douglas Aircraft Company would build the Air Force IRBM, Thor. The Army contracted with Chrysler to aid the Army-Navy IRBM, Jupiter.[53] Additionally, the Air Force's ballistic missile headquarters, the Western Development Division, contracted with the Ramo-Wooldridge Corporation for "systems engineering" and technical direction on each Air Force project.[54] Solid propellant research caused the team to expand further in late 1957, when Lockheed received a Navy contract to develop the Polaris submarine-launched ballistic missile (SLBM).[55] It also sparked work on a new solid fuel Air Force ICBM, Minuteman. By the end of 1958, the Air Force had also brought Ramo-Wooldridge onto

[52] *Ibid*., p. 245.

[53] Office of the Director of Guided Missiles, Department of Defense, Monthly Reports on Progress of ICBM and IRBM Programs, Report 4, 3/31/1956, U.S. Declassified Documents Online (DDO) [Hereafter, "DoD Report"]; "Air Force Discloses Contractors Building Its Ballistic Missiles," *The Wall Street Journal*, 8/3/1956; "3 Contracts Given For Missiles Work," *The New York Times*, 1/15/1957; "Chrysler Corp. Is Awarded Missile Development Project," *The Wall Street Journal*, 2/20/1956; "Chrysler Gets Contract for Work on New Missile," *The Washington Post*, 6/29/1956.

[54] For a good account of Ramo-Wooldridge and the concept of "systems engineering," see Hughes, *Rescuing Prometheus*, pp. 69-139.

[55] "What's News," *The Wall Street Journal*, 10/24/1957.

management duty for that missile, and contracted with Boeing to make the airframe.[56] These airframe contractors would collaborate with a team of companies making key subcomponents, the most important of which were engines, guidance systems, and reentry vehicles.

ICBM	ATLAS (Air Force)	TITAN (Air Force)	MINUTEMAN (Air Force)
Technical Direction	Ramo-Wooldridge	Ramo-Wooldridge	Ramo-Wooldridge
Airframe	Convair (General Dynamics)	Martin	Boeing
Propulsion	Rocketdyne (North American)	Aerojet (General Tire & Rubber)	Thiokol Aerojet (General Tire & Rubber) Hercules
Guidance	General Electric Burroughs Arma (American Bosch Arma)	AC Spark Plug (General Motors) Bell (AT&T/Western Electric) Remington Rand Univac (Sperry-Rand)	Autonetics (North American)
Reentry Vehicle	General Electric AVCO	AVCO	AVCO

IRBM/SLBM	THOR (Air Force)	JUPITER (Army)	POLARIS (Navy)
Technical Direction	Ramo-Wooldridge		
Airframe	Douglas	Chrysler Army Ballistic Missile Agency	Lockheed
Propulsion	North American	North American	Aerojet (General Tire & Rubber)
Guidance	AC Spark Plug (General Motors)	Remington Rand Univac (Sperry-Rand)	General Electric MIT
Reentry Vehicle	General Electric	Cincinnati Test Labs Goodyear Army Ballistic Missile Agency	Lockheed Naval Ordnance Lab Atomic Energy Commission
Submarines			Electric Boat (General Dynamics) Newport News Shipbuilding and Drydock Portsmouth Naval Shipyard Mare Island Naval Shipyard

Figure 1: Primary private and public entities in the ballistic missile program.[57]

These and other smaller contracts comprised a hefty amount of ballistic missile spending, which seized an ever-weightier share of the government budget each year. A program that was only 1% of U.S. defense spending in 1955 soared by 1960 to become the country's second-most funded major weapons program. At the end of Eisenhower's presidency, the U.S. appropriated

[56] Robert Piper, "Minuteman Chronology," Air Force Ballistic Missile Division Historian's Office, 1/20/1959, Digital National Security Archive (DNSA), p. 8, p. 17.

[57] "Air Force Discloses Contractors Building Its Ballistic Missiles," *The Wall Street Journal*, 8/23/1956; DoD Report Nos. 23 (11/29/1957), 28 (3/31/1958), 30 (5/31/1958), 33 (8/31/1958), 36 (11/30/`958), 37 (12/31/1958), 44 (7/31/1959), and 48 (10/14/1960), DNSA; McElroy to Eisenhower, January 1958 ICBM and IRBM progress report, 2/28/1958, DNSA; McElroy to Eisenhower, June 1959 ICBM and IRBM progress report, 7/29/1959, DNSA; "Sperry Rand Group to Design Missile Range Instruments," *The Wall Street Journal*, 9/7/1960.

more money for ballistic missiles than for the Navy's ships or aircraft. After 1958, ballistic missile appropriations remained second only to Air Force aircraft. Major contracts ate much of this money. For example, nearly half of all ballistic missile spending in fiscal year 1957 (nearly $600 million in a budget of $1.4 billion) went to three airframe contracts for Convair, Martin, and Douglas.[58] Even so, as the services doled out the first contracts in 1955 and 1956, they were clear that they were not throwing unlimited funds at a new Manhattan Project. The Air Force noted that scientific research was "not to be limited by budgetary conditions," but that, in all other respects, "economic considerations obtain."[59]

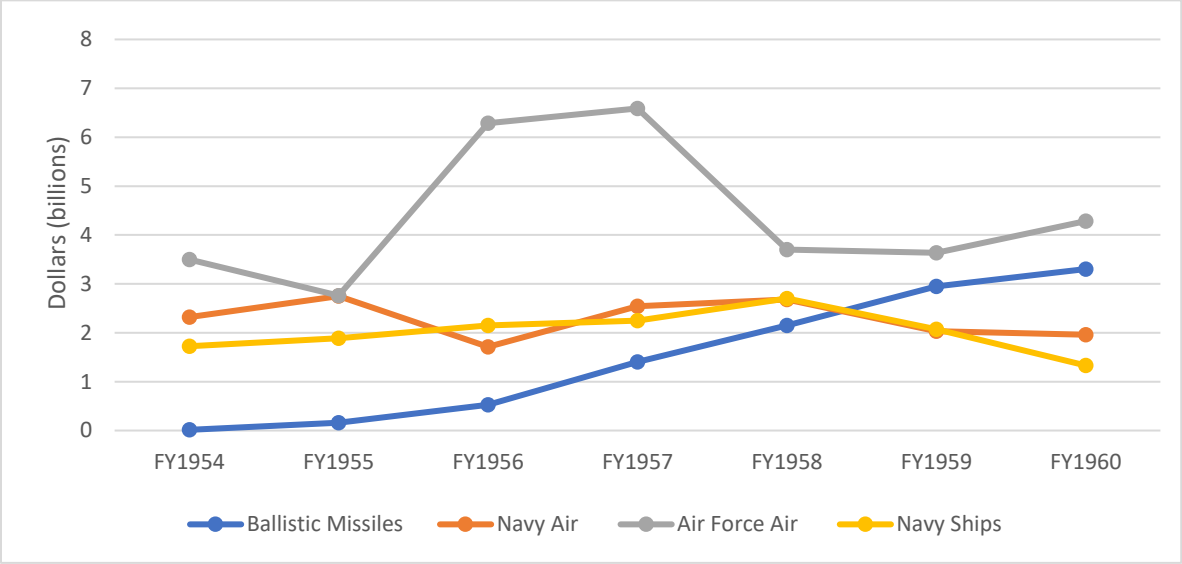

Figure 2: Capital-intensive defense appropriations, 1954-1960.[60]

The Air Force directed that budget estimates should derive from either contractor proposals or previous experience. Yet previous experience was a "somewhat difficult" lodestar

[58] "3 Contracts Given For Missiles Work," *The New York Times*, 1/15/1957.
[59] Harold Morris, "Fiscal Year 1957 Budget Estimate," 7/26/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 6.
[60] Ballistic missile data from Beard, *Developing the ICBM*, p. 206. Navy and Air Force data from The Budget of the United States Government, fiscal years 1956 (pp. 506-07), 1957 (p. 508), 1958 (p. 488), 1959 (pp. 436-37), 1960 (pp. 450-451), 1961 (p. 441), and 1962 (pp. 477-78), St. Louis Federal Reserve Bank, FRASER. Air Force air data for fiscal years 1957, 1958, and 1959 also include non-ICBM and -IRBM missile systems.

because "no precedent exists…except for wartime activity when economic considerations were ignored." As such, contractor estimates constrained by "sound business principles" and "the best judgment" possible were the only real way forward.[61] The problem was that business principles, judgment, and the benefits of competition ran up against the aircraft industry's oligopoly.

In the 1950s, aircraft and automobiles competed for the heart of America's industrial economy. Between 1954 and 1960, car and plane companies were the two largest employers in transportation, the largest sector in American durable goods manufacturing (figure 3). Manufacturing employed almost a third of all Americans.[62] For four of those six years, the aircraft industry employed even more people than a recession-hit automobile industry. For decades, those lumbering aircraft companies had sold almost all of their product to the Department of Defense.[63] Whereas nearly the entirety of that military production had once gone toward fighters and bombers, between 1956 and 1961 the industry came to survive on cruise and ballistic missile contracts. At the start of the period, missiles were just under 6% of the airframe industry's output value; by the end of Eisenhower's presidency, they were just under half of its output value.[64] In those same years, the airframe industry soared from just under one quarter of total missile sales to three quarters.[65] The big aircraft companies were becoming the missile market, and the missile market was becoming their bread and butter.

[61] Harold Morris, "Fiscal Year 1957 Budget Estimate," 7/26/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 6.
[62] Hitchcock, *The Age of Eisenhower*, p. 253.
[63] G. R. Simonson, "Missiles and Creative Destruction in the American Aircraft Industry, 1956-1961," *The Business History Review*, Vol. 38, No. 3 (Autumn, 1964), p. 304-305.
[64] *Ibid*., p. 313.
[65] *Ibid*.

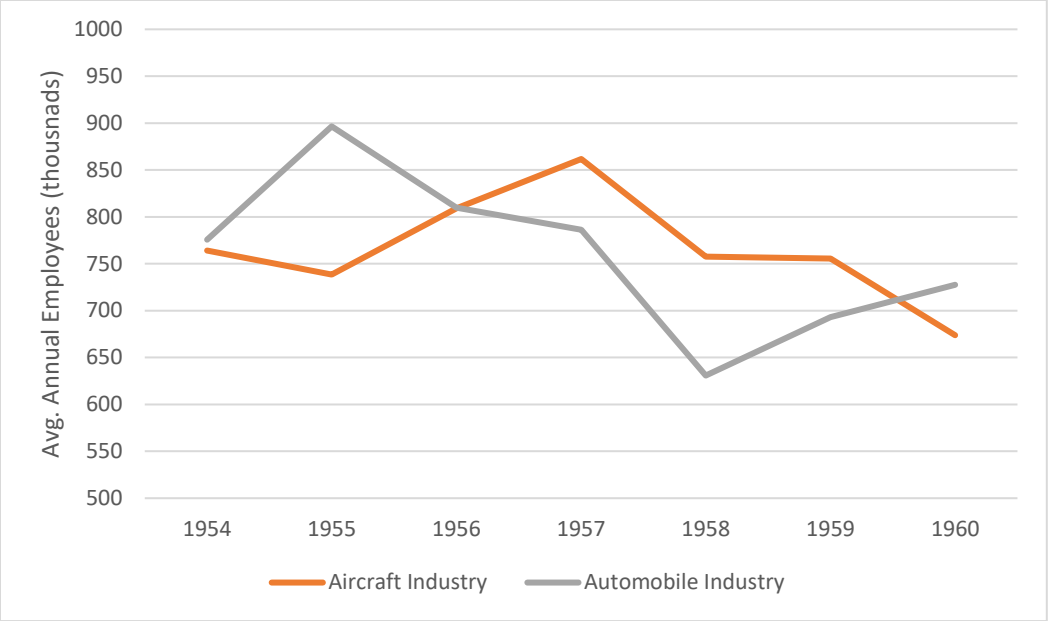

Figure 3: Automobile and Aircraft Industry Employment, 1954-1960.[66]

As the best observer of this revolution has noted, the airframe industry "was decidedly oligopolistic as it had been since well before World War II."[67] On the one hand, the revolutionary technologies of the missile age had helped overturn the industry's monopoly on experience. That allowed new competitors from the electronics and automobile industries into the aerospace field.[68] But on the other hand, the old, gigantic airframe manufacturers still dominated the contracting process. The services were attracted to their seemingly related know-how, specialized personnel, and old relationships with the Pentagon.[69]

[66] For 1954 and 1955, see Department of Labor, Monthly Labor Review, October 1956, Vol. 79, No. 10, FRASER, p. 1215. For 1956, see Department of Labor, Monthly Labor Review, December 1958, Vol. 81, No. 12, FRASER, p. 1423. For 1957 and 1958, see Department of Labor, Monthly Labor Review, December 1959, Vol. 82, No. 12, FRASER, p. 1394. For 1959 and 1960, see Department of Labor, Monthly Labor Review, December 1961, Vol. 84, No. 12, FRASER, p. 1394.

[67] Simonson, "Missiles and Creative Destruction in the American Aircraft Industry, 1956-1961," p. 308.

[68] *Ibid*., p. 306.

[69] *Ibid*., p. 305.

As a result, the Department of Defense contracted with a narrow field of private firms. This was notable across all missiles, but especially in ballistic missiles. For ballistic missile airframes, the services contracted with Douglas, Boeing, Lockheed, Convair, Martin, and Chrysler. Excluding Chrysler, the Army's automotive outlier, these companies were the first, second, fourth, fifth, and seventh largest of the country's top 14 airframe firms by total military sales in fiscal year 1956.[70] Just eight of those 14 firms were engaged in any significant missile production by 1961.[71] The picture remains stark when collapsing all subsidiary divisions into their parent companies and looking across the four major components: airframes, guidance, propulsion, and reentry vehicles. For the 24 slots available in these areas among the six ballistic missile projects, the services contracted with just 18 for-profit companies: American Bosch Arma, AT&T/Western Electric, AVCO, Boeing, Burroughs, Chrysler, Douglas, General Dynamics, General Electric, General Motors, General Tire & Rubber, Goodyear, Hercules, Lockheed, Martin, North American Aviation, Sperry-Rand, and Thiokol. The ballistic missile team constituted a who's-who of the country's most gargantuan aircraft, telecommunications, automotive, and electronics companies. They represented decades of experience managing government-industry relationships, a near-monopoly on the country's skilled engineers, the core of American manufacturing, and the heart of its defense economy.

The competitive contract system was supposed to make the government's partners in industry design better plans and work more efficiently. To contract for a missile, the services issued invitations for design proposals to companies it deemed qualified to compete, and then awarded contracts for the missile's various design, engineering, and production phases.[72] Design

[70] *Ibid*., pp. 308-310.
[71] *Ibid*., pp. 312.
[72] *Ibid*., p. 311.

was an important, even paramount, consideration in awarding contracts, but the government also considered other factors like cost and organization.[73] The theory of the market stipulated that firms would compete to make the most attractive proposal—cheapest, best-designed, and most likely to show results—which would then be selected by impartial referees at the Pentagon.

The contract competitions are revealing. Consider four. First, the competition in early 1955 for a second ICBM design. As noted above, the Air Force had been dissatisfied with Convair's performance on Atlas and believed it would be improved by introducing a competitor working on a different airframe design (or offer a fail-safe if Convair could not get the job done). In its recommendation to start a new ICBM competition, the Air Force wrote that "confidence in achieving the earliest operational missile will be enhanced by the introduction of a competitor and technical back up to the Convair program."[74] An Air Force panel selected companies to compete for the contract. That panel evaluated 77 firms on the criteria of "available development capability," "related experience," "management performance," and "past performance." Of those 77 firms, it considered only five "highly qualified" enough to compete: Bell, Douglas, General Electric, Lockheed, and Martin.[75] The Air Force awarded Martin the contract.[76]

Second, the competition for Thor's airframe contractor at the end of 1955. The Air Force evaluation board reviewed proposals from Douglas, Lockheed, and North American. It rejected several other potential bidders like Chrysler and Martin due to existing ballistic missile commitments, Aerophysics for lack of production capability, and McDonnell for designs the Air

[73] *Ibid*., pp. 311-12.
[74] Commander, Air Research and Development Command, to Chief of Staff, U.S. Air Force, "Second Source ICBMS Airframe," March 1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 3.
[75] *Ibid*.
[76] Chief of Staff, U.S. Air Force, to Commander, Air Research and Development Command, "Selection of Contractor for Alternate Airframe for Project WS-107A," October 1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 10.

Force considered unfit for the program.[77] It rejected Northrop simply because it had not yet participated in the program.[78] Of the remaining three firms, the Air Force set the following evaluation criteria: proposed design, available engineering manpower, impact on the contractor's other programs, organizational and management capability, location, and facility financing requirements.[79] The Air Force unanimously selected Douglas because of the company's "experience with Army ballistic missiles" and their "willingness to supply necessary facilities with their own funds." It rejected Lockheed because of "current management problems, lack of experience, and requirement for $15,000,000 of government furnished facilities." It also rejected North American due to its "very heavy current engineering workload" and need for "considerable facilities to be provided by the Government."[80]

Third, the 1958 competition for a Minuteman airframe contractor. Douglas, Hughes, Boeing, Convair, Martin, Bendix, Ford, General Motors, and Chrysler were among the major companies that submitted bids. The Air Force chose Boeing.[81]

Fourth, the 1959 competition for Titan's inertial guidance system. The Air Force issued a request for proposals to the AC Spark Plug division of General Motors, the Nortronics division of Northrop, Sperry Gyroscope of the Sperry-Rand Corporation, the Autonetics division of North American Aviation, the Arma division of American Bosch Arma, the Minneapolis-Honeywell Regulator Company, and the Kearfott division of General Precision Equipment. It selected these companies because of their "qualifying experience" in related fields. It excluded several others

[77] Bernard Schriever to Charles Terhune, "Recommendation of IRBM Contractor to USAF," 11/30/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 11.
[78] *Ibid*.
[79] *Ibid*.
[80] Commander, Air Research and Development Command, to Chief of Staff, United States Air Force, "IRBM Sourcing," 12/22/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 12.
[81] "Douglas Air, Two Others Give Joint Bid for Work on Minuteman Missile," *The Wall Street Journal*, 9/9/1958; Piper, "Minuteman Chronology," Air Force Ballistic Missile Division Historian's Office, 1/20/1959, DNSA, p. 17.

from the invitation. Litton had "poor showing in facilities and in total available experienced personnel" as well as a history of "poor performance on the Navy Polaris Program," where it was the only one of three companies that "never delivered an acceptable component." General Electric was disqualified because of its "lack of capability for in-house development of inertial components and system." Detroit Controls had a "lack of system development capability and adequate production capability." And Emerson Electric Manufacturing Company had a "lack of experience in development and production of inertial equipment."[82]

Four general observations about the nature of the ballistic missile industry emerge from these competitions. First, roughly the same family of big companies bid on almost every one of these contracts. If a firm lost one contract, it would just bid on the next. Second, the ballistic missile program's capital requirements squeezed out smaller companies, and even some bigger companies. As in the Douglas case, the government preferred companies with the most money and the most willingness to put it at risk. That meant big firms could outcompete smaller firms simply due to the size of their wallets. Third, because the government liked working with experienced firms, the contracting process developed an evolutionary momentum that tended toward narrowness. Established companies had a big advantage over newcomers in both technical competence and government relationships (aided by a revolving door; as will be seen below, many industry executives and employees came from the military). As they worked on the missile program, those companies became even more established. Firms like McDonnell could eventually not break into the industry at all, for essentially no reason. Smaller firms that failed once, like Litton, might not even be invited to compete again. And fourth, the Air Force simply engineered arbitrary preferential treatment. It was unwilling in several cases to consider smaller

[82] Charles Terhune to Bernard Schriever, "Release of Request for Proposal, TITAN Inertial Guidance Procurement," 2/26/1959, Bernard A. Schriever Papers, LOC, Box 3, Folder 2.

firms that lacked facilities—but was otherwise happy to subsidize huge amounts of capital construction for larger firms.

These forces—pre-existing oligopoly, deep pockets, the self-reinforcing feedback loop of experience, and arbitrary preference—strengthened the hold of a small group of colossal companies over the ballistic missile program. Congress attempted to make sure the services were giving small businesses their due.[83] In 1958, Florida Senator George Smathers communicated that mission in the language of competition while opening three days of Congressional hearings on small business participation in missile programs: "In the course of the swift forward strides now being made, our policymakers must not overlook that segment of the economy which has done more to preserve the free and competitive economic system upon which our country has grown to greatness than all the 'household word' giants of industry." An "all-out" missile program, he warned, could create "for the decades to come, an economic structure which would concentrate in a handful of huge corporations the bulk of the productive capacity of this country." Security needed to come first, but nevertheless the U.S. "must guard against permitting a few contracting officers inadvertently undoing the combined antimonopoly work of the Department of Justice and the Federal Trade Commission."[84] But their conversation mainly concerned sub-contracting. When it came to the big components, the big companies ran the show. The services might have sought efficiency and innovation through the mechanism of private companies in competition, but they did so in an anti-competitive marketplace that they

[83] For example, see Air Force briefing notes for Congress, in Bernard Schriever to Director of Procurement and Production, Air Materiel Command, "Small Business Participation in Ballistic Missiles Program," 6/13/1957, Bernard A. Schriever Papers, LOC, Box 2, Folder 14.

[84] United States Senate, Hearings Before a Subcommittee of the Select Committee on Small Business, "The Participation of Small Business in the Missile, Rocket, and Outer Space Exploration Programs of the Department of Defense: April 29, 30, and May 1, 1958," ProQuest Congressional, p. 2.

made worse by both habit and intention. Their control not just over who won, but who even got to compete, strengthened oligopoly behind the illusion of quality control, fairness, and freedom.

The services had an ambivalent attitude toward oligopoly that was both critical and encouraging. They had no illusions about industry's anti-competitive, profit-seeking, market-distorting intentions. In March 1955, Western Development Division director Bernard Schriever accused Convair of undertaking a "propaganda campaign" to "put them in a position to apply political pressure in the event they lose the nose cone competition."[85] In October, another Air Force officer wrote that "I do not believe we should contact industry for the answers to any problems" because "with [the Aircraft Industries Association] as powerful as it is and with the far reaching effect, it is a dangerous thing to ask industry for guidance, as we may always rest assured that they will seek favoritism if given an opportunity."[86] Yet there was also concern about the industry becoming too diversified, too competitive, too disorganized, and too free. Schriever fretted in mid-1955 about the coming influx of space programs, writing that "an uncontrolled expansion of the industry base" would lead to a dilution of manpower, wage inflation, and bottlenecks in limited facilities like test stands. These effects would be "catastrophic to the early attainment of an ICBM." He especially feared the Army and Navy entering the field with their own contractor requirements (and usurping the Air Force's prestige, to boot). Schriever's answer to these problems was "centralized management" and, by implication, the measured and constrained growth of the industrial base.[87] According to him, too many players and the whole system would slow down.

---

[85] Bernard Schriever to Vincent Ford, "General Dynamics – Convair Propaganda Campaign," 3/18/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 3.

[86] Roy A. Watkins, "Supplemental Memorandum for Colonel Morris," 10/14/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 10.

[87] Bernard Schriever draft memorandum to Thomas Power, "ICBM-TBM Interference," attached to Bernard Schriever to Donald Putt, 8/22/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 7; Bernard Schriever to

The military's dedication to competition was, therefore, more complicated than it appeared. It was hostile to inefficiency and market manipulation, and believed that competition would lead to more cost-effective, more efficient, and better-designed programs. But the reality of the American aircraft industry did not live up to the mythologized paradise of free-market competition. And the services were not committed to making that mythology reality. Instead, they were invested in a controlled and oligopolistic market that they cultivated through their own criteria for awarding contracts. Hierarchy and concentration, not freedom and diffusion, was their answer to the ballistic missile challenge. In this anti-competitive environment, it is doubtful that industry's budget estimates were as optimized as the Air Force hoped.

If competition was a shibboleth, so too was the purity of privatization. Beyond R&D awards, another large portion of the federal budget went toward funding private facilities. As noted above, the services tried to award contracts to companies that were most able to meet the capital requirements of their projects. But taxpayers often needed to subsidize private companies. The reasons were multiple. In the first instance, oligopoly allowed contractors to keep self-funding to the minimum necessary for winning the contract. Oligopolistic contract competitions did not inspire generous funding proposals—especially when contractors knew the government was willing to finance big gaps. Additionally, many private companies actually might not have been able to afford the huge capital requirements for making ballistic missiles.[88] And even if they could have afforded it, those companies were fearful of investing private funds in big projects specialized for unproven technologies that very well might have no future.[89] The business risk

Thomas Power, "ICBM-TBM Interference and Dilution of Manpower," 9/23/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 8.

[88] Harold T. Morris, "Fiscal Year 1957 Budget Estimate," 7/26/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 6.

[89] *Ibid*.

involved in joining the ballistic missile project was high. These machines required all-new, expensive facilities. They were different from aircraft and needed accordingly different production technologies.[90] As such, between 1956 and 1961 the airframe industry spent roughly $2 billion on facilities dedicated to both cruise and ballistic missiles.[91] In the case of ballistic missiles, these private expenditures were complemented by even larger public expenditures. For example, in fiscal year 1959, the Air Force spent roughly $241 million on industrial facilities, while its contractors spent only $178 million.[92] For every private dollar, the government spent about $1.30. Even if big firms believed missiles were the future, the government had to absorb substantial amounts of their risk to convince them to take the plunge.[93]

This subsidized industrial base was as colossal as it was far-flung, entrenching the ballistic missile program in myriad state and local economies. A brief tour of just some of these new facilities, most of which emerged between 1956 and 1958, shows the dizzying scale. First, airframes. Outside of Denver, Martin built a $10 million, 500,000 square foot, 5,000-person Titan facility for which it announced a $2 million expansion before construction was even complete.[94] The Army issued Chrysler a $2 million contract for Jupiter facility construction at the Redstone Arsenal in Huntsville, Alabama.[95] Convair began building a $40 million, 1 million square-foot, 6,600-person plant for Atlas research, development, and production in Kearny Mesa,

[90] Simonson, "Missiles and Creative Destruction in the American Aircraft Industry, 1956-1961," p. 307.
[91] *Ibid.*, p. 306.
[92] "AF Ballistic Missile Programs Facilities Investment," no date, Bernard A. Schriever Papers, LOC, Box 11, Folder 11.
[93] This stems, in part, from problems of expert agenda-setting creating industries from the top down. See Brian Balogh, *Chain Reaction: Expert Debate and Public Participation in American Commercial Nuclear Power, 1945-1975* (Cambridge: Cambridge University Press, 1991).
[94] Wilson to Eisenhower, 3/26/1956, DDO; "Glenn L. Martin Gets $28 Million Contract For Plane Tools, Parts," *The Wall Street Journal*, 2/13/1956; "Glenn L. Martin Co. Plans Aircraft Plant Near Denver," *The Wall Street Journal*, 11/29/55; Richard Witkin, "Missiles Program Dwarfs First Atom Bomb Project," *The New York Times*, 4/7/1957; "Glenn Martin to Expand," *The New York Times*, 3/13/1957.
[95] DoD, Report 7, 6/30/1956, DDO, p. 8.

San Diego (Convair put up $20 million for the plant, which the Air Force matched).[96] This would be Convair's second missile-only plant, and its only plant dedicated solely to long-range surface-to-surface missiles.[97] Lockheed finished a Polaris factory in Sunnyvale, California by the end of 1958.[98] Boeing began building a new $11 million Minuteman plant in Ogden, Utah during the middle of 1960.[99]

Second, engines. The Air Force assigned Rocketdyne to a $13 million factory under construction in Neosho, Missouri.[100] Rocketdyne also moved into a $3.5 million facility in Canoga Park, California, just outside of Los Angeles, which already employed 4,000 of the company's 17,000 total guided missile personnel by April 1956.[101] Aerojet finished a $20 million rocket engine plant near Sacramento, and two months later it announced another $13 million, 360,000 square foot engine plant on the same site that would employ 1,000 people in a company that then had 6,000 employees.[102] At the end of 1960, construction began on a $34 million Minuteman engine plant in Brigham City, Utah, to be owned by the Air Force and operated by Thiokol.[103]

[96] "Convair Division of General Dynamics and Air Force Plan $40 Million Intercontinental Missile Plant," *The Wall Street Journal*, 5/3/1956; "New Plant of AF to Make Ocean-Spanning Missile," *The Washington post*, 5/3/56; "40-Million-Dollar Facility Dedicated on Kearny Mesa," *The San Diego Union*, 7/13/1958.

[97] "Convair Division of General Dynamics and Air Force Plan $40 Million Intercontinental Missile Plant," *The Wall Street Journal*, 5/3/1956.

[98] DoD, Report 32, 7/31/58, DNSA, p. 25.

[99] "Mushrooming Missile Complex Centered in Utah," *The New York Times*, 8/30/1960.

[100] "Rocket Plants Slated," *The Wall Street Journal*, 6/15/1956; DoD, Report 7, 6/30/56, DDO, p. vii.

[101] "North American Aviation Sets Up Rocket Engine Unit," *The Wall Street Journal*, 11/8/1955; Richard P. Cooke, "Rockets' Rise," *The Wall Street Journal*, 4/19/1956.

[102] Witkin, "Missiles Program Dwarfs First Atom Bomb Project," *The New York Times*, 4/7/1957; "Rocket Plants Slated," *The Wall Street Journal*, 6/15/1956; Cooke, "Rockets' Rise," *The Wall Street Journal*, 4/19/1956.

[103] "Pentagon to Pay $34 Million to Build New Thiokol Plant," *The Wall Street Journal*, 1/28/1960; "Missile Works Begun: Thiokol-Air Force Minuteman Plant to Rise in Utah," *The New York Times*, 12/4/1960.

Third, guidance. In Chicago, Arma took over a 750,000 square-foot Air Force plant that would make inertial guidance systems with 2,000 employees.[104] Arma also announced an additional $2 million expansion at its Garden City, New York electronics plant to accelerate guidance equipment production.[105] Near Milwaukee, AC Spark Plug began construction of a new electronics plant.[106]

This array of new plants added to a network of existing facilities such as Convair's Lindbergh Field, San Diego missile facilities; Chrysler's missile plant outside Detroit, Michigan; Bell's guidance factory in Whippany, New York; AC Spark Plug's guidance factory in Flint, Michigan; and General Electric's nose cone factories in Pittsfield, Massachusetts and Philadelphia, Pennsylvania.[107] Polaris also roped in submarine manufacturers: the Electric Boat Division of General Dynamics in Groton, Connecticut, the Newport News Shipbuilding and Drydock Company, and the Navy's own Portsmouth and Mare Island Naval Shipyards.[108]

The ballistic missile industrial base was a sprawling behemoth with roots in communities across the United States. Every new plant and contract transmuted abstract policy ideas into real money, real buildings, and thousands of real jobs. By the middle of 1957, this capital and labor began its own alchemical process, transmuting raw materials into ballistic missiles. Each new

[104] "American Bosch Will Use Jet Engine Plant For Air Force Contract," *The Wall Street Journal*, 6/29/1956; "Chicago Area Plants Win Big U.S. Contracts," *Chicago Daily Tribune*, 6/29/1956; Raymond Ellis, "U.S. Awards Missile Order to Am. Bosch," *Chicago Daily Tribune*, 4/24/1957.

[105] "American Bosch Arma to Expand," *The Wall Street Journal*, 8/28/1957.

[106] "AC Spark Plug Receives Contract From Air Force," *The Wall Street Journal*, 6/19/1956.

[107] For Convair, see "Convair Division of General Dynamics and Air Force Plan $40 Million Intercontinental Missile Plant," *The Wall Street Journal*, 5/3/1956; DoD, Report 16, DDO, 3/31/1957, figure 4. For Chrysler, see DoD, Report 2, 1/31/1956, DDO, p. 14; "Chrysler Is Authorized To Set Up an Assembly Line for Jupiter Missile," *The Wall Street Journal*, 6/4/1958; "Douglas Aircraft Wins $24 Million Missiles Contract From Army," *The Wall Street Journal*, 8/4/1958. For Bell, see DoD, Report 15, 2/28/57, DDO, p. 9. For AC Spark Plug, see DoD, Report 35, 10/31/58, DNSA, p. 12. For General Electric, see DoD, Report 15, 2/28/57, DDO, figure 3; DoD, Report 15, 2/28/57, DDO, p. 4.

[108] McElroy to Eisenhower, 2/28/1958, DNSA, p. x; DoD, Report 28, 3/31/1958, DNSA, p. 20; DoD, Report 23, 10/31/1957, DNSA, p. 25; DoD, Report 30, 5/31/1958, DNSA, p. 23; DoD, Report 33, 8/31/1958, DNSA, p. iv; DoD, Report 37, 12/31/1958, DNSA, p. 20; McElroy to Eisenhower, 7/29/1959, DNSA, p. 3; DoD, Report 44, 7/31/1959, DNSA, pp. 24-25.

day, each new dollar, each new factory floor, each new employee, and each new component pushed ballistic missiles from the realm of ideas and debate into the realm of the physical world.

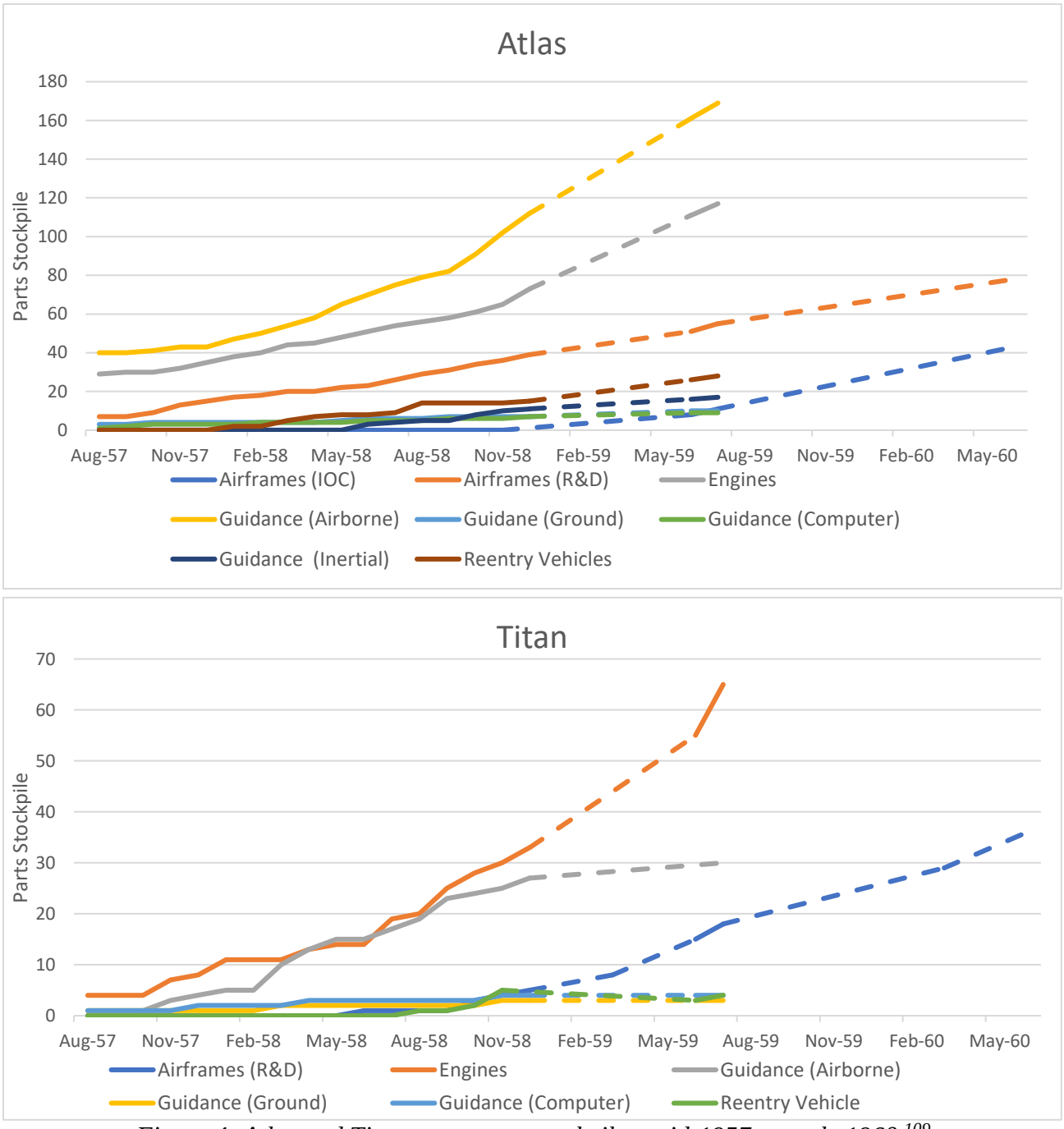

Figure 4: Atlas and Titan component stockpiles, mid-1957 to early 1960.[109]

[109] Data from DoD reports for each month after Report 22, 9/30/1957, DNSA. Dashes indicate missing data.

In addition to factories, the U.S. government began its own set of major construction projects: launch complexes. These were massive, capital-intensive facilities that brought together launch stands, silos, and high-tech ground support equipment. By mid-1960, Air Force contractors had built complexes for two Atlas squadrons at Vandenberg Air Force Base (AFB) in California, with one more finished but not yet operational, and two more under construction. They were building three further complexes at Warren AFB, Wyoming; one at Offutt AFB and one at Lincoln AFB, Nebraska; one at Fairchild AFB, Washington; one each at Forbes AFB and Schilling AFB, Kansas; one at Altus AFB, Oklahoma; one at Dyess AFB, Texas; one at Walker AFB, New Mexico; and one at Plattsburgh AFB, New York. The Air Force was also constructing, but had not yet finished, several complexes for Titan squadrons: two at Lowry AFB, Colorado; one at Ellsworth AFB, South Dakota; one at Beale AFB, California; one at Larson AFB, Washington; and one at Mountain Home AFB, Idaho.[110] The Air Force planned even more construction in Arizona, Kansas, and Arkansas.[111]

This inundation of new capital and jobs reoriented communities toward a new industry designed, promoted, and subsidized by the Department of Defense. California in particular absorbed the greatest mass of the industry. Indeed, the dawn of the missile age coincided with, and even led, a major transformation in the American West's economy. The Pacific states—with California in the lead—went from receiving slightly more than 12% of military prime contracts during World War II to just under 27% in 1961.[112] This was paired with a dramatic defense-oriented expansion in the South, which grew as a technological base in its own right and, even

[110] DoD, Report 48, 10/14/60, DNSA, pp. 8-9, pp. 30-31.
[111] *Ibid*.
[112] Gavin Wright, "World War II, The Cold War, and the Knowledge Economies of the Pacific Coast," in Brilliant and Kennedy, *World War II and the West it Wrought*, p. 81.

more importantly, as a supplier to the West's defense boom.[113] This growth reflected in large part the influence of Southern legislators; as Bruce Schulman has observed, "the South had developed…a political alliance with the Pentagon that brought economic bounty to the region in return for Congressional support of the Defense Department."[114] That arrangement, the bounty it brought, and the stimulating effects of California's defense growth brought a wave of skilled, white, northern workers to the South.[115] These growth pattern had social consequences. Federal defense dollars allowed Southern states to grow "without liberal politics or redistributionist economic policy – without support for welfare, labor, blacks."[116] They also sucked money away from New England, the mid-Atlantic, and the Midwest.[117] But even as the West and South boomed, ballistic missile capital was seeded through communities in every region—each becoming more and more dependent on them, especially as they became the center of gravity for supporting industries like electronics.[118]

When the Air Force wanted to improve Convair through competition in 1955, it was therefore embarking on a more complex, ambitious, and consequential project than it appeared. On the surface, the services were committed to the American ideal of the market. But the defense market was not a free market. It was an oligopoly that the services distrusted and yet sustained through their own choices and subsidies. Those choices turned the ballistic missile program into a veritable nation-wide development plan, siphoning public resources to stimulate big businesses with the effect of privileging certain regions. The patterns of this defense economy deeply affected business, demography, local politics, and national growth. Its final effect was to sow

[113] Schulman, *From Cotton Belt to Sun Belt*, p. 142, p. 157.
[114] *Ibid*., p. 145.
[115] *Ibid*., pp. 159-60.
[116] *Ibid*., p. 151.
[117] *Ibid*., p. 143.
[118] James C. Tanner, "Missile Makers: Rising Share of U.S. Guided Missile Work Based in Southwest," *The Wall Street Journal*, 4/2/1956.

ballistic missile interests in varying degrees around the country, creating vested interests in state, local, and national politics that would fight hard for their factories—even if that fight was at odds with national priorities or market movements.[119]

The ballistic missile program illuminates how the economy of the emerging warfare state was riven with contradictions. It lionized the efficiency of free competition, but was anti-competitive, centrally coordinated, and political. It concentrated power in places like California while also scattering vested interests around the country in a chaotic system run by three uncoordinated services. The Pentagon spoke the language of competition while choosing bigness and control as the best route to a missile. That choice sat uncomfortably with America's diffuse politics and its belief in the effectiveness of free competition.

The Normalized Warfare State

One week after Eisenhower authorized the ballistic missile program, the CEO of Aerojet sent Bernard Schriever a copy of the "Higgins Memorandum." This document outlined the Army's policy to procure ammunition with contractor-operated but government-owned plants. According to the memo, the policy aimed to avoid "substantial investment of private capital in productive resources, the sole use of which is in the manufacture of items having no civilian use." For the Army, military ammunition production required such intense safety measures, such huge plants, and such centralized control as to make private companies and their facilities undesirable. For industry, munitions required "one-purpose facilities which cannot profitably be converted to civilian-type production." Demand for these products was inconsistent—high in war, almost non-existent in peace—and so "such an investment would be impossible to justify."

[119] On market inefficiency, see Roland, *Delta of Power*, p. 55.

The only way to get private investment would be to "induce" it with subsidies. But the Army estimated that Congressional approval for such subsidies would be "unlikely," that subsidies would put chosen firms in a distasteful "monopolistic position," and that the "competitive process" the Army used to select operating contractors worked better. The Army and industry also worried about the ethics of private munitions plants. The memo noted that the European munitions industry was "considered by American public opinion as contrary to the American tradition." Americans characterized those companies as "merchants of death," accusing them of "sinister influences" on politics because profit motives "appeared to push them in the direction of inciting wars."[120] According to the Army, American companies had been "emphatic in declaring that they do not wish to become a 'munitions industry.'" Neither private industry nor the Army had a practical or moral desire to create business interests in war.[121]

On the precipice of big decisions about America's defense economy, Schriever and his colleagues gave the Higgins Memorandum serious attention.[122] They reached different conclusions. The Air Force, as demonstrated above, had few compunctions about subsidizing and managing an oligopolistic industry which had no apparent civilian use, needed centralized management, demanded large and risky investments, and involved dangerous chemicals.[123] These compunctions were also not shared by the ballistic missile managers in the Navy and the Army, although the latter relied on private industry less than the other branches. Awareness of the Army munitions policy in the military and in industry shows that these people understood the

[120] On American perceptions of the arms industry after World War I, see Ledbetter, *Unwarranted Influence*.

[121] F. H. Higgins to the Deputy Secretary of Defense, "Integrated Production of Complete Rounds of Ammunition," 10/28/1954, attached to W. L. Rogers to Bernard Schriever, 12/27/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 12.

[122] Schriever forwarded the memo to senior colleagues in the Air Force and Ramo-Wooldridge, and requested that they return it to him. *Ibid*.

[123] In 1957, for example, an explosion at an Aerojet facility killed one worker and injured two others. "Rocket Plant Blast Kills One," *The New York Times*, 7/27/1957.

ethical implications of privatizing ballistic missile work and creating an American "munitions industry." But devoted to the idea of the market economy, they made informed choices to develop the peacetime business of nuclear weapons.

In the privatized warfare state, a great distance emerged between war and work. The defining characteristic of daily ballistic missile development was not urgency, but normalcy. For technical experts, the ballistic missile program accelerated the maturation of a new profession—rocket science—that was at least as integral to their identity as any sort of patriotism. For workers, the Cold War mattered less than the war between labor and management—even though they were constructing the tools of nuclear apocalypse with their own hands. For the government and for management, strikes were a frustrating but unavoidable part of the routine of peacetime industry. These were not the characteristics of a wartime program in a wartime economy like the Manhattan Project. Urgency and mission hovered beneath the surface of the ballistic missile program. But for workers in America's warfare state, making ballistic missiles was mostly a job just like any other.

The scientific challenges of building humanity's first space-faring, super-sonic vehicles forced the missile industry to emphasize technical expertise. The composition of its workforce changed as a result. Between 1954 and 1962, hourly production workers fell from 71.6% to 40% of the airframe industry's labor at the same moment as technical jobs skyrocketed.[124] The people filling these roles were skilled in wide-ranging areas of advanced science and engineering, from aeronautics to computer science. To build rocket engines, for example, Aerojet sought mechanical engineers, aeronautical engineers, chemical engineers, electrical engineers, stress analysts, systems analysts, computer scientists, physicists, metallurgists, and draftsmen.[125] For its

[124] Simonson, "Missiles and Creative Destruction in the American Aircraft Industry, 1956-1961," p. 307.
[125] Classifieds, *Chicago Daily Tribune*, 2/26/1956, p. C27.

inertial guidance system, Arma needed engineers knowledgeable in systems evaluation, gyroscopes, digital computers, accelerometers, telemetry, stabilizing devices, servos, automatic controls, thermodynamics, and optics.[126] In the broader defense-funded high-tech revolution sweeping America in the 1950s, ballistic missiles were among those technologies that asked the most of disparate experts' skills and ability to collaborate.

These experts tended to have backgrounds that fused advanced education with experience in the military and private industry. A snapshot of Convair and Ramo-Wooldridge in the mid-1950s offers insight into the sort of person involved in the missile program. James Dempsey ran Convair's Atlas program. A lieutenant colonel in the Air Force, Dempsey had studied aeronautical engineering at the University of Alabama before completing a degree at West Point in 1943. He flew reconnaissance missions in the European theater and, after the war, served on research and development assignments for the Air Force. In that period he also finished a master's degree in aeronautical engineering at the University of Michigan. In 1953 he left the military to join Convair.[127] Dempsey's chief engineer on Atlas was Karel Bossart, a Belgian who got his BS from Brussels University in mining and aeronautical engineering before completing an MS in aeronautical engineering at MIT in 1927. He worked as an engineer and analyst for several aircraft firms between 1930 and 1941 before joining Convair that year.[128] Bossart's assistant chief engineer, Mortimer Rosenbaum, got his BS in aeronautical engineering from MIT in 1935 and had worked as an analyst, draftsman, and engineer at Convair ever since.[129]

[126] *Ibid*.
[127] Convair Public Relations, James R. Dempsey appointment, 6/9/1954, Bernard A. Schriever Papers, LOC, Box 1, Folder 9; Convair employee biographies, December 1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 12.
[128] Convair employee biographies, December 1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 12; Convair San Diego organization chart, 8/8/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 9.
[129] *Ibid*.

This team was supported by scientists like Charles Critchfield, who became Convair's director of scientific research in 1955. He worked as a junior physicist for the U.S. Bureau of Standards in the mid-1930s while getting his BS at George Washington University, where he also got his master's degree and, in 1939, his doctorate. In the early 1940s he researched and taught mathematical physics at the University of Rochestor, Princeton's Institute of Advanced Studies, and Harvard, before contributing to the Manhattan Project at Los Alamos and Oak Ridge. He re-entered the academy in the late 1940s, becoming a tenured professor of physics at the University of Minnesota in 1949.[130] Hyman Serbin also supported Convair's Atlas development during his sabbatical as a professor of aeronautical engineering at Purdue University. He had studied at the Carnegie Institute of Technology and Caltech before conducting doctoral work at the University of Pittsburgh and Princeton. After finishing his education in 1939, he worked for 14 years as an engineer for Lockheed, Martin, Fairchild, the Air Force, and SAC, as well as in academia.[131]

These Convair employees illuminate a team of relatively young and highly educated men whose professional identities shifted between industry problem-solver, government servant, and scholar. The technical team at Ramo-Wooldridge's Space Technologies Laboratory (STL), which coordinated and oversaw R&D work across all Air Force missile projects, demonstrated similar characteristics. By 1958, STL had 55 senior staff members with an average of over 20 years R&D experience; 46% of those senior staff had doctorates, 23% had master's degrees, and 31% had bachelor's degrees. STL's 518 junior staff members had an average of 8 years experience; 17% held doctorates, 37% held master's degrees, and 41% held bachelor's

[130] Convair News Release, Charles L. Critchfield appointment, 3/8/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 9.

[131] T. G. Lanphier to Bernard Schriever, Hyman Serbin employment file, 5/18/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 5.

degrees.[132] This was an even better-educated group of experts than at Convair, and a selection of their biographies reveals a similar fluidity among industry, research, and government.

Ruben Mettler, head of Systems Engineering, had studied electrical and aeronautical engineering and received his doctorate from Caltech, where he also consulted for several companies. He served in the Navy for three years as an electronics officer before joining Hughes Aircraft R&D Laboratories as head of the Systems Department and, later, Associate Director of the Radar R&D Division, where he helped develop fire-control computers and electronic systems. Before joining R-W, he served as Special Consultant to the Department of Defense, where he helped Donald Quarles, then Assistant Secretary of Defense for Research and Development, on systems analysis problems concerning manned strategic bombers. He had also worked as a member of the Killian Committee.[133]

Frank Manov, a member of the Systems Engineering Group, had a BA in electrical engineering from UC Berkeley and 14 years of work experience: three at the National Bureau of Standards developing proximity fuses and guided bombs, one at the 9th Air Force HQ in the European theater of World War II researching military operations, three as a consulting radio engineer in San Francisco, three as the chief of the Guided Branch at the Naval Ordnance Laboratory's Guided Missiles Division, three with NATO as Chief, Operations Analysis Directorate, and one as Manager of the Systems Analysis Department at Sylvania, where he researched ballistic missile defense.[134]

[132] Bernard Schriever to Anderson, "AFBMD/BMO/SAC-MIKE/STL (R-W)," 4/2/1958, Bernard A. Schriever Papers, LOC, Box 2, Folder 17.
[133] Duane Roller to Bernard Schriever, "New R-W Personnel," 3/29/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 3.
[134] *Ibid*.

Charles Morrow, a gyroscopes researcher, held a PhD in physics from Harvard. He worked for nine years in communications engineering and nine years in R&D for precision guidance components at companies like Sperry. In 1951 he joined Hughes Aircraft R&D Laboratories as an engineer studying metals and acoustics, where he developed gyroscopes and electromechanical devices for the Falcon missile.[135]

Robert Rypinski, a member of the Flight Test and Instrumentation Group, held a BS from MIT in Engineering Administration with concentrations in electrical and mechanical engineering. He researched ultra-high frequencies, radar, and electronics at Harvard and Caltech, and had 25 years of experience running military electronics programs. Those positions included assignments at the U.S. Navy Yard running radar installation and maintenance, at the Commander Service Force Pacific running the Fleet Maintenance Electronics Unit, and at the Jet Propulsion Laboratory as Chief of Field Test Operations at White Sands Proving Ground.[136] Rypinski was joined in flight test work by Newell Hart Smith, who held a PhD in physics from Duke University and had 20 years of experience working on materials and aerodynamics at Westinghouse, as a university professor, and as a physicist at the National Advisory Committee for Aeronautics and Los Alamos.[137]

Adolph K. Thiel worked in the electronics group for the all-inertial guidance unit. He held a PhD in Engineering Sciences from the Institute of Technology in Darmstadt, Germany, with concentrations in mechanical and aeronautical engineering. In Germany, he worked on flight mechanics, performance, and control studies for several missiles including the V-2. Like Wernher Von Braun and other former Nazi rocket scientists at the Army Ballistic Missile

[135] *Ibid*.
[136] *Ibid*.
[137] *Ibid*.

Agency, Thiel joined the Allies after the war—working first with the French War Ministry on guided missiles and then, in 1946, spending several years developing ballistic missiles for the Army at Fort Bliss and the Redstone Arsenal.[138]

Why would men like these—and it is worth noting that they were all men—want to work in the ballistic missile program? They were motivated by a complex mixture of academic interest, job benefits, and commitment to national service. Their serious involvement in higher education, research, and teaching hints at what must have been a powerful intellectual attraction to the ballistic missile program, which was throwing resources at the world's most cutting-edge problems of rocketry, space travel, and computers. Early rocketry pioneers had jumped at the chance to get military funding for their research in the late 1930s and early 1940s, even if their personal politics did not align with those of the federal government.[139] The ballistic missile program offered a similar attraction to them. Indeed, the Air Force allowed Ramo-Wooldridge to disclose its classified ICBM work to potential employees as a hiring ploy if the company believed it would help entice an essential expert.[140]

The promise of a good lifestyle also mattered. Job advertisements for ballistic missile work were suffused with language about discovery and pioneering research, as well as salaries and benefits that guaranteed personal and familial comfort. In 1956, Martin took out ads in the *Chicago Daily Tribune* asking Chicagoans to "come to colorful Colorado." The company sought "men of energy, ambition and initiative who wish to be associated with a growing, modern and dynamic organization; men who wish to live in a healthy natural climate where the cost of living

[138] *Ibid*.

[139] For example, see Daniel Kevles, "Enlisting the Laboratories: Science, Defense, and the Transformation of the High-Tech West," in Brilliant and Kennedy, *World War II and the West it Wrought*; pp. 47-49.

[140] Bernard Schriever to Simon Ramo, "Project Disclosure to Employment Candidates," 12/28/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 12.

is not prohibitive and outdoor living is the accepted way of life." Next to Martin's ad, Aerojet sought Chicagoans for work in Sacramento and Los Angeles. "Top salaries and growth opportunities are yours at Aerojet," the company announced. Generous benefits included "company paid vacations, sick leave, holidays, company sponsored educational plan, life insurance, hospitalization and retirement plans." In Los Angeles, prospective employees could look forward to "restful residential areas with excellent educational facilities located within 15 minutes from plant site." The next column over, guidance engineers could find an enticing opportunity with Arma—"pioneers in inertial navigation"—for work on a mysterious "new system" that seemed to have something to do with space. The company demanded "creative engineering of the highest order" if they were to make this system "possible."[141] These ads dripped in masculine fantasies of glory, exploration, discovery, and the ability to provide for one's family. None of them summoned engineers to defend American national interests.

If ballistic missile jobs satisfied research interests, financial comfort, and the masculinity attached to both, they also engaged, to some extent, experts' sense of national duty. It is difficult to know exactly how experts felt about working on a weapons program. Evidence points to a relatively complicated dynamic. Many of the men profiled above served in the military. That communicates at least some affiliation with federal foreign policy priorities, if complicated by the moral clarity of World War II and the compulsion of the draft. Anecdotally, too, there is evidence that missile work carried broad political meaning for them. The wife of the general manager of Martin's Denver division caricatured his attitude toward work on Titan as "another way to save the world."[142] Simon Ramo, the head of Ramo-Wooldridge and the consummate ballistic missile expert, explained in 1989 that "it seemed to me very clear that it would be a

[141] Classifieds, *Chicago Daily Tribune*, 2/26/1956, p. C27.
[142] Witkin, "Missiles Program Dwarfs First Atom Bomb Project," *New York Times*, 4/7/57.

terrible situation for the United States if the Soviet Union had such tremendous, overriding power of attack on the United States. So I had at that time little doubt that [developing missiles] was sensible to me."[143] On the other hand, McCarthyism had curtailed political dissent among experts. Some engineers who openly opposed working on military research were literally run out of the country.[144] The remainder either supported U.S. foreign policy or were simply cowed into submission. They were educated and employed by men like John Burchard, dean of MIT's School of Humanities and Social Studies, who loudly declared that some scientists were too prone to "off-beat political ideas," that they exhibited "the potentials of joint effort," and that future scientists would need to embody the spirit of "free inquiry" or else the U.S. would "throw away the only thing which can in the long run preserve us against the mass man of the East."[145] In this oppressively suspicious and conformist time, expertise and politics were not directly connected. If some believed their work was a means to fight Communism, others probably suppressed political distaste and focused instead on the ways their jobs advanced research.

Overall, a commitment to science was likely the thing that unified missile experts most. And as the program developed, that sense of unity in a shared scientific project cultivated a strong professional identity among the workers involved. It was not painless, of course. In 1955, missile experts made headlines when a group of scientists quit their jobs over a dispute about whether scientists or engineers would have more influence on missile development.[146] With so many fields and areas of expertise jammed together in the ballistic missile program, conflict was a certainty. But several factors pushed this disparate community toward a common identity.

---

[143] Simon Ramo: Part 9, Living Legends, Hagley Digital Archives, https://digital.hagley.org/islandora/object/islandora:2578932

[144] Kevles, "Enlisting the Laboratories: Science, Defense, and the Transformation of the High-Tech West," in Brilliant and Kennedy, *World War II and the West it Wrought*, p. 67.

[145] Benjamin Fine, "Role of Engineer in Era Stressed," *The New York Times,* 10/9/1956.

[146] Gladwin Hill, "20 Scientists Quit Missiles Project," *The New York Times*, 12/14/1955.

First, they comprised a small talent pool. The group of scientists who quit their jobs in 1955 was quickly snatched up by another missile company.[147] Bernard Schriever often complained along the lines that "the scientific and technical talent available in this country for development of space vehicles is very limited," and that industry was engaged in a "mad scramble for the very few truly qualified people."[148] Simon Ramo even considered telling contractors to coordinate hiring decisions because competition for "the same group of personnel" could disrupt work and inflate wages.[149] Such a problem threatened in 1956, when General Electric—then the Army's propulsion contractor for Jupiter—began offering big salary increases to Aerojet employees if they would defect to the Army project. Schriever resolved this problem by allowing North American to supply engines to both the Air Force and the Army (which had the incidental effect of further consolidating the propulsion oligopoly).[150] In such a tight market, these experts formed a small, highly desired community that moved in the same circles and worked on the same projects.

Second, because these jobs were concentrated in regions like southern California and cities like Los Angeles, missile experts lived, studied, and worked next to each other. As Gavin Wright has pointed out, "employee residences tended to cluster in island-type groups tightly defined by establishment size and journey-to-work distances."[151] Places like Huntsville, Alabama

[147] "Republic Engages Missiles Experts," *The New York Times*, 1/5/1956; "Ford Sets Up Guided Missiles Unit in California, Absorbs Scientists, Engineers Who Quit Lockheed," *The Wall Street Journal*, 5/11/1956.

[148] Bernard Schriever to Thomas Power, "ICBM – TBM Interference and Dilution of Manpower," 9/23/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 8.

[149] Simon Ramo to Bernard Schriever, "Proposed Letter to Contractors on Technical Personnel Recruiting," 10/3/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 10.

[150] Bernard Schriever to Thomas Power, "Propulsion Requirements For The Army IRBM," April 1956, Bernard A. Schriever Papers, LOC, Box 2, Folder 3.

[151] *Ibid*., p. 86.

and Denver, Colorado experienced housing shortages when the new missile workers moved in.[152] Missile experts did not just work together—they lived together, too.

Third, the government and contractors made organizational decisions that thickened connections between missile experts, isolated them from their company's other operations, and linked them with missile employees at other firms. Convair and Douglas, for example, created new divisions for missile development that they housed in buildings dedicated just to missile work.[153] In the case of Convair, the Air Force urged these divisions in order to increase the company's efficiency and speed.[154] And in at least one ballistic missile assembly building, workers from Boeing and the Autonetics division of North American Aviation shared intermixed workshop and office spaces (figures 5 and 6). These organizational and physical designs deepened day-to-day relationships between ballistic missile workers across the aerospace industry while separating them from other projects.

[152] DoD, Report 4, 3/31/1956, DDO, p. 1, p. 3; DoD, Report 5, 4/30/1956, DDO, pp. 1-2; Tanner, "Missile Makers: Rising Share of U.S. Guided Missile Work Based in Southwest," *The Wall Street Journal*, 4/2/1956.

[153] While Convair's division was a direct response to ballistic missile work, Douglas established its division in late 1955, before the ballistic missile program had begun. "Astronautics Now Convair Division," *The Wall Street Journal*, 3/11/1957; "Douglas Aircraft Sets Up Missile Engineering Unit," *The Wall Street Journal*, 10/4/1955.

[154] Philip C. Calhoun to Sheppard, "Convair Organization," 2/28/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 2; B. L. Boatman, "Telephone Conversation with Mr. Jim Dempsey," 11/23/1955, Bernard A. Schriever Papers, LOC, Box 1, Folder 11.

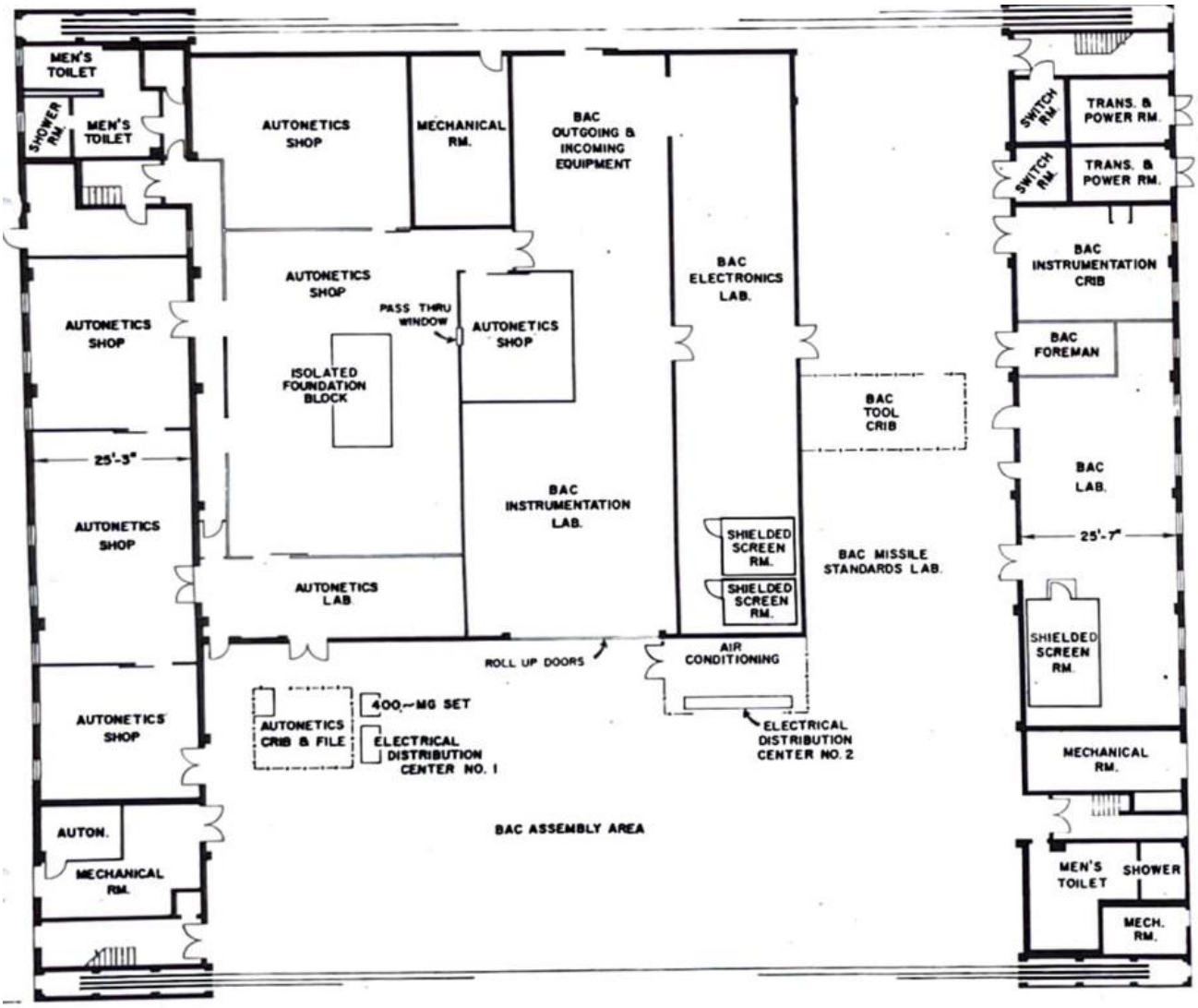

Figure 5: Minuteman Assembly Building, First Floor, Cape Canaveral, Florida.[155]

[155] Drawn by G. M. Stamatakis, Space Technologies Laboratories, 6/5/1960, in Minuteman handbook, BAS papers, LOC, Box 10, Folder 2. "BAC" stands for Boeing Airplane Company.

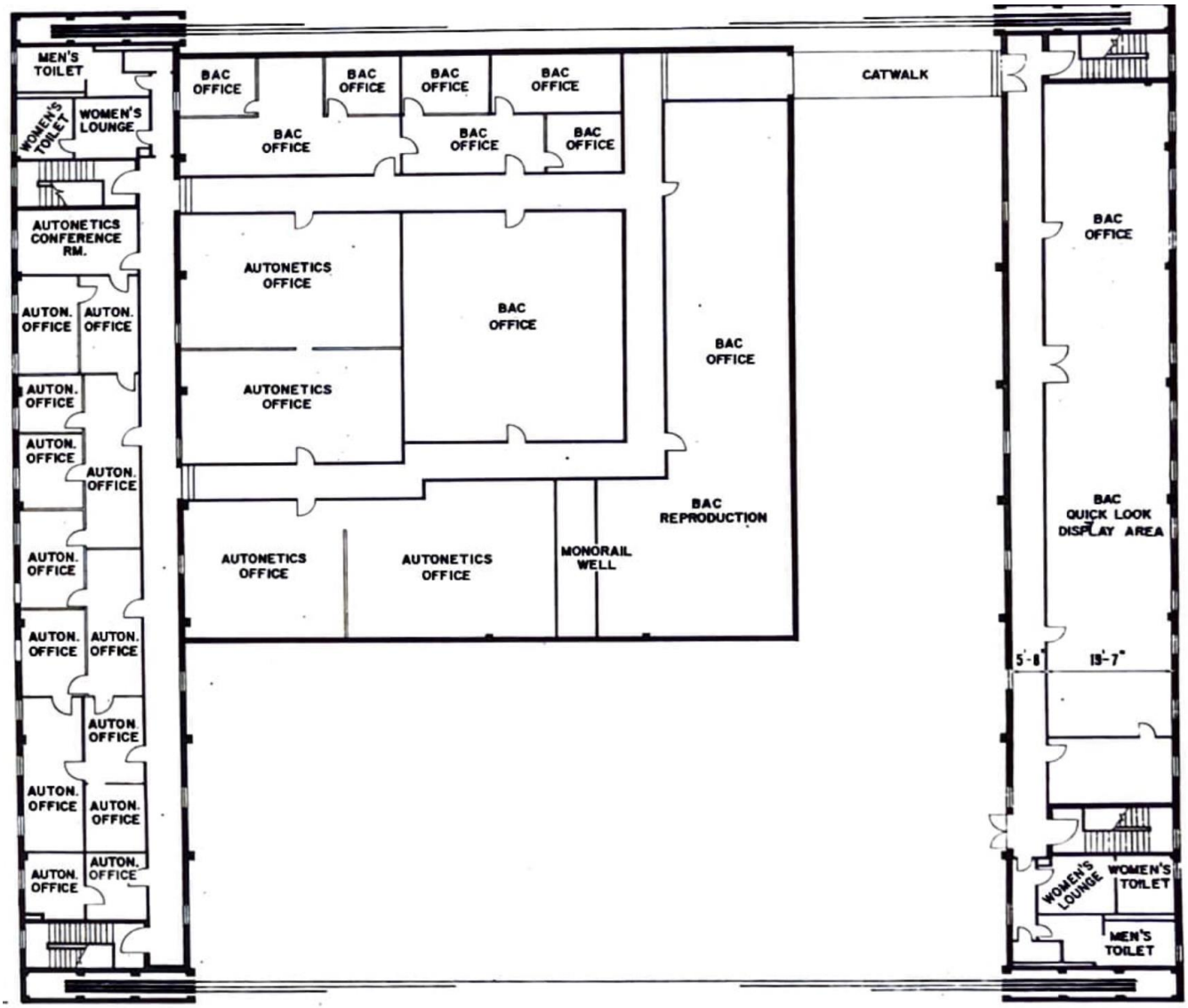

Figure 6: Minuteman Assembly Building, Second Floor, Cape Canaveral, Florida.[156]

[156] *Ibid.*

Fourth, as the 1950s technological revolution unfolded, missile experts occupied an increasingly central role as national heroes. First, the "engineer" grew prominent as the profession on the front line of the Cold War.[157] Then, after Sputnik and the scramble to put an American satellite in space, the "rocketeer" became a cultural symbol and aspirational profession for young people fascinated with space travel.[158] In this environment, technical expertise—and especially technical expertise relating to missiles—developed a powerful cultural cachet.

These forces—a small community living and working together on a clearly delineated project with a shared purpose and increasing cultural weight—fused a group of disparate experts into a profession. Privatized ballistic missile work forged a new social class whose careers, livelihoods, communities, and identities were attached to the creation of weapons of mass destruction. Before America developed a permanent defense establishment, emergency conversion of civilian production in war meant that there was a constant and obvious alignment between making and using weapons. But in this new economy, the link between making and using weapons was shattered—especially since ballistic missiles were a deterrent whose purpose was never to be used at all. For rocket scientists, the Cold War and national defense could float from view, replaced by a drive for the euphoria of discovery that was disconnected from policy. Their personal and professional identities became another vested interest in the warfare state.

More broadly, for most laborers involved in the ballistic missile program, missile work was just another job that demanded fair terms of employment. While working on an Atlas test stand on July 9, 1958, a 33-year-old mechanic named Fred Adams plunged 120 feet to his death at the Air Force Missile Test Center (AFMTC) in Cape Canaveral, Florida. Another mechanic, a 26-year-old named C. L. Tripp, reached out to catch Adams; he got caught in an elevator cable

[157] See, for example, Benjamin Fine, "Role of Engineer in Era Stressed," *The New York Times*, 10/9/1956.
[158] Malvina Lindsay, "Young Rocketeers Herald Space Age," *The Washington Post*, 3/22/1958.

and badly mangled his arm.[159] Adams' death shocked his colleagues at Pan American Airways, AFMTC's primary contractor. They voted to strike.[160] As many as 2,500 workers refused to do their jobs at the test center, completely shutting down construction of three Titan towers.[161] They carried picket signs declaring "workers demand proper medical service – safe working condition from PAA," and called on Pan Am to fire the head of the medical department and a supervisor on the Atlas pad.[162] Pan Am said neither people would lose their jobs to "these vicious tactics."[163] But pressure mounted: around 1,500 of the striking workers belonged to a local chapter of the Transportation Workers Union (TWU), which represented 7,000 Pan American employees across the country.[164] Although TWU had not ordered the strike, the union rushed to support its members.[165] On the second day of the strike, TWU launched a two-hour national work stoppage in solidarity.[166] The union meant business: the striking workers ignored a federal injunction, and a union leader threatened that "if this strike is not settled by Sunday, we're going to strike the whole Pan American system."[167] The AFMTC commander, a Major General in the Air Force, called for a settlement on the fourth day of the strike. That evening, Pan Am offered a package of new safety measures and workers voted at a "stormy meeting" to return to their jobs.[168] Many remained dissatisfied—above all Adams' widow and two children.[169]

[159] "Missile Worker Hurtles 120 Feet to Death," *Atlanta Daily World*, 7/10/1958.
[160] "Strike at Test Center," *The New York Times*, 7/15/1958.
[161] "Labor Dispute at Missile Center Threatens to Spread," *The New York Times*, 7/16/1958; "Missile Strikers Ignore Injunction," *The New York Times*, 7/17/1958.
[162] "Labor Dispute at Missile Center Threatens to Spread," *The New York Times*, 7/16/1958.
[163] *Ibid*.
[164] "2 Hour Sitdown Called to Back Missile Strike," *Chicago Daily Tribune*, 7/16/1958.
[165] "Wildcat Strike At Missile Center," *Chicago Daily Defender*, 7/16/1958.
[166] "2 Hour Sitdown Called to Back Missile Strike," *Chicago Daily Tribune*, 7/16/1958.
[167] "Labor Dispute at Missile Center Threatens to Spread," *The New York Times*, 7/16/1958; "Missile Strikers Ignore Injunction," *The New York Times*, 7/17/1958.
[168] "Accord is Reached at Missile Center," *The New York Times*, 7/19/1958.
[169] "Missile Worker Hurtles 120 Feet to Death," *Atlanta Daily World*, 7/10/1958.

In the public turmoil after Sputnik, TWU employees must have had a heightened awareness of their work's national importance. Yet they decided that they had not signed up to risk their lives in a warzone. They would not compromise on workplace standards, even if it meant endangering a project they knew to be the country's highest priority. In fact, they must have understood and chosen to use the leverage they held over the Titan test program, which had still not made a successful flight.

The 1950s was a golden age for organized labor.[170] Unlike workers in civilian industries, however, ballistic missile workers were running a critical defense program. In wartime, work stoppages in such a program would have been virtually unthinkable and certainly intolerable. But when confronted with decisions between national security and economic security, ballistic missile laborers often chose the latter. Work stoppages were routine. Arma employees went on strike from October 1955 through the beginning of 1956.[171] In the summer of 1956, steel and aluminum strikes threatened testing facility construction and prompted the Air Force to request that its contractors prepare for shortages.[172] The International Nickel Company went on strike at the beginning of 1957, forcing the government to initiate emergency nickel alloy procurement.[173] Linde Air Products went on strike for the first half of 1957.[174] A strike was settled in March at Carborundum Company, a Jupiter contractor.[175] The B. F. Goodrich Company, which also worked on Jupiter, went on strike that same month.[176] AFMTC workers went on strike in January and June 1957, followed by two strikes in 1958.[177] A strike by Baroco Electric Company

[170] Kristoffer Smemo, Samir Sonti, and Gabriel Winant, "Conflict and Consensus: The Steel Strike of 1959 and the Anatomy of the New Deal Order," *Critical Historical Studies*, Vol. 4, No. 1 (March 2017), p. 46.
[171] DoD, Report 2, 1/31/1956, DDO, p. 2.
[172] DoD, Report 7, 6/30/1956, DDO, p. vi; DoD, Report 8, 7/31/1956, DDO, p. ii.
[173] DoD, Report 15, 2/28/1957, DDO, p. 11; DoD, Report 16, 3/31/1957, DDO, p. 13.
[174] DoD, Report 15, 2/28/1957, DDO, pp. 10-11; DoD, Report 19, 6/30/1957, DDO, p. 10.
[175] DoD, Report 16, 3/31/1957, DDO, p. 14.
[176] DoD, Report 16, 3/31/1957, DDO, p. 14; DoD, Report 17, 4/30/1957, DDO, p. 17.
[177] DoD, Report 15, 2/28/1957, DDO, p. 9; DoD, Report 19, 6/30/1957, DDO, p. vi, p. 5, p. 10, p. 18.

workers at the Redstone Arsenal in mid-1958 prevented turbopump tests; the employees had unique leverage because their work was not only critical, but so specialized that they manned the only facility in the country able to do it.[178] In October 1958, all Thor guidance fabrication shut down when the United Auto Workers, International Brotherhood of Electrical Workers, and International Association of Machinists went on strike at AC Spark Plug's plants in Flint and Milwaukee.[179] Electricians building Aerojet facilities went on strike in July 1959.[180] Submarine construction was hampered by a strike at Winchester Electronics that same month, and again a year later by a strike at Lockheed's Sunnyvale factory.[181] And in the summer of 1959 over half a million steel workers started what would become the largest strike in U.S. history.[182]

Strikes had a meaningful impact in slowing down a program whose leadership was flush with urgency. In early 1958, the Department of Defense told the president that the "plague of industrial strikes" was a key cause of fluctuations to the program's schedule.[183] Its report concluded that in just three months, the program had lost almost 16 million mandays to strikes, 91% of which it attributed to steel strikes in 1956.[184] "That these strikes did not seriously hamper the program," reported Defense, "is entirely due to the diligent efforts of the Air Force and contractor personnel who took extraordinary measures and time to overcome the situation."[185] As the 1958 AFMTC strikes unfolded, the Department of Defense told Eisenhower that "the occurrence of such incidents is becoming more critical."[186] Strikes in 1958 affected IRBM

[178] DoD, Report 33, 8/31/1958, DNSA, p. 16.
[179] DoD, Report 35, 10/31/1958, DNSA, p. 12. The strike does not reappear in report 36, indicating that the parties reached a resolution in October.
[180] DoD, Report 44, 7/31/1959, DNSA, p. 26.
[181] DoD, Report 44, 7/31/1959, DNSA, p. 24
[182] Smemo, Sonti, and Winant, "Conflict and Consensus: The Steel Strike of 1959 and the Anatomy of the New Deal Order," p. 40.
[183] DoD, Report 28, 3/31/1958, DNSA, p. 23.
[184] DoD, Report 28, 3/31/1958, DNSA, p. 23.
[185] DoD, Report 28, 3/31/1958, DNSA, p. 23.
[186] DoD, Report 32, 7/31/1958, DNSA, p. 6.

ground equipment and training sites.[187] The 1959 steel strike hurt launch complex construction enough to significantly delay initial operational dates for both Atlas and Titan.[188]

For the military, labor activity was both a practical and philosophical headache. On February 20, 1959, for example, Admiral Arleigh Burke—head of the Navy's ballistic missile program—delivered a speech to the Charleston, South Carolina Chamber of Commerce. On March 10, Bernard Schriever received and read a copy of that speech. Consider the sentences he underlined. To Schriever, it mattered when Burke stated that the Soviet "danger could come more from an economic Communist offensive levelled against the free world" than a military strike. It mattered to him when Burke said that "our country has grown strong in an environment of personal liberty in which the spirit of competition runs strong among us," and that "the United States has become a world leader as a result of the effort of many hard-working people to whom the concepts of private enterprise and individual initiative have real meaning" (Schriever strongly underlined "private enterprise and individual initiative" twice). It mattered when Burke said Americans were "becoming indifferent to the hard realities of the competition we face as a nation" and that "we are in a competition now for our national existence"; on the side, Schriever added: "Many forms of competition!" And it mattered when Burke said that the U.S. "will stay ahead only by the dint of hard work, by higher standards of individual achievement, by the exercise of free initiative." In the margins, Schriever scribbled: "Tell the unions this."[189]

The men in charge of the ballistic missile program were pro-business, free market ideologues who saw labor unionism as a glaring sore point in the domestic frontline of the Cold

[187] DoD, Report 34, 9/30/1958, DNSA p. 20, and DoD, Report 35, 10/31/1958, DNSA, p. 19.
[188] James Douglas to Eisenhower, 3/1/1960, DNSA; DoD, Report 44, 7/31/1959, DNSA, p. 9.
[189] Address by Admiral Arleigh A. Burke to the Chamber of Commerce of Charleston, South Carolina, 2/20/1959, Bernard A. Schriever Papers, LOC, Box 11, Folder 11.

War. Eisenhower, too, was pro-business.[190] But his vision for the American economy was not anti-labor; it was that of a "corporate commonwealth" threading a "middle way" of effective yet limited government, class harmony, and depoliticized administration.[191] Especially given labor's immense power in the 1950s, workers played an important role in Eisenhower's commonwealth, even if he considered them inferior to management.[192] Strikes in the ballistic missile industry, therefore, put his administration in a bind. On the one hand, they disrupted critical defense work and were a powerful force of the left. On the other hand, putting the strikes down would be an admission that ballistic missile development had entered a phase of wartime urgency akin to the Manhattan Project. It would necessitate an invasive assertion of federal power that would disrupt the commonwealth, inflame class tensions, and impose state domination over the economy.[193] For Eisenhower, this posed a bad choice between organized labor interrupting defense production, on the one hand, and, on the other, a wartime garrison state splintered by class tensions. It was also a clear choice: the former was a necessary part of his vision for America's peacetime economy, whereas the latter was the ultimate evil embodied by the Soviet Union.

The government therefore took no significant actions to stop the strikes. The sole exception was the gigantic 1959 steel strike, which ground all American steel production to a halt. Only after delaying did Eisenhower declare that strike an emergency, argue that it threatened national security, and invoke an 80-day Taft-Hartley Act injunction for the first time.[194] In that delay, he purportedly resisted appeals for federal intervention by arguing: "Don't

[190] Hitchcock, *The Age of Eisenhower*, p. 118; Griffith, "Dwight D. Eisenhower and the Corporate Commonwealth," p. 108.
[191] For more on Eisenhower's governance, see Hitchcock, *The Age of Eisenhower*, p. 303 and p. 259; Griffith, "Dwight D. Eisenhower and the Corporate Commonwealth," p. 88, p. 91, p. 93, p. 108.
[192] Smemo, Sonti, and Winant, "Conflict and Consensus: The Steel Strike of 1959 and the Anatomy of the New Deal Order," p. 46.
[193] *Ibid*., p. 132.
[194] *Ibid*., p. 41, p. 68.

we want Mr. Khrushchev to see this country as a…freedom-loving place?"[195] But 1959 was an extreme instance affecting the entire economy. More characteristic was the 1958 AFMTC strike, which the disputants resolved themselves despite a weak federal injunction, and with only a gentle push from the local Air Force officer.[196] In the Cold War battle of ideas, the U.S. government decided the garrison state was a more dangerous threat than labor. Defeating unions with state power would have been an admission of the American system's failure. And so even in the country's most urgent national security program, strikes proceeded like in any other sector. What makes those strikes remarkable is how deeply unremarkable they were.

The ballistic missile program indicates that this sort of un-exceptionality was the hallmark of the privatized warfare state. It was, by design, not an emergency wartime project. Instead, its creators integrated it into an American system they were sure was superior to the Soviet model. That integration depended on the contradictory tug of centralized management and oligopoly. But once integrated, it behaved like any other sector in the American economy. Experts developed a professional attachment to it that was divorced from the Cold War emergency. Labor treated it like a normal job, and the government treated labor like normal in return. People understood that the program was important and special, but in their day-to-day behavior, building weapons of mass destruction became as routine as anything else. In becoming so routine, so central to their livelihoods, so pivotal to their identities, it developed an economic and social momentum entirely distinct from the policy questions of the Cold War.

[195] *Ibid*., p. 131.
[196] "Missile Strikers Ignore Injunction," *The New York Times*, 7/17/1958

The Democratized Warfare State

As the ballistic missile program unfolded, Eisenhower needed to make decisions about the shape and size of America's newest deterrent. What types of missiles would the United States have, and how many? The president was determined to be conservative. He wanted less duplication, less money, and, ultimately, a small arsenal. Circumstances would not be so accommodating. When Sputnik transformed the ballistic missile race into a national crisis, the structure of America's Cold War politics squeezed Eisenhower into making the program an ever-larger colossus. This monster grew in the tension between democracy and secrecy. On the one hand, the warfare state withheld information about the Cold War from almost all Americans. On the other hand, the porous, partisan, and pluralistic nature of American politics meant that the president could not make choices based solely on the intelligence at his disposal. Eisenhower was trapped in a system that diffused power among people unable to make fully informed decisions. He decided that political survival in such a system demanded more and more missiles.

After the ballistic missile program was firmly underway, Eisenhower planned to restrain it. This economizing strain had two sources. First, since as early as mid-1956 there had been a growing sense in the NSC that the military, scientists, industry, and certain Congressmen were applying needless upward pressure on the program. In August, Humphrey complained that "we had been led astray in matters of national security by scientists and by vested interests—military, political, and business vested interests." Wilson agreed with the president that there was a minimum level of deterrence that the U.S. had already reached. He complained that "anything called research had become sacred" and that "if he tried to cut down on research he was apt to 'get the business.'"[197] Eisenhower was also dissatisfied with scientists, later criticizing their

[197] Memorandum of Discussion at the 293rd and 294th Meetings of the National Security Council, 8/16/1956 and 8/17/1956, *FRUS 1955-57*, XIX, Document 86.

profligate spending and endless projects that made the question of eliminating programs "virtually insoluble." Even worse, their technical briefings left him "thoroughly confused."[198] The president targeted upward pressure in Congress as well, suggesting that the Killian Report's expensive recommendations—which Humphrey claimed "would ruin us"—had been a "moderating influence" because "some Congressmen were much more extreme."[199] He likely had in mind Senator Jackson's speech a few months prior arguing for wartime mobilization.

Eisenhower was also frustrated by upward pressure in the military. He had believed since 1955 that ballistic missiles were not militarily useful weapons, but were rather psychological tools of which the U.S. needed only a limited number.[200] At the end of 1956 he told his advisers that the ICBM's "main significance attaches to the first few of these missiles, and that consequently we should press forward strongly with development, but should hold down procurement."[201] At a January 1957 NSC meeting in which the Air Force, Army, and Navy presented operational deployment plans, Eisenhower and his Special Assistant for National Security Affairs, Robert Cutler, shut down their enthusiasm. They agreed that "the object of these programs was the achievement of a research and development capability for the missiles" and that "there had been no authorization to date by the President for the creation of force units and inventories of missiles along the lines described by the previous speakers."[202] Wilson's decision to increase Polaris's priority status in April 1957 sparked criticism from Eisenhower

[198] Minutes of a Bipartisan Congressional Meeting, 12/3/1957, *FRUS 1955-57*, XIX, Document 169.
[199] Memorandum of Discussion at the 293rd and 294th Meetings of the National Security Council, 8/16/1956 and 8/17/1956, *FRUS 1955-57*, XIX, Document 86.
[200] Memorandum of Discussion at the 257th Meeting of the National Security Council, 8/4/1955, *FRUS 1955-57*, XIX, Document 30; Memorandum of Discussion at the 339th Meeting of the National Security Council, 10/10/1957, *FRUS 1955-57*, XIX, Document 146.
[201] Memorandum of a Conference with the President, 12/7/1956, *FRUS 1955-57*, XIX, Document 99.
[202] Memorandum of Discussion at the 309th Meeting of the National Security Council, 1/11/1957, *FRUS 1955-57*, XIX, Document 105.

about duplication, which led him to review the entire slate of guided missiles and seek out weapons that could be eliminated.[203]

Second, the economic environment in 1957 provided extra pressure to streamline the missile program. Congress's main priority at the beginning of the year was to rein in the budget, and the House Appropriations Committee targeted the missile program as a source of duplication and excess.[204] Then, in August, the U.S. began sinking into recession.[205] The contraction turned out to be significant. In January 1958, national unemployment reached its highest level since 1941. Polls that month showed Americans feeling more anxious about the economy than they had since the Great Depression.[206] By April, unemployment had soared to 7.5%.[207]

These pressures forced the Eisenhower administration to carefully consider what was necessary for defense spending. The missile program seemed to be progressing at a reasonable pace. Although the ICBMs were still far from succeeding, Jupiter flew its first successful test in May 1957 and Thor flew its first successful test in September.[208] The IRBM program lodged another major accomplishment when a Jupiter nose cone successfully re-entered the atmosphere that August—becoming the first object Americans had ever made, launched into, and recovered from space.[209] Work was progressing nicely and money was tight. So Eisenhower dampened the excitement for procurement among the services, backed the Pentagon's effort to streamline the program by cutting one of its duplicated IRBMs, and reduced the program's overall pace and

[203] Watson, *Into the Missile Age*, p. 175.
[204] *Ibid*., p. 174.
[205] Hitchcock, *The Age of Eisenhower*, p. 376.
[206] *Ibid*.
[207] William M. McClenahan Jr. and William H. Becker, *Eisenhower and the Cold War Economy* (Baltimore: The Johns Hopkins University Press, 2011), p. 88.
[208] "Chronology of Significant Events in the U.S. Intermediate and Intercontinental Ballistic Missile Programs," 11/8/1957, DNSA, p. 13, p. 15
[209] *Ibid*., p. 14; "This Month in Exploration – August," NASA, 8/1/2007, https://www.nasa.gov/mission_pages/exploration/main/this_month_august07_prt.htm

urgency.[210] Nobody in the NSC objected when Wilson said his plans to contract the missile program specifically contradicted the September 1955 NSC directive to pursue ballistic missiles as quickly as possible.[211] As technological progress and economic problems crowded out the increasingly distant shocks of the thermonuclear revolution and the Killian Report, the sense of vulnerability that had spurred the missile program began to fade away.

The Sputnik crisis that began in October 1957 made this attempt at economization all but impossible. The press was now writing stories demanding to know how the White House would meet Russia's challenge.[212] Defense contractors were launching what Eisenhower called a "scare campaign."[213] Lyndon Johnson led damning Congressional investigations.[214] These pressures were compounded by the leaking of the Gaither Report, a paper by dozens of outside experts claiming that SAC would be vulnerable to a Soviet ICBM attack by 1959 and requesting $20 billion in additional defense funding.[215] By the end of 1958, the pressure had not let up—indeed, it had worsened. Democrats trounced Republicans in the November midterm elections, winning 13 Senate seats for a 62-34 advantage and 47 House seats for a 282-153 advantage.[216] That same month, the Soviet Union announced it had started "serial" ICBM production.[217] On November 27, Khrushchev heightened international tensions by delivering a public ultimatum for the U.S., UK, and France to leave West Berlin.[218] And even as they received private intelligence walking back initial dire estimates of Soviet capabilities, politicians continued to publicly attack the

[210] Watson, *Into the Missile Age*, pp. 175-76.
[211] Memorandum of Discussion at the 333rd Meeting of the National Security Council, 8/1/1957, *FRUS 1955-57*, XIX, Document 134.
[212] Hitchcock, *The Age of Eisenhower*, p. 378.
[213] Memorandum of a Conference with the President, 10/23/1957, *FRUS 1955-57*, XIX, Document 149.
[214] Hitchcock, *The Age of Eisenhower*, pp. 382-384.
[215] *Ibid*., pp. 379-380.
[216] Robert A. Divine, *The Sputnik Challenge* (Oxford: Oxford University Press, 1993), pp. 197-98.
[217] Neufeld, *Development of Ballistic Missiles*, p. 190
[218] Hitchcock, *The Age of Eisenhower*, p. 411.

administration's approach to national security.[219] John F. Kennedy declared in August that the U.S. was "about to lose the power foundation that has long stood behind our basic military and diplomatic strategy."[220] The Eisenhower administration faced allegations from Congress, the press, and the public that its inaction and incompetence had allowed a dangerous "missile gap" to open in the Soviet Union's favor.[221]

In such an atmosphere, the only politically legitimate answer to matters of missile research, development, and procurement was "more, faster." Eisenhower and his advisers came to believe that their previous cutbacks were now political suicide. This was because the executive branch did not make decisions in a vacuum, but in a democracy. Eisenhower was beholden to public opinion and to Congress. After Sputnik, both forces began to question the health of American society and the competence of the president's leadership.[222] Gallup polling showed that Eisenhower's popularity plummeted from 79% to 57% between January and November 1957.[223] His conservative coalition of northern Republicans and southern Democrats in Congress began to fray, with southerners already upset at Eisenhower's September 1957 decision to uphold school integration in Little Rock.[224] And Congressmen like Johnson and Kennedy were incentivized to play on Sputnik to boost the Democrats and enhance their own prospects in the upcoming presidential election.[225] Forces unique to America's diffuse democratic system—partisanship, regional politics, regular elections, and public accountability—put the president's agenda and reputation on the line. Eisenhower did not

[219] *Ibid*., pp. 397-399
[220] John F. Kennedy, "Remarks of Senator John F. Kennedy, in the Senate, August 14, 1958: United States Military Power – Preparing for the Gap," 8/14/1958, https://www.jfklibrary.org/archives/other-resources/john-f-kennedy-speeches/united-states-senate-military-power-19580814; Hitchcock, *The Age of Eisenhower*, p. 397.
[221] Hitchcock, *The Age of Eisenhower*, pp. 396-97.
[222] Divine, *The Sputnik Challenge*, p. vii, p. xviii, p. 62.
[223] *Ibid*., pp. 44-45.
[224] *Ibid*., p. 61.
[225] *Ibid*., p. 79.

personally understand the Sputnik hysteria, and he did not want to take hasty and reactionary measures to resolve it.[226] But because he did not run an authoritarian regime, what he wanted and what he could do were separate problems.

Ironically, the root of Eisenhower's Sputnik problem was the warfare state's anti-democratic tendency to cloak itself in utter secrecy. The president did not share in the public hysteria around Sputnik for three reasons. First, upon becoming president he received classified information about the stark dangers of the thermonuclear age that had given him a "Sputnik shock" not in 1957 but in 1953.[227] Second, the top-secret U-2 program that Eisenhower launched in 1956 provided him with intelligence that the Soviets were lagging in the missile race.[228] And third, Eisenhower was confident in America's own progress on missiles.[229] Sputnik, therefore, neither shocked Eisenhower nor convinced him of Soviet superiority. But the president was committed to preserving Cold War stability by maintaining the U-2's secrecy.[230] The tradeoff was that he could not give the public, Congress, or most people beyond his inner circle any convincing information that would indicate the U.S. was already doing enough in the ballistic missile race.[231] He failed to manage public perceptions without divulging state secrets.[232] The darkness of the warfare state, paired with the pull of democratic politics, compelled Eisenhower to take hawkish actions because the government forbade Americans from fully understanding where they stood in the contest with the Soviet Union. In a hysteria caused by the absence of information and the presence of Soviet propaganda, political logic ushered Eisenhower toward

[226] *Ibid*., p. 6, p. 17, p. 68.
[227] McGeorge Bundy, *Danger and Survival: Choices About the Bomb in the First Fifty Years* (New York: Vintage Books, 1990), pp. 341-342.
[228] Hitchcock, *The Age of Eisenhower*, p. 457.
[229] *Ibid*., p. 386.
[230] *Ibid*., pp. 456-458. On Eisenhower inheriting a tradition of nuclear secrecy, see Bundy, *Danger and Survival*, p. 339.
[231] Hitchcock, *The Age of Eisenhower*, p. 174.
[232] Bundy, *Danger and Survival*, pp. 340-41.

bigger defense budgets and more missiles. As Secretary of State John Dulles observed, "there was an irresistible pressure to accelerate the program and demonstrate our capacity as rapidly as possible."[233]

These forces resulted in a concrete expansion of the ballistic missile program. In terms of R&D, Eisenhower restored missile work to full urgency and delayed a choice on which IRBM to cut.[234] In terms of money, Eisenhower requested supplemental appropriations of $1.3 billion to accelerate missile and early-warning radar development in fiscal year 1959.[235] Ballistic missiles would receive almost $3 billion in total that year.[236] And in terms of procurement, Eisenhower approved increasingly expansive plans for operational missile deployments. Before April 1958, the authorized arsenal totaled 298 missiles.[237] On April 24, 1958, Eisenhower authorized an expansion to 358 missiles.[238] By December 5, 1958, that authorized arsenal now counted 390 missiles.[239] On December 6, 1958, Eisenhower approved an additional expansion to 572 missiles.[240] On January 13, 1960, he approved additions that brought the arsenal to 690 missiles.[241] On April 1, 1960, he authorized additions bringing the total to 840 missiles.[242] And on October 5, 1960, he authorized additions that brought the arsenal to 904 missiles.[243] In the

[233] Memorandum of a Conversation, 11/27/1957, *FRUS 1955-57*, XIX, Document 168.
[234] Watson, *Into the Missile Age*, p. 180-82.
[235] Hitchcock, *The Age of Eisenhower*, p. 390.
[236] Beard, *Developing the ICBM*, p. 206.
[237] 130 ICBMs, 120 IRBMs, 48 SLBMs. Memorandum of Discussion at the 363rd Meeting of the National Security Council, 4/24/1958, *FRUS 1958-60*, III, Document 21.
[238] 130 ICBMs, 180 IRBMs, 48 SLBMs. Memorandum of Discussion at the 363rd Meeting of the National Security Council, 4/24/1958, *FRUS 1958-60*, III, Document 21.
[239] 130 ICBMs, 180 IRBMs, 80 SLBMs. Charles Haskins to Gordon Gray, "Council Actions Relating to Quantities of Ballistic Missiles," 12/5/1958, DDO.
[240] 200 ICBMs, 180 IRBMs, 192 SLBMs. Memorandum of Discussion at the 389th Meeting of the National Security Council, 12/6/1958, *FRUS 1958-60*, III, Document 41.
[241] 270 ICBMs, 180 IRBMs, 240 SLBMs. Memorandum of Discussion at the 430th Meeting of the National Security Council, 1/7/1960, *FRUS 1958-60*, III, Document 82.
[242] 420 ICBMs, 180 IRBMs, 240 SLBMs. Memorandum of Discussion at the 439th Meeting of the National Security Council, 4/1/1960, *FRUS 1958-60*, III, Document 94.
[243] 420 ICBMs, 180 IRBMs, 304 SLBMs. Editorial Note, *FRUS 1958-1960*, III, Document 123.

two and a half years after Sputnik, Eisenhower approved a three-fold expansion of the U.S. ballistic missile arsenal.

The president was tormented by almost every one of these procurement authorizations. In April 1958, he wondered why the U.S. would make so many first-generation missiles when the program was already developing second-generation missiles that would soon render them obsolete. He "warned that we could not let our defense programs pyramid simply because we had once established these programs." He argued that "too much could reduce the United States to being a garrison state or ruin the free economy of the nation."[244] When he gave his December authorization, he questioned why it was necessary to procure large numbers of Atlas missiles to cover the short period before Titan superseded it; he asked why Defense was "gambling" on Polaris missiles that had not yet been proven in testing; he inquired why the apparently ideal Polaris missile was not restraining Atlas and Titan planning; he demanded to know why the U.S. needed "such a hell of a lot" of Polaris missiles at all; he insisted that some missiles could be cut; he wondered "how many times do we have to calculate that we need to destroy the Soviet Union?"; he mused that "somewhere along the line we had got ourselves heavily over-insured"; and he implored the military to keep in mind "what other things we are trying to defend"—namely, the "American competitive system."[245] He gave his January 1960 authorization while doubting if ballistic missiles would ultimately prove effective and lamenting the ways in which they raised the risks of war.[246] In February he responded to the Atomic Energy Commission Chairman's desire for more cheap missiles by retorting that the U.S. could easily grow its

[244] Memorandum of Discussion at the 363rd Meeting of the National Security Council, 4/24/1958, *FRUS 1958-60*, III, Document 21.
[245] Memorandum of Discussion at the 389th Meeting of the National Security Council, 12/6/1958, *FRUS 1958-60*, III, Document 41.
[246] Memorandum of Discussion at the 430th Meeting of the National Security Council, 1/7/1960, *FRUS 1958-60*, III, Document 82.

military to become an "armed camp" and a "garrison state," and that Sputnik had caused "unnecessary hysteria" over a deterrent he believed was adequate.[247] And in April 1960, he approved Minuteman procurement while biting that he "hoped the Department of Defense would be as eloquent in suggesting the abandonment of unnecessary weapons systems as it had been in proposing the commitment of Minuteman to production."[248]

Although Eisenhower was the sole decision-maker, he did not lack advisors who shared his frustration. Dulles told the NSC in April 1958 that "the United States should not attempt to be the greatest military power in the world, although most discussions in the Council seemed to suggest that we should have the most and the best of everything." He added that if the country kept up its military spending, "the time would come when all our national production would be centered on the military establishment."[249] Cutler supported Dulles at this meeting, having just collaborated with him on a memorandum arguing that the U.S. should not build a "superfluous deterrent capability."[250] And in December 1958, Robert Anderson, the new Treasury Secretary, lamented "the problem of whether this country can invariably afford every right gun and every right target at every right time."[251] Why did powerful people like Dulles, Cutler, and Anderson fail to help Eisenhower win these fights over procurement?

Even though procurement decisions were classified and thus not subject to public scrutiny, the expansionist drive of America's secretive warfare democracy extended its logic into

[247] Memorandum of Discussion at the 434th Meeting of the National Security Council, 2/4/1960, *FRUS 1958-60*, III, Document 87.
[248] Memorandum of Discussion at the 439th Meeting of the National Security Council, 4/1/1960, *FRUS 1958-60*, III, Document 94.
[249] Memorandum of Discussion at the 363rd Meeting of the National Security Council, 4/24/1958, *FRUS 1958-60*, III, Document 21.
[250] Letter from the President's Special Assistant for National Security Affairs (Cutler) to Secretary of State Dulles, 4/7/1958, *FRUS 1958-60*, III, Document 19.
[251] Memorandum of Discussion at the 389th Meeting of the National Security Council, 12/6/1958, *FRUS 1958-60*, III, Document 41.

the most private realms of the state. Eisenhower made all but one of his procurement authorizations before the Soviets revealed the U-2 to the world in May 1960, after which the missile gap myth still stood strong.[252] People high in the ballistic missile program believed in the myth—or, at the very least, feared the prospect of it being true—and considered accelerated and expanded procurement an obvious remedy.[253] Eisenhower could not appear to be a responsible military leader if he declined their plans. If he did, they might take their dissent public by going to Congress or leaking to the press. And even if they did not believe in the missile gap, they remained a risk during this moment of crisis. If they felt unsupported by the president, they might go public with accusations of Eisenhower's weakness to get more funding for their organization from Congress. These were not unfounded fears. Eisenhower frequently complained about leaks in his administration, and had already seen CIA Director Allen Dulles stir panic in Congress over Sputnik as a ploy to funnel money to the CIA.[254] Eisenhower understood that he risked sparking another round of politically debilitating public accusations if he looked soft on defense. Secrecy mixed with democracy and a porous government to pressure Eisenhower into

[252] McBundy, *Danger and Survival*, p. 350.

[253] Thomas Power: "I consider it paramount that the adverse effects of the missile gap which will exist between 1961-1964 be minimized as much as possible. The means of overcoming our numerical deficiency in missiles is through multiple concepts of employment of the total strategic force… The accelerated missile programs have been identified by AFBMD as being feasible and attainable and are in consonance with my stated objective force for end FY 1963." Thomas Power to Curtis LeMay, "AFBMD Briefing to the AFBMC on 25 February 1959," 3/3/1959, Bernard A. Schriever Papers, LOC, Box 3, Folder 3; In a paper drafted for Bernard Schriever: "If we were today to make that mistake [of underestimating Soviet missile capabilities], the military balance of power could, within a matter of two or three years, be irreparably relinquished to Communism… We must make the decisions now to increase our rates of production and operational build-up so as to provide us with an ICBM force in the early 1960's of sufficient size and invulnerability to survive a surprise attack, and rise up from it to lash back with sure and overwhelming retaliatory power." B. L. Boatman to Bernard Schriever, "The Missile Gap," 3/2/1959, Bernard A. Schriever Papers, LOC, Box 11, Folder 11; Bernard Schriever requesting a study on missile salvos: "It is obvious to me that the whole argument of the missile gap will boil down to the question of whether or not there exists a high probability of such an attack," Bernard Schriever to Charles Terhune, "Sneak Attack," 3/7/1959, Bernard A. Schriever Papers, LOC, Box 3, Folder 3.

[254] Hitchcock, *The Age of Eisenhower*, pp. 385-86.

supporting the military planners, even in private. The most he believed he could do was lecture them about fiscal responsibility and hope they would listen.

Of course, Eisenhower was not merely beaten into submission. He also grew more accommodating to a large ballistic missile arsenal. The Pentagon's many projects were steadily becoming realities. In December 1957, Atlas flew the country's first successful ICBM flight test. Seven of 13 additional tests in 1958 were completely successful, and in 1959 it flew another 22 tests of which 21 succeeded.[255] By the summer of 1959, the first Atlas squadron was operational in California.[256] This squadron joined operational IRBM squadrons in Europe.[257] Additionally, the Air Force first successfully fired Titan in February 1959, and in July 1960 Polaris made progress when a submarine achieved the amazing accomplishment of launching a missile from underwater.[258] Moreover, came to Eisenhower believe that the Soviet Union was now focusing mainly on missiles, making America's own program its most important deterrent.[259] All of these developments convinced Eisenhower that ballistic missiles were increasingly useful military weapons. So, despite fretting in November 1959 that he was "waiting for the day" he would learn Polaris worked, he also began warning that missiles would make long-range bombers obsolete.[260] This helps explain some of Eisenhower's willingness to approve more ballistic missile procurement. But it does not account for his continuous and vigorous dissent while doing so.

[255] Herbert York, "Summary of Presentation on History of Development of U.S. Long-Range Guided Missiles," 5/5/1960, DNSA, pp. 3-4; Hitchcock, *The Age of Eisenhower*, p. 388. Minuteman would not fly its first test until February 1, 1961. Piper, "Minuteman Chronology," Air Force Ballistic Missile Division Historian's Office, 1/20/1959, DNSA, p. 96.

[256] DoD, Report 48, 10/14/1960, DNSA, pp. 8-9.

[257] Sheehan, *A Fiery Peace in a Cold War*, pp. 388-89.

[258] Joint Chiefs of Staff Joint Secretariat Historical Division, "Chronology of Significant Events and Decisions Relating to the U.S. Missile and Earth Satellite Development Programs, Supplement II, November 1958 Through October 1959," 11/27/1959, DNSA, p. 18; Hitchcock, *The Age of Eisenhower*, p. 388.

[259] Memorandum of a Conference with President Eisenhower, 11/16/1959, *FRUS 1958-60*, III, Document 78.

[260] *Ibid.*

The expansion of the missile arsenal was also helped along by mere confusion. After Sputnik, Eisenhower enhanced the Secretary of Defense's authority over the services and refashioned the Special Assistant for Guided Missiles as a stronger Director of Guided Missiles.[261] Neither reform brought order to the procurement process. In the ballistic missile program's diffuse organization, procurement planning was uncoordinated across services and initiated by the military bureaucracy rather than the NSC. Careerism, interservice rivalry, technological passion, industrial interests, and wartime mentalities shaped military planners' visions with no discipline imposed from above. At times, lobbying worked against high-level efforts to shape the program. As the recession peaked in August 1958, for example, the Department of Defense contemplated cutting Titan.[262] Administration scientists and Air Force officials protested over the summer, arguing that Titan was a better missile than Atlas, and that eliminating it would not bring any real savings. They argued that cancelling Titan would also lead to needless waste and hurt local economies. By their calculations, it would cause a loss of $150 million in facilities—$50 million provided by industry and $100 million by the Air Force—and dislocate some 16,000 to 21,300 workers employed by 120 contractors in 20 states. By December, the Director of Guided Missiles capitulated.[263]

At other times, low-level planning proceeded independently of any oversight. In August 1959, Bureau of the Budget Director Maurice Stans told the NSC that the Navy planned an ultimate objective of 45 Polaris submarines carrying 720 missiles—"sufficient to destroy all of

[261] Hitchcock, *The Age of Eisenhower*, p. 394; Watson, *Into the Missile Age*, pp. 182-183.
[262] Robert Piland to James Killian, "ATLAS-TITAN," 11/24/1958, DNSA; Neufeld, *Development of Ballistic Missiles*, p. 189.
[263] Memorandum of Discussion at the 389th Meeting of the National Security Council, 12/6/1958, *FRUS 1958-60*, III, Document 41.

Russia." When he had asked a Pentagon official why the U.S. needed any other missiles, airplanes, or overseas bases, he had been told: "that was someone else's problem."[264]

At other times, the services simply disregarded orders. In August 1959, the Air Force approved a plan for 805 Minuteman missiles by fiscal year 1964.[265] On August 22, 1959, the Air Force Ballistic Missile Division (AFBMD) commander told the Air Force Chief of Staff that the Department of Defense had not given formal approval for the 805 missile plan, but that AFBMD would work to protect it.[266] On August 25, Air Force headquarters approved AFBMD's protective actions while awaiting official authorization.[267] But in April 1960, Eisenhower ridiculed the notion of 800 Minuteman missiles: "Perhaps we should go crazy and produce 10,000 Minutemen," he had snapped.[268] Nevertheless, on June 10, 1960, Air Force headquarters told AFBMD to keep planning for 805 missiles "notwithstanding the President's FY 1961 budget."[269] On June 30, headquarters went even further and approved a plan for 1,500 Minuteman missiles by fiscal year 1965.[270] The Air Force was likely influenced by the assumption that John Kennedy, who had been so hawkish on missiles in 1958, would authorize their plans if he won the 1960 election. But once Kennedy had won and left Congressional politics, he was briefed on the country's actual defense posture. Eisenhower reported to the NSC that the president-elect was now "apparently concerned about the possibility that we are

[264] Memorandum of Discussion at the 417th Meeting of the National Security Council, 8/18/1959, *FRUS 1958-60*, III, Document 72.
[265] Piper, "Minuteman Chronology," Air Force Ballistic Missile Division Historian's Office, 1/20/1959, DNSA, p. 37, p. 39.
[266] *Ibid*., p. 39.
[267] *Ibid*.
[268] Memorandum of Discussion at the 439th Meeting of the National Security Council, 4/1/1960, *FRUS 1958-60*, III, Document 94.
[269] Piper, "Minuteman Chronology," Air Force Ballistic Missile Division Historian's Office, 1/20/1959, DNSA, p. 68.
[270] *Ibid*., p. 69.

overdoing things."[271] Still, after Minuteman flew its first successful test in February 1961, Air Force Vice Chief of Staff Curtis LeMay and SAC Commander Thomas Power asked the Kennedy administration to make 8,000 of their new missiles. Kennedy's Secretary of Defense, Robert McNamara, allowed only 1,000.[272]

America's democratic and secretive warfare state pushed the ballistic missile program to become larger than the president wanted. As Commander in Chief, Eisenhower bore ultimate responsibility for the shape of the military. But he was also subject to an array of forces baked into the American system that put him in positions favoring the continued growth of the ballistic missile arsenal. Some of these forces he helped shape, like uncoordinated bureaucracies and the secrecy veiling national security information. Others he inherited wholesale, like Congress, partisanship, and electoral democracy. But all of them made it hard for Eisenhower to command America's Cold War with the iron fist of a wartime leader or authoritarian dictator. By hiding critical security information, Eisenhower became subject to democratic pressure pushing toward ever-more hawkish defense plans. He bowed to those pressures because he valued his reputation, the success of the Republican party, and the preservation of his political capital over putting his foot down in the name of reason. After all, Eisenhower's idea of reason was only reasonable in light of private information. The ballistic missile program therefore developed a political momentum and logic entirely of its own, egged on not by powerful leadership but by an irreconcilable tension between the shroud of secrecy and the politics of democracy.

[271] Memorandum of Discussion at the 469th Meeting of the National Security Council, 12/8/1960, *FRUS 1958-60*, III, Document 129.
[272] Sheehan, *A Fiery Peace in a Cold War*, p. 419.

Conclusion

When Eisenhower delivered his Farewell Address on January 17, 1961, he chose to devote his final words as president to the "imperative need" for, and yet the "grave implications" of, America's new permanent defense establishment. He issued two specific warnings: one about the "acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex," and another about becoming "captive of a scientific-technological elite."[273] There is a direct connection between the missile program and these cautions. At the President's direction in April 1959, a naval attaché named E. P. Aurand visited several key ballistic missile plants. Aurand told Eisenhower that "in aggregate, the aircraft/missile complex now represents a major segment of U.S. industry and it makes weapons almost exclusively. Reductions in numbers and kinds of projects which may be necessary will have a major impact on the areas where they exist." He argued that the loss of Denver's Titan plant—a factory, he emphasized, which "produces only Titan"—would be a "major economic blow to that city." He remarked on the concentration of industry in California, "which makes this an extremely critical economic and political pressure point." He observed that only two companies, Aerojet and Rocketdyne, made all the engines for all the country's missiles. And he noted that Convair and Martin were interested in extending their control over ICBM operations. "Whether this is in the national interest or not," Aurand wrote the president, "is a question I believe should be studied."[274]

Aurand's suspicion of the aerospace industry was shared by Malcolm Moos, a key speechwriter for Eisenhower's Farewell Address. Aurand sometimes brought aerospace trade journals into Moos's office, where they would observe in shock the vast number of companies

[273] Dwight Eisenhower, Farewell Address, 1/17/1961, The Avalon Project, Yale Law School, https://avalon.law.yale.edu/20th_century/eisenhower001.asp.
[274] E. P. Aurand to Eisenhower, 4/21/1959, DNSA.

involved.[275] Moos and his speechwriting team, in turn, brought the idea of a military-industrial complex to Eisenhower while drafting his speech.[276] At a press conference following the address, Eisenhower offered a concrete example of what the concept meant. "Some of this misuse of influence and power could come about unwittingly but just by the very nature of the thing," he explained. "When you see almost every one of your magazines, no matter what they are advertising, has a picture of the Titan missile or the Atlas or solid fuel or other things, there is becoming a great influence, almost an insidious penetration of our own minds that the only things this country is engaged in is weaponry and missiles."[277]

The ballistic missile program sat at the crux of a transformation in American life. It reflected the ways in which the Cold War sharpened and transformed bedrock features of the country's politics and economics. To wage the Cold War throughout its entire being, the U.S. government decentralized, privatized, normalized, and democratized its weapons of mass destruction. These choices were shaped by existing structures of government and economy, ideas about the value of democratic capitalism, and hostility to a Soviet system that American leaders considered antithetical to their own. Yet these organizations and convictions were distorted by doubt about the American system's capacity to survive a deadly confrontation. This tension produced a contradictory array of forces: a desire for centralized power, anti-competitive oligopoly, federal subsidies for private companies, vested interests, and a misinformed public. The disorder of democratic capitalism clashed with the order demanded by security. In that clash emerged a new disorder: a peacetime weapons industry with an inherent expansionary drive. And so the ballistic missile program sprawled, a single node in the even grander sprawl of America's

[275] Ledbetter, *Unwarranted Influence*, pp. 95-96
[276] Ralph E. Williams to Martin Teasley, 12/28/1985, Dwight D. Eisenhower Library.
[277] Ledbetter, *Unwarranted Influence*, p. 96.

warfare state. It sprawled organizationally, geographically, socially, politically, and militarily. In its sprawl, it bestowed upon the United States a grotesque colossus able to end all life on Earth. This was the fallout of a government determined to protect its idea of freedom, and willing to put everything on the line for it.

Sources

Primary Sources

Bernard A. Schriever Papers, Library of Congress, Washington, D.C.

Foreign Relations of the United States, Office of the Historian, U.S. Department of State

FRASER, St. Louis Federal Reserve

U.S. Declassified Documents Online, Gale Primary Sources

U.S. Nuclear History: Nuclear Arms and Politics in the Missile Age, 1955-1968, Digital National Security Archive

Online Documents, Dwight D. Eisenhower Presidential Library

ProQuest Congressional

ProQuest Historical Newspapers

Secondary Sources

Balogh, Brian. *Chain Reaction: Expert Debate and Public Participation in American Commercial Nuclear Power, 1945-1975.* Cambridge: Cambridge University Press, 1991.

———. *The Associational State: American Governance in the Twentieth Century*. Philadelphia: University of Pennsylvania Press, 2015.

Beard, Edmund. *Developing the ICBM: A Study in Bureaucratic Politics.* New York: Columbia University Press, 1976.

Brenes, Michael. *For Might and Right: Cold War Defense Spending and the Remaking of American Democracy.* Amherst: University of Massachusetts Press, 2020.

Divine, Robert. *The Sputnik Challenge.* Oxford: Oxford University Press, 1993.

Dudziak, Mary. *War Time: An Idea, Its History, Its Consequences.* New York: Oxford University Press, 2013.

Friedberg, Aaron. *In the Shadow of the Garrison State: America's Anti-Statism and Its Cold War Grand Strategy.* Princeton, NJ: Princeton University Press, 2012.

Griffith, Robert. "Dwight D. Eisenhower and the Corporate Commonwealth." *The American Historical Review*, Vol 87, No. 1 (1982), pp. 87-122.

Heefner, Gretchen. *The Missile Next Door: The Minuteman in the American Heartland*. Cambridge: Harvard University Press, 2012.

Hitchcock, William. *The Age of Eisenhower: America and the World in the 1950s*. New York: Simon and Schuster, 2018.

Hogan, Michael. *A Cross of Iron: Harry S. Truman and the Origins of the National Security State, 1945-1954*. Cambridge: Cambridge University Press, 1998.

Hughes, Thomas. *Rescuing Prometheus: Four Monumental Projects That Changed the Modern World*. New York: Vintage, 2000.

Katznelson, Ira. *Fear Itself: The New Deal and the Origins of Our Time.* New York: Liveright, 2013.

Kevles, Daniel. "Enlisting the Laboratories: Science, Defense, and the Transformation of the High-Tech West." In Mark Brilliant and David Kennedy, eds., *World War II and the West it Wrought.* Stanford: Stanford University Press, 2020.

Ledbetter, James. *Unwarranted Influence: Dwight D. Eisenhower and the Military Industrial Complex.* New Haven: Yale University Press, 2011.

Leffler, Melvyn. *For the Soul of Mankind: The United States, The Soviet Union, and the Cold War.* New York: Hill and Wang, 2007.

MacKenzie, Donald. *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance.* Cambridge, MA: The MIT Press, 1993.

May, Ernest. "Cold War and Defense." In Keith Neilson and Ronald Haycock, eds., *The Cold War and Defense.* New York: Praeger, 1990.

———. "The U.S. Government, a Legacy of the Cold War." *Diplomatic History*, Vol. 16, No. 2 (Spring 1992), pp. 269-277.

Neufeld, Jacob. *The Development of Ballistic Missiles in the United States Air Force.* Office of Air Force History, United States Air Force, 1990.

Reynolds, David. *From Munich to Pearl Harbor: Roosevelt's America and the Origins of the Second World War.* Chicago: Ivan R. Dee, 2001.

Roland, Alex. *Delta of Power: The Military-Industrial Complex.* Baltimore: Johns Hopkins University Press, 2021.

Schulman, Bruce. *From Cotton Belt to Sunbelt: Federal Policy, Economic Development, and the Transformation of the South, 1938-1980.* Oxford: Oxford University Press, 1991.

Sheehan, Neil. *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon.* New York: Random House, 2009.

Sherry, Michael. *In the Shadow of War: The United States since the 1930s.* New Haven: Yale University Press, 1997.

Simonson, G. R. "Missiles and Creative Destruction in the American Aircraft Industry, 1956-1961," *The Business History Review*, Vol. 38, No. 3 (Autumn, 1964), pp. 302-314.

Smemo, Kristoffer, Samir Sonti, and Gabriel Winant. "Conflict and Consensus: The Steel Strike of 1959 and the Anatomy of the New Deal Order." *Critical Historical Studies*, Vol. 4, No. 1 (March 2017), pp. 39-73.

Sparrow, James. *Warfare State: World War II Americans and the Age of Big Government.* Oxford: Oxford University Press, 2013.

Stuart, Douglas. *Creating the National Security State: A History of the Law That Transformed America.* Princeton: Princeton University Press, 2008.

Watson, Robert. *Into the Missile Age: 1956-1960.* Historical Office, Office of the Secretary of Defense: 1997.

Westad, O. A. *The Cold War: A World History.* New York: Basic Books, 2017.

Wright, Gavin. "World War II, The Cold War, and the Knowledge Economies of the Pacific Coast." In Mark Brilliant and David Kennedy, eds., *World War II and the West it Wrought.* Stanford: Stanford University Press, 2020.