THE LAIRD-PACKARD WAY:

Unpacking Defense Acquisition Policy

Brian M. Fredrickson, Major, USAF

Wright Flyer Papers

Air Command and Staff College

Evan L. Pettus, Brigadier General, Commandant
James Forsyth, PhD, Dean of Resident Programs
Paul Springer, PhD, Director of Research
Corbin Williamson, PhD, Essay Advisor

Please send inquiries or comments to

Editor
The Wright Flyer Papers
Department of Research and Publications (ACSC/DER)
Air Command and Staff College
225 Chennault Circle, Bldg. 1402
Maxwell AFB AL 36112-6426

Tel: (334) 953-3558
Fax: (334) 953-2269

Email: acsc.der.researchorgmailbox@us.af.mil

AIR UNIVERSITY

AIR COMMAND AND STAFF COLLEGE

The Laird-Packard Way: Unpacking Defense Acquisition Policy

Brian M. Fredrickson, major, usaf

Wright Flyer Paper No. 74

Air University Press
Muir S. Fairchild Research Information Center
Maxwell Air Force Base, Alabama

Commandant, Air Command and Staff College
Brig Gen Evan L. Pettus

Director, Air University Press
Lt Col Darin M. Gregg

Project Editor
Dr. Stephanie Havron Rollins

Copy Editor
Carolyn B. Underwood

Illustrator
L. Susan Fair

Print Specialist
Megan N. Hoehn

Distribution
Diane Clark

Air University Press
600 Chennault Circle, Building 1405
Maxwell AFB, AL 36112-6010
https://www.airuniversity.af.edu/AUPress/

Facebook:
https://www.facebook.com/AirUnivPress

and

Twitter: https://twitter.com/aupress

Accepted by Air University Press April 2018 and published March 2020.

Disclaimer

This Wright Flyer Paper and others in the series are available electronically at the AU Press website: https://www.airuniversity.af.edu/AUPress/Wright-Flyers/.

AIR UNIVERSITY PRESS

Contents

List of Illustrations

Tables

Foreword

It is my great pleasure to present another issue of The Wright Flyer Papers. Through this series, Air Command and Staff College presents a sampling of exemplary research produced by our residence and distance-learning students. This series has long showcased the kind of visionary thinking that drove the aspirations and activities of the earliest aviation pioneers. This year's selection of essays admirably extends that tradition. As the series title indicates, these papers aim to present cutting-edge, actionable knowledge—research that addresses some of the most complex security and defense challenges facing us today.

Recently, The Wright Flyer Papers transitioned to an exclusively electronic publication format. It is our hope that our migration from print editions to an electronic-only format will foster even greater intellectual debate among Airmen and fellow members of the profession of arms as the series reaches a growing global audience. By publishing these papers via the Air University Press website, ACSC hopes not only to reach more readers, but also to support Air Force–wide efforts to conserve resources. In this spirit, we invite you to peruse past and current issues of The Wright Flyer Papers at https://www.airuniversity.af.edu/AUPress/Wright-Flyers/.

Thank you for supporting The Wright Flyer Papers and our efforts to disseminate outstanding ACSC student research for the benefit of our Air Force and war fighters everywhere. We trust that what follows will stimulate thinking, invite debate, and further encourage today's air, space, and cyber war fighters in their continuing search for innovative and improved ways to defend our nation and way of life.

EVAN L. PETTUS
Brigadier General, USAF
Commandant

Abstract

Within liberal democracies, the weapons soldiers carry into battle determines the fate of nations, but the resources needed to build specific weapons must be allocated by elected representatives of the people years or even decades before a war or conflict begins. Therefore, to increase the odds of victory in future war, it is the responsibility of senior military leaders to learn how to fight two different types of battles, both on the battlefield (the art of waging war itself) and the battle that occurs within the realm of defense acquisition (the battle before the battle). This research intends to focus on the latter form of battle—the battles that occur within the realm of defense acquisition.

This paper contends that the study of David Packard, the co-founder of electronics firm giant Hewlett-Packard (HP) and one of the founding fathers of Silicon Valley, is essential for those who seek to understand better the realm of defense acquisition (the battles before the battle). David Packard served as deputy secretary of defense between January 1969 and December 1971, significantly influencing modern defense acquisition policy and playing a critical role in the birth of fourth-generation airpower. This research focuses on the lessons learned from Packard's experience, some developmental programs in the late 1960s and early 1970s, and the impact of those programs on Packard's acquisition reform movement. Specific programs visited include the C-5, F-111, F-14, B-1, the A-X Competition, the Lightweight Fighter (LWF) Competition (YF-16, YF-17), and the Advanced Medium Short Take-off and Landing (STOL) Transport (AMST) Competition (YC-14, YC-15). Packard's three prototyping competitions, the A-X, AMST, and LWF, resulted in the rise of the A-10, F-16, F/A-18, and C-17. Within the realm of defense acquisition, lessons learned from these developmental programs are analogous to lessons learned from battles and operational campaigns, while the evolution of acquisition policy is analogous to the evolution of warfighting doctrine. Packard's approach to acquisition, not the platforms themselves, is at the center of this study.

Packard's reforms as deputy secretary opened a temporary window of opportunity that Air Force senior leaders effectively leveraged to launch arguably the most successful and comprehensive force modernization campaign since World War II. Much of Packard's time in the Pentagon was spent aligning the Office of the Secretary of Defense (OSD) and the military services to more effectively and collectively combat what he believed were the "big three" problems with defense acquisition programs: trying to buy weapon systems with designs that were too complex and ambitious, allowing for too much concurrency (the deliberate overlap between the development and production),

and employing poor management practices (because of too frequent and poorly timed turnover of Department of Defense (DOD) program managers as well as the lack of authority provided to DOD program managers to make meaningful cost-schedule-performance trade-offs). Packard combated these problems with varying degrees of success.

However, while Packard's reforms opened a window of opportunity that launched a new generation of platforms, very few of his reforms proved durable. The DOD's approach to procuring weapon systems in recent decades is characterized by the exact problems that Packard warned against at the time. In the conclusion, the author hypothesizes why Packard's three problems (concurrency, complexity, and poor management) are systemic, representing the natural state of programs within the defense acquisition system. Overall, this paper will explore how Packard became an agent for change and present evidence to make the following claims:

1. **Acquisition reform does not have to be permanent to be meaningful.** Much like warfighting doctrine, acquisition policy is a living, evolving document. This claim is in direct contrast to the assertion of renowned Harvard Professor J. Ronald Fox that effective acquisition reform is an *Elusive Goal*, a riddle waiting to be solved.[1] Instead, this paper asserts that reform initiatives are inherently unsustainable. Such an interpretation refocuses reform initiatives toward the pursuit of specific aims rather than pursuing a durable solution that satiates all players within the system in the long-run. The battlefield of defense acquisition is continuously strewn with winners and losers; a durable solution that satisfies all players within the defense acquisition system does not exist. At the same time, Packard's legacy indicates that it is possible to open a window of opportunity to achieve the goal of cost-effectively modernizing the force.
2. **The defense acquisition system needs to move slower in the short-run to move fast in the long-run.** Packard's sequential, "fly-before-you-buy" approach to acquisition initially appeared to slow efforts to modernize the force; however, by delaying the production decision, increasing the amount of competition in the system, and breaking more extensive developmental programs into smaller programs (via prototyping competitions), Packard's approach increased options available to senior policymakers in the long-run. As this paper will demonstrate, Packard's approach mattered: the rise of fourth-generation airpower was not inevitable, particularly given the austere defense budgets of the 1970s.

3. **Military leaders should remain wary of calls for quick fixes and "rapid" approaches to acquisition, particularly those which prematurely commit the DOD to production contracts.** Similar to war, defense acquisition can never be made quick and easy. Initiatives to accelerate the fielding of weapon systems via concurrency (even during wartime), including the F-111, C-5, and F-14 programs, were disastrous. In combat, military leaders are looked upon to make quick and decisive decisions based on incomplete information. In acquisition, Packard's legacy indicates that military leaders can demonstrate patience in the face of pressure and make the correct decision, not the quickest decision, which matters most.
4. **Effective force modernization requires long-term, strategic clarity.** This paper will illustrate how Secretary of Defense Melvin Laird chartered Packard to look well into the future, beyond the Vietnam War and refocus acquisition efforts to develop capabilities to counter the rise of great powers such as China and Russia from the moment he stepped into the Pentagon.
5. **The Laird-Packard Way remains relevant today.** The technologies and weapons that the DOD procures have changed since the late 1960s, but the incentives which drive the behavior of various actors within the defense acquisition system remain the same. Packard's approach to acquisition, not the weapon systems developed, is at the heart of "the LP [Laird-Packard] Way."
6. **The DOD can afford competition within the defense industrial base.** Packard achieved it under more fiscally constrained conditions than currently exists.
7. **Most stakeholders, particularly the services, will resist change.** Therefore, a force external to the services (such as OSD) must initiate change.
8. **If the DOD and OSD are dissatisfied with the state of the acquisition system, the problem of defense acquisition must be framed; clear intent must be disseminated.** Throughout his tenure, Packard spoke often and consistently of the "three problems" of defense acquisition programs, whether during his public appearances, interviews with the media, or official correspondence within the DOD. Laird and Packard cared a great deal about the implementation of policy, much more so than the issuance of the policy itself. Packard's legacy indicates that implementation, not authoring policy, is the primary roadblock of reform efforts.

Given recent calls for innovation and modernization, this research is timely and relevant. Packard's experience offers a blueprint for addressing two of the US Air Force's current top priorities. On 31 July 2017, Air Force senior leaders unveiled a list of five priorities: *Restore Readiness, Cost-Effectively Modernize, Drive Innovation, Develop Exceptional Leaders, and Strengthen our Alliances*.[2] This paper represents an initial iteration of the author's ongoing study of David Packard's legacy as deputy secretary. Although it falls short of a definitive history of Packard's impact on the DOD, it is the most extensive account currently available and at a point where results should be added to the ongoing discussion on acquisition reform. Packard's legacy offers particular utility to staff officers and acquisition professionals who are looking to arm their senior leaders with hard-hitting, relevant information on how to "fix" defense acquisition. The author will continue his study of defense acquisition history, focusing not on the barriers that exist within the system or the policy and weapon systems themselves but instead on senior military and OSD leaders who demonstrated exceptional ability to maneuver and achieve their aims within this realm. Finally, the author suggests a notional framework (Table 2. The Five Dimensions of Defense Acquisition) to frame the general discussion on acquisition reform as well as three questions he will focus on during follow-on research.

Notes

1. Fox, *Defense Acquisition Reform, 1960-2009: An Elusive Goal, 37.*
2. Air Force Senior Leaders Unveil New Priorities," Af.mil.

About the Author

Maj Brian M. Fredrickson entered the Air Force in 2004 after receiving his commission from the United States Air Force Academy. He is a developmental engineer who believes there will be significant and far-reaching changes in how America and her allies will acquire weapon systems in the twenty-first century. Brian spent his career engaged in direct support of research, development, test, and evaluation efforts (RDT&E), noting that the characteristics of large acquisition programs have evolved significantly because of three factors: the consolidation of the US defense industrial base at the end of the Cold War, the nonlinear advancement of technology during the information age, and the globalization and commercialization of the aerospace industry and aircraft supply chains. As the DOD influence in commercial research and development (R&D) continues to erode, he believes the DOD must fundamentally change the way it acquires its weapons in the future.

Acknowledgments

First, I wish to thank my advisor, Dr. Corbin Williamson for his time, feedback, and energy. Second, I wish to thank Dr. Paul Springer, Dr. Jonathan Zartman, Dr. John G. Terino, and the leadership at Air Command and Staff College for allowing students to conduct independent research. Third, I wish to thank the men and women at the OSD Historical Archives and the Pentagon Library—including Dr. Erin Mahan and Dr. Glen Asner—who accommodated my visit and facilitated my research. Fourth, I would like to thank Col Daniel Runyon, the acquisition and sustainment chair at Air War College for his time and support. Fifth, I would like to thank David Packard for his service to the nation as Deputy Secretary (and also for informally being my mentor for the year). All mistakes found herein are my own.

Most importantly, I wish to thank my wife for her patience.

Table 1. Timeline of Events

Timeline of Events: David Packard, Deputy Secretary Jan 1969-Dec 1971
David Packard born 7 September 1912 (Pueblo, CO) 1938: Packard and Bill Hewlett establish HP
1967 – **Jun:** Arab-Israeli War – **Jul:** The Soviet Union unveils five all-new aircraft and four major revisions to existing aircraft including MiG-25 Foxbat (Domodedovo Air Show) – **Aug:** Gen Westmoreland requests 200,000 troop surge to Vietnam (55,000 approved)
1968 – **Jan:** North Vietnamese launches Tet Offensive; North Korea seizes United States Ship (USS) Pueblo – **31 Mar:** Lyndon B. Johnson abandons re-election bid and bombing campaign (Rolling Thunder) – **Mar-Apr:** Combat Lancer: three of six F-111s are lost during operational debut in Vietnam – **4 Apr:** Martin Luther King Jr. assassinated in Memphis, TN – **5 Jun:** Democratic Presidential Candidate Robert Kennedy assassinated in Los Angeles – **Aug:** Soviet tanks enter Czechoslovakia
1969 – **Jan:** President Nixon inaugurated (Melvin Laird becomes Secretary of Defense (SECDEF); Packard becomes Deputy Secretary of Defense (DEPSEC)) – **May:** Packard names "3 Problems"—too complex, too much concurrency, and too much turnover – **May:** Defense Systems Acquisition Review Council (DSARC) established [program management] – **Oct:** Program Objective Memorandum (POM) established [resource management] – **Oct:** Defense Program Review Committee (DPRC) established [validated needs] – **Oct:** Packard completes National Security Study Memorandum (NSSM)-3
1970 – **Jan:** Nixon Doctrine: "we shall reduce involvement/presence in other nations' affairs." – **1969-1972:** DOD cuts military from 3.4M to 2.5M; DOD civilians from 1.2M to 1.1M; defense industry projected loss of 1M jobs; FY69-71 the budget drops 9%; factoring in inflation, the purchasing power of the defense budget reduced 16% – **1969-1970:** Packard incorporates "fly-before-you-buy" approach to procurement, not providing contractors promises of production program by program (S-3, F-15, AWACS, F-14, B-1) – **Jan-Mar 1970:** Packard ends close air support (CAS) stalemate; launches A-X (YA-9, YA-10) – **May 1970:** Packard issues acquisition guidance—"The Packard Memo."
1971 – **July 1971:** Packard issues DOD Directive 5000.1 (formal Defense Acquisition Policy) – **Sept 1971:** Testimony for Advanced Prototyping Initiatives – **Dec 1971:** Of $67.5M requested for 12 programs, $12M received for two: LWF (YF-16, YF-17) and Advanced Medium STOL Aircraft (AMST) (YC-14, YC-15) – **13 Dec 1971:** Packard resigns and returns to HP – **3 May 1973:** White House confirms Packard top pick for SECDEF; Packard declines – **26 Mar 1996:** David Packard dies age 83 (Stanford, CA)

Author Foreword

It makes no difference that we were the wealthiest nation in history. It makes no difference that we had the most powerful military establishment in the history of the world. It makes no difference that we had the largest and most efficient research and development capability. It is not what a nation is, but what it wants to be that determines its future.

-David Packard
Deputy secretary of defense, 1969-1971

Those who read this paper will hopefully walk away with a better understanding of *how* the Department of Defense (DOD) can go about "fixing" its troubled acquisition system. As a warning, using the term "fix" is limited in capacity. Carl von Clausewitz posited that war is "never an isolated act;" it "does not consist of a single short blow" and the result of war is never final as the "defeated state often considers the outcome merely as a transitory evil."[1]

The same is true in defense acquisition reform. Acquisition reform, like warfare, is a zero-sum game. Given the relatively fixed nature of the RDT&E portions of the defense budget, acquisition-related decisions favorable to one set of programs and stakeholders are inevitably unfavorable to another. In other words, changes within the acquisition system naturally create winners and losers, so the results are rarely final. Thus, calls for defense acquisition reform will never cease, the sources of discontent naturally flowing from one set of stakeholders to another.[2]

From the perspective of the DOD, this paper will demonstrate that reform does not have to be sustainable for it to be meaningful, as long as it creates a window of opportunity that stakeholders can effectively exploit to achieve desired objectives. Therefore, when using the term "fix" in the acquisition system, it means creating a set of conditions that effectively and efficiently, albeit temporarily, align procurement efforts with long-term security interests of the nation, as opposed to maximizing gains for specific subgroups or stakeholders. Akin to an amphibious assault on a heavily defended beachhead, the forward momentum gained during such an effort is inherently unsustainable. Even if successful, both efforts are typically designed to secure an objective for a finite period (whether minutes, months, or years). This paper posits that such an opportunity existed between 1969 and 1972 when David Packard helped create much of modern-day acquisition policy and framework. This paper contends that the window of opportunity was exploited effectively by senior leadership within the Air Force and the OSD to give rise to fourth-generation platforms, the workhorses of modern airpower. Granted,

much of the policy gains made since those years have been lost, but the reforms initiated during these years offer valuable lessons for current and future acquisition leaders.

Table 2. Five Dimensions of Defense Acquisition

Initiator	Target "Benefactor"				
	OSD	**Services**	**Industry**	**Congress**	**White House**
OSD	*Internal efforts to improve internal performance	*OSD initiated efforts to align better or improve OSD-service performance	*OSD initiated efforts to align better or improve OSD-industry performance	OSD initiated efforts to align better or improve OSD-Congress performance	OSD initiated efforts to align better or improve OSD-White House (WHO) Performance
Services (Army, Navy, Air Force)	Service efforts to improve OSD-service performance	Internal efforts to improve internal performance	Service efforts to improve service-industry performance	Service efforts to improve service-Congress performance	Service efforts to improve service-WHO performance
Defense Industry	Industry initiated efforts to improve industry-OSD performance	Industry initiated efforts to improve industry-services performance	Internal efforts to improve internal performance	Industry initiated efforts to improve industry-Congress performance	Industry initiated efforts to improve industry-WHO performance
Congress	Congress or Senate initiated efforts to improve OSD performance	Congress or Senate initiated efforts to improve military performance	Congress or Senate initiated efforts to improve industry performance	Internal efforts to improve internal performance	Congress or Senate initiated efforts to improve White House performance
The White House	President initiated efforts to improve OSD performance	President initiated efforts to improve military performance	President initiated efforts to improve OSD performance	President initiated efforts to improve congressional performance	Internal efforts to improve internal performance

Table 2 illustrates the five dimensions of defense acquisition and defines the scope of the study at hand. This paper posits that the five dimensions of defense acquisition align with five basic types of stakeholders, who act rationally within the incentives and influences that exist within their respective spheres. The present research focuses primarily on the top row, efforts initiated by the OSD to improve its internal performance, its collective performance with the services, and its collective performance with the defense industry. Specifically, the paper will follow David Packard, co-founder of Hewlett-Packard Company, during his time as DEPSEC from January 1969 through December 1971,

providing insight into both his informal efforts (speeches, visits overseas, and day-to-day battle-rhythm) and formal efforts (changes to policy, formal reorganization and reallocation of roles and responsibilities between OSD and the services, and impact on specific contracts). Embarking on the journey through the eyes of Packard, one of the founding fathers of Silicon Valley enables readers to understand how Packard's ideas are embedded within current defense acquisition policy as well as how far it has unraveled from Packard's initial intent. The defense acquisition system resides within a complex and conflicting web of politics, profit, and parochialism. Above all, Packard and his boss, SECDEF Melvin Laird reveal lessons on how to maneuver in this realm effectively.

There is not a better time to revive Packard's legacy than now. Despite the fact that the world has changed over the last half-century, there are numerous historical parallels between the late 1960s and today. When David Packard arrived at the Pentagon from Silicon Valley in 1969, the DOD was worn down by in a protracted, unconventional war in Southeast Asia; a peer competitor had recently unveiled a new air superiority fighter, the MiG-25 Foxbat, and was in the midst of a significant modernization program across the board; and America's defense procurement system was in gridlock, widely considered ineffective and nonresponsive to the needs of the war fighter. Given the resurgence of similar conditions today, David Packard's legacy provides a guidebook for those who hope to swing the pendulum of DOD defense acquisition back in the right direction (to more effectively, efficiently, and expeditiously deliver materiel solutions to the war fighter). If the DOD ever desires a template to innovate and cost-effectively modernize the force, Laird and Packard can show us how.

Some stakeholders within the defense acquisition system tend to continue measuring the capabilities of the military in terms of historically essential platforms, such as fighters and bombers. However, the new reality is that the military will likely evolve its posture toward Multi-Domain Battle, a concept that allows a commander to achieve cross domain-effects. Therefore, while this paper focuses on a narrow chapter of airpower-centric acquisition history, the lessons learned can be applied across the procurement of systems that support a much broader range of war-fighting domains, whether ground, sea, air, space, and cyberspace. Packard's approach to procurement, not the era or specific technologies developed, matters most.

Notes

1. Carl Von Clausewitz, *On War,* 79-81.

2. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 5.

Introduction

Lead times for change in military capabilities are long, while political objectives can change quickly. Most modern wars can only be fought with forces of size and type decided years in advance, when economic, political, and technological expectations may have been very different. Strategy or even policy then have to adjust to bring capability and objective into alignment.

-Richard K. Betts

On 31 July 2017, Air Force senior leaders unveiled a list of five priorities: *Restore Readiness, Cost-Effectively Modernize, Drive Innovation, Develop Exceptional Leaders,* and *Strengthen our Alliances*.[1] In the late–1960s, the DOD faced almost identical challenges. At the end of the 1960s, the services were long overdue for total force modernization, a requirement neglected and stretched out by the drain of a protracted, asymmetric war in Southeast Asia. America's peer competitor, the Soviet Union, unveiled five new aircraft and four significant revisions to existing aircraft two years earlier in 1967, while defense procurement initiatives at home to deliver next-generation platforms, the F-111, and C-5A, remained mired in cost and schedule overruns. Given the skyrocketing cost of new programs, a high rate of inflation, and ongoing reductions in defense budget outlays, modernizing the force was projected to result in substantial force cuts. NSSM-3, a study led by Packard during his first nine months on the job at the Pentagon, projected that given the costs of new programs the Air Force would lose one-third of its wings; the Navy would lose one-quarter of its attack carriers and one-fifth of its air wings, and the Marine Corps would need to reduce the number of aircraft within each wing by one-third.[2]

Because of rising per-unit costs, America would be unable to sustain its force structure. Shortly after that, President Nixon called on America's allies to carry a more significant share of their defense burden and asked the DOD to reduce worldwide commitments from a two-and-a-half war to a one-and-a-half war posture in what became known as Nixon Doctrine. In his first State of the Union address, Nixon announced:

> The nations of each part of the world should assume the primary responsibility for their own well-being, and they themselves should determine the terms of that well-being. We shall be faithful to our treaty commitments, but we shall reduce our involvement and our presence in other nations' affairs.[3]

The Nixon Doctrine relied heavily on modernizing strategic mobility capabilities, such as the C-141 and C-5A, as the smaller force would need to be more agile to respond to potential global events. Countering the Soviet build-up necessitated the development of new tactical air capabilities, especially restoring the ability to achieve air superiority against a peer competitor. Finally, the Nixon Doctrine incorporated an increase in military assistance to US allies.

Soon after his arrival to the Pentagon in January 1969, SECDEF Melvin Laird gave DEPSEC David Packard the challenge to reform the defense acquisition system and cost-effectively modernize the force. Packard, a Silicon Valley entrepreneur and co-founder of electronics firm giant HP reluctantly accepted the position. He initially thought it would take him two years to reform acquisition processes; however, it took him nearly three years. His experience came to reveal both the capabilities and limitations of the DEPSEC in exacting meaningful acquisition reform. During Packard's tenure, he teamed with Laird to completely reverse course on former Secretary Robert McNamara's Total Package Procurement (TPP) approach. TPP combined system development and the production of weapon systems into one contract.

Instead, Packard championed a sequential, incremental, "fly-before-you-buy" approach to defense procurement. He believed that prototyping and hardware demonstration provided the most effective path to mature technologies and lower risk before making a production decision. An ardent opponent of concurrency—which overlapped development and production—Packard wanted companies to prove the capability of their technologies and systems via hardware demonstrations rather than design studies and sales pitches. Packard's approach in the Pentagon mirrored his methods at HP. HP made production decisions based not on analytical studies and designs on paper but instead on inventions and hardware components upon which he could feel and observe their performance and capabilities. In short, the "fly-before-you-buy" approach required "competing teams to demonstrate the superiority of their product, rather than the superiority of their salesmanship."[4] Although Packard's approach worked in the private sector, there was not a guarantee that the same strategy would work in the Pentagon.

Packard enjoyed a synergistic relationship with Laird during his years in the Pentagon. Just as HP and "the HP Way" would have never come into existence without Bill Hewlett, the success or failure of Packard's legacy in the Pentagon rested heavily on the empowerment, latitude, and authority provided by Mel Laird. This paper is titled: "The Laird-Packard (LP) Way–Unpacking Defense Acquisition Policy," a testament to the significance and nature of the Laird-Packard relationship. Packard would likely have been unable to overcome the political and institutional barriers necessary to implement

meaningful change without Laird's steady hand of leadership and skills as a bureaucratic in-fighter.

The overarching goal of Packard's reforms was to create a more responsive system that created additional production-ready options for future decision makers. In this sense, Packard was not as concerned with doing things "faster" or "more rapidly," as he was with doing things "right." Counterintuitively, this slowed acquisition efforts in the short run as his sequential approach to acquisition focused not on taking short-cuts but on making prudent, well-informed decisions and advancing technologies only when they demonstrated sufficient reliability, performance, and cost-certainty.

In contrast, former SECDEF Robert McNamara's approach, TPP, eliminated competition much earlier in the acquisition process, limiting options while saddling the DOD with an incredible amount of risk by committing production contracts to designs that only existed on paper. In contrast, Packard's approach provided the customer, the Pentagon, with increased flexibility and leverage through two key initiatives. First, he established a production decision point (i.e., "Milestone C" in current nomenclature), protected by a committee within OSD to ensure its integrity.[5] Second, he increased the number of programs pushed into hardware development by putting his full weight behind advanced prototyping initiatives. In contemporary terms, Packard enabled more programs to proceed beyond "Milestone A."[6] Packard referred to these milestones as "checkpoints."[7] In other words, the goal of Packard's approach was to create more options for decision makers by sustaining competition as far into the acquisition cycle as possible. Packard made these moves amid declining defense budgets and, counterintuitively, saved money and ensured faster procurement despite fiscal constraints.

Maintaining competition through the developmental phases of a program created more options and leverage for senior leaders in the long run, more opportunities for defense contractors to sustain their design teams and prototyping capabilities, and led to more prudent usage of taxpayer dollars by increasing cost and performance certainty. Packard refused to buy into the notion that the DOD could not afford competition and refused to accept the notion that the military's fate was to repeatedly become hostage to large, high-risk, developmental programs that depended on the simultaneous development of unproven avionics, airframes, and propulsion systems. He viewed creating airframes and propulsion systems as planting seeds for a tree, a long-term intensive effort that would require unique, large-scale tooling to create significant and highly-specialized components made from advanced materials. Meanwhile, as the head of an electronics firm, he clearly understood that the technologies underpinning avionics were moving at the speed of Moore's

law.[8] Thus, Packard refused system architectures that irrevocably bundled the development of airframes, propulsion systems, and avionics together.

Closer analysis of Packard's two-front campaign reveals how both mechanisms (protecting the integrity of the production decision and enabling competition) required a deliberate and concerted effort, driven from the top-down. A well-known example is the LWF Program, which resulted in the development of both the F-16 and F/A-18 and has been shared from the perspective of Colonel John Boyd.[9] However, though Boyd's role was important, Packard set the stage for success by backing a much broader prototyping initiative from his position as DEPSEC. As Robert Coram, the author of *Boyd* points out: "first there was Packard's decision to start a prototype program. Without Packard's decision, the LWF would have been stillborn."[10] The same can be said for the A-X program, a competition between the YA-9 and YA-10, which resulted in the production of the A-10, and the AMST Program, a competition between the YC-14 and YC-15, which led to the development of the C-17.

Given the broader context and scope of such prototyping initiatives, it becomes clear that Boyd's efforts were part of a much larger movement envisioned and backed by top leadership within the Pentagon—a strategic effort to create more options for future decision makers. Packard's advanced prototyping initiatives provided contractors increased flexibility and maneuverability and were designed to rapidly advance specific component technologies (discrete efforts focused on constituent systems: airframes, propulsion systems, flight control laws, etc.). Therefore, they were nimble programs that competed favorably against more extensive programs hamstrung by relatively fixed system architectures and other political constraints, such as complex and diffuse supply chains. In short, Packard did not fear disruptive technologies and paradigm shifts. Instead, he attempted to implement changes in the Pentagon designed to harness and exploit them just as he had done at HP.

Packard's approach may have appeared incredibly risky in the eyes of skeptics, given the situation he faced. The drawdown of the Vietnam War had a significant impact on both the military and defense industries. In total, the fate of two million jobs across the DOD and defense industry hung in the balance. From 1969 to 1972, the DOD worked to reduce the number of uniformed personnel from 3.4 million to under 2.5 million and the number of DOD civilians from 1.2 million to 1.1 million.[11] Between FY1969 and FY1971, the budget dropped nearly nine percent, and with factoring in inflation, the purchasing power of the defense budget was reduced by almost 16 percent.[12] The defense industry was hit particularly hard. According to the Department of Labor statistics, 3.4 million Americans held jobs generated by

DOD spending at the beginning of 1970; Packard estimated 1 million defense contractor employees would need to find work elsewhere.[13]

During similar budget and personnel contractions at the end of the Cold War, SECDEF Les Aspin and DEPSEC William Perry took the opposite approach. Instead of developing a long-term strategy to keep defense industry design teams and highly-skilled labor intact, Aspin and Perry communicated to the defense industry that "half of the companies represented at the meeting would not exist in five years." The event became known as Aspin's Last Supper, driving a massive consolidation of the defense industrial base. Boeing, Lockheed Martin, Northrop Grumman, General Dynamics, and Raytheon are the five US companies that survived.[14]

Conversely, in the late-1960s, Packard did the exact opposite, providing opportunities for as many companies as possible by offering numerous prototyping contracts without the promise of production, thereby maintaining competition within niche sectors of the industrial base. By providing highly-specialized design and prototyping teams with opportunities to compete, defense companies not only had a chance to survive the downturn but also improve upon their technologies. Packard's experience at HP during World War II and the Korean War taught him that defense budgets were cyclical and war almost inevitable. Therefore, he pursued a long-term approach that would preserve a level of competition within the defense industrial base and would offer more flexibility to decision makers as global security dynamics evolved in the future.

Packard established himself as a firm leader in the Pentagon who did not have any qualms about taking on defense conglomerates, politicians, and generals whose personal interests he deemed detrimental to the greater common good, undermined national security, or put soldiers on the frontlines at risk. When problems across many defense programs threatened to render Lockheed financially insolvent in 1970, Packard opposed a government bailout, illustrating the extent to which he played hardball with defense contractors. Packard's decision to launch the A-X Program helped close a tenuous and protracted debate between the Air Force and Army about the CAS mission. It showed how little tolerance he had for service parochialism and interservice rivalry. Finally, Packard's refusal to immediately disband the Office of Systems Analysis (OSA), McNamara's infamous team of "whiz kids" who preferred a purely analytical approach rather than input from politicians and Pentagon top brass to determine future military force structure, illustrated his refusal to be pushed around by politicians.

Packard began to make his mark within his first year, exacting significant changes to Requests for Proposal (RFPs) going out the door in 1969 and 1970,

notably for the F-15, Airborne Warning and Control System (AWACS), S-3, and B-1. He ensured that these contracts did not provide promises of production, instead he demanded that programs were sufficiently mature before allowing a move into production. Such characteristics may seem "commonsense" to the observer, but the incentives inherent within the defense acquisition system often drive premature commitments to production (reflected by high levels of concurrency in development) while allowing very few programs beyond advanced prototyping phases (beyond Milestone A and Milestone B). Packard identified three types of prototypes: advanced prototypes, production prototypes, and systems integration prototypes. Each phase of prototyping activity incurred a variety of associated but different risks. Therefore, Packard understood that success in one phase of prototyping did not ensure success in subsequent stages. Thus, maintaining competition as long as possible was essential to gain certainty in the overall cost and performance of a given weapon system. Taken as a whole, Packard's legacy offers clues into how to create leverage for the services, how to incubate technologies and structure acquisition programs to survive austere budgets, how to provide future policy-makers with options to quickly and cost-effectively modernize the force, and most importantly, how to facilitate innovation within the constraints of a vast bureaucracy.

Packard played a significant role in the boom of platforms in the mid-to-late 1970s; his choices and actions reminded the Pentagon how it could generate a diverse ecosystem of options in the face of budget cuts. An analogy from Packard's personal life illustrates his leadership approach. He enjoyed gardening and spent his Sundays in Washington DC tending to his backyard. According to his wife, Lucile Packard, "every chance he gets, Dave is out in the back planting bulbs – tulips, crocuses, daffodils, snowdrops, and hyacinths."[15] His efforts at the Pentagon can be likened to a gardener planting seeds in a greenhouse. While the prototyping efforts he backed would take years to incubate and grow before they were ready for harvest, those seeds eventually provided America's top leaders with a much broader range of choices to modernize the force during the 1980s, at a critical juncture and turning point during the Cold War. The Reagan-era production boom was possible because of Packard's initiatives a decade prior. In this gardening analogy, Packard planted the seeds by initiating prototyping efforts, Reagan harvested the crop by transitioning mature programs into full-rate production. The result was arguably the most bountiful crop in DOD history, one from which the DOD and its allies continue to reap benefits today.

The most critical seeds Packard planted were for long-lead systems: new airframes and propulsion systems. Many of the aircraft the DOD operates

today can still be tied to Packard: his prototyping initiative resulted in the development of the A-10, F-16, F/A-18, and C-17; and elements of his "fly-before-you-buy" approach were implemented at the subsystem level to mitigate risk in the S-3A, B-1, F-15, and AWACS programs. The author of the original DOD Instruction 5000 series, the creator of the POM and the concept of a Milestone Decision Authority (MDA), Packard contributed to the establishment of many pieces of the underlying framework which comprises the modern acquisition system. As a result of his contributions, it is not a far-stretched assertion to call Packard the father of fourth-generation airpower and one of the founding fathers of modern acquisition policy.

Four fundamental tenets of Packard's approach to defense acquisition emerge in this paper. First, Packard pushed the services to continuously develop new, mission-specific platforms, regardless of the status of the threat. Second, Packed crafted development contracts without the promise of a follow-on production contract. Third, Packard broke developmental contracts for aircraft programs into component subsystems (i.e., airframe contract, propulsion system contract, and avionics contract). Finally, Packard championed trade-offs, specifically providing flexibility between schedule and performance goals to achieve cost.

While this paper provides insight into several essential chapters of Packard's time as DEPSEC, it is not exhaustive. Specifically, this paper does not include an in-depth analysis of Packard's role in the Safeguard Program or the results of the Fitzhugh Report (Blue-Ribbon Committee chartered by President Nixon). Packard served as one of the primary spokesmen and advocates for the Safeguard Program in 1969; an effort focused on Antiballistic Missile (ABM) defense primarily to counter the rise of China's nuclear capabilities. Although this work consumed a significant amount of Packard's time and arguably provided President Nixon additional leverage during talks between the US and Soviet Union, this paper does not provide a detailed account of events that transpired because of the ABM Treaty of 1972 and subsequent funding cuts and eventual cancellation of the program. Concerning the Fitzhugh Report, the chronology of events indicates that Packard's approach to defense acquisition evolved independently from the findings of the committee. Programs such as the S-3A and B-1 illustrate that Packard's tenets, such as "fly-before-you-buy," were implemented beginning in August 1969, well before the findings of the July 1970 Fitzhugh Report.

This paper also does not provide an in-depth analysis of the Lockheed Crisis in 1970 or the Packard Commission in 1985. The exclusion of the Lockheed Crisis and Packard Commission is regrettable, as both events are

significant pieces of Packard's legacy and further insight into his weapons buying strategies. However, they were beyond the scope of the study.

Although more thoroughly understanding the DOD weapons buying policy is at the heart of this study, this paper seeks to provide qualitative, rather than quantitative insights into the original rationale behind DOD's current acquisition framework. Mechanisms within current requirements, resource, and program/contract management constructs, such as the POM and the concept of the MDA, are both cornerstones to the modern acquisition framework and part of Packard's legacy. Studying the history of such mechanisms reminds acquisition professionals that the defense acquisition system is man-made, the barriers and constraints of its process tied to the interests and defended by its various and diverse stakeholders. Therefore, to understand the initial intent of policy and subsequent attempts at policy reform, it is beneficial to study both the life and experiences of individuals who have exacted successful reform and the broader context of the era in which they lived. In short, a policy is not formed in a vacuum; defense acquisition history is best served if it accounts for the broader context of world events.

Concerning acquisition policy, the reader should note that DOD Instruction 5000.02: "Operation of the Defense Acquisition System," has grown significantly in recent years – tripling in length over the last 15 years, from 50 pages in May 2003, to 80 pages in December 2008, to 154 pages in January 2015.[16] The supplementary guides that accompany the 5000 series policy, such as the Defense Acquisition Guidebook, are also growing in length, recently standing at 1,248 pages. Studying David Packard's legacy steers the reader back to the core intent of his policy changes, the opportunity to understand the rationale behind the original, austere seven-page guidance (including enclosures) he issued on 13 July 1971.[17] This approach entailed not simply dissecting and analyzing the policy itself, creating novel cost analysis methods to reframe cost overruns and schedule delays, or comparing the current policy to Packard's original policy but instead making an effort to gain an in-depth and thorough understanding of Packard's experiences while at the Pentagon. Fundamental to Laird and Packard's approach was the principle of "placing more emphasis on people and less emphasis on elaborate procedures."[18]

Concerning people, there is merit in studying the human aspects of defense acquisition; acquisition professionals are inherently analytical creatures. Jomini would be proud of the scientific approaches employed to analyze historical cost and schedule overruns. However, while DOD acquisition professionals may have become masters of earned value management, the critical path, and other increasingly complex parametric cost and schedule tools, it is essential not to lose sight of the Clausewitzian nature of the acquisition environment.

The fog and friction of the acquisition provide insights into how human nature results in a significant number of political-military barriers, many self-imposed, that challenge the ability of the DOD to modernize and innovate cost-effectively. In combat, the enemy has a vote. In the defense acquisition system, the other stakeholders in the system have a vote. Thus, OSD and DOD acquisition strategy is best served if it anticipates that other stakeholders within the system that will inherently seek to serve the political, parochial, or profit-driven incentives inherent within their respective spheres. The LP Way offers insight for navigating this environment in a meaningful way.

Recent acquisition trends continue to drift from Packard's original intent. In particular, the rapid consolidation of the defense industrial base after the Cold War and the failure by critical DOD and OSD leaders to counter the resurgence of sophisticated designs and concurrency in recent years. Calls to make acquisition more rapid and faster perpetuate the death spiral, trapping the war fighter in the current paradigm by failing to address the underlying causes which have caused the dearth of options available to decision makers. The lack of options today is the consequence of decisions made 15 or 20 years ago. As Packard's legacy indicates, correcting the course of defense acquisition is not something to be achieved overnight through maxims espousing "rapid" or "fast" acquisition but instead a fundamentally sound approach that effectively counters Packard's three problems: too complex, too much concurrency, and too much turnover. To Packard, the "three problems" were the "axis of evil" of defense acquisition programs. Much of what he did as DEPSEC was intended to counter them.

Many of the United States Air Force's (USAF) top leaders are pilots, so the following analogy may also help frame how Packard approached the challenge before him. For Packard, taking a sequential, incremental approach and slowing down acquisition was analogous to a pilot pushing the stick forward to recover from a stall. While pushing the stick forward to recover from a stall may seem counterintuitive to someone who has never flown an aircraft, as pilot-in-command of the defense acquisition system, Packard knew precisely what he was doing. In pushing the stick forward in 1969, he knew he would lose altitude in the short run, but it was a move that would allow him to pick up airspeed and recover lift in the long run. Packard did not measure airspeed using knots; instead he measured the amount of competition within the system. The more competition with the system, the more options senior leaders had, and the more maneuverable and responsive the system became, just as HP had achieved in Silicon Valley. As Packard gained airspeed by 1971, he gradually lifted the nose of the defense acquisition system, trading airspeed for altitude and initiating a slow and steady 10 to 15-year climb, a climb for

the ultimate prize: providing more production-ready options to future decision makers to modernize the force cost-effectively.

Over the years, Packard's approach to acquisition has been oversimplified into a four-word maxim: "fly-before-you-buy." However, "fly-before-you-buy" misses many vital characteristics of Packard's original intent.

It misses the LP Way. What is the LP Way? The LP Way is a proven long-term approach to acquisition that delivers a diverse set of options for policymakers to modernize the force cost-effectively. The backbone of the LP Way is competition. The LP Way eschewed system architectures that contained immature or unproven technologies, recognizing that the development of a weapon system can only progress as fast as its most troubling part. Instead, the LP Way combated concurrency and premature commitment to production by unleashing a swarm of disconnected prototyping efforts; each competition tightly focused on the advancement of one particular system (a propulsion system, air vehicle, radar, and so forth). Systems were considered for aggregation into a weapon system only at the point where they demonstrated the sufficient maturity level to do so—that is the decision maker had confidence in its price and performance and a selection based on hardware demonstrations rather than brochures and salesmanship. As a result, the LP Way put the ball back into the hands of senior leaders within OSD and the services and gave them the altitude and airspeed they needed to maneuver as pilot and co-pilot of the defense acquisition system.

Organization of the Paper

For the most part, the sections that follow are constructed chronologically, focused primarily on David Packard's time as the DEPSEC from January 1969 to December 1971. Packard spent much of his first year in the Pentagon trying to figure out a way to play the hand he was dealt. He identified three problems with acquisition programs, Packard's "axis of evil": designs were too complex and ambitious, the military-industrial complex tolerated too much concurrency, and programs were poorly managed because of lack of the authority provided to the services and rapid turnover of uniformed program managers. Much of Packard's time in the Pentagon was dedicated to solving these three problems of defense acquisition.

During his first year on the job, Packard made changes program by program. He deleted large sections of every RFP he reviewed, removing large amounts of requirements and specifications, challenging the Pentagon's accepted way of doing business. Both at HP and the Pentagon, Packard sought to minimize time and resources allocated to paperwork and maximize the

time and resources allocated to hardware development. In his second year on the job, Packard turned the corner, issuing *The Packard Memo* on 28 May 1970, which contained initial guidance on his envisioned policy reform.[19] The Packard Memo became codified on 13 July 1971 as DOD Directive 5000.1, *Acquisition of Major Defense Systems* during Packard's third year on the job. Packard's efforts culminated in his support of the advanced prototyping initiatives. The following table summarizes Packard's approach to acquisition.

Table 3. Packard's Principles of Defense Acquisition[20]

Packard's Principles of Defense Acquisition
1. **Help the services do a Better Job.** "The services have the primary responsibility to get the job done."
2. **Have Good Program Managers with Authority and Responsibility.** ".. . they must be kept in the job long enough to get something done."
3. **Control Cost by Trade-offs.** "Make practical trade-offs between operating requirements and engineering design."
4. **Make the First Decision Right.** "The initial decision to go ahead with full-scale development of a particular program is the most important decision of the program. If this decision is wrong, the program is doomed to failure… to make this decision correctly requires that the program be kept in advanced development long enough to resolve key technical uncertainties."
5. **"Fly-Before-You-Buy."** "Engineering development must be completed before substantial commitment to production is made."
6. **Put More Emphasis on Hardware; Less on Paper Studies.** Premature implementation of logistic support, training, and maintenance matters tends to be wasteful
7. **Eliminate TPP.** "It is not possible to determine the production cost of a complex weapon system before it is developed."
8. **Use the Type of Contract Appropriate for the Job.** Cost-incentive type contracts should be used for new major weapon systems. "(a) cost control . . . can be achieved by better management; (b) a prime objective of every development program must be to minimize the life-cycle cost, as well as the production cost of the article or system being developed; (c) price competition, is virtually meaningless in selecting a contractor for a cost-incentive program."

Regarding this paper, Packard's lines of effort are divided into the following three categories:

1. **Operational Design.** Efforts to align procurement efforts with America's strategic commitments and long-term interests

2. **Rebuilding the OSD-Service Relationship.** Reallocating the roles and responsibilities among the services and OSD to more effectively manage acquisition programs

3. **Changing how the DOD buys its weapons.** Finally, the translation of what was initially a program by program approach to acquisition reform into formalized guidance and then policy.

This study consists of seven parts. Part I introduces the man, David Packard. Part II focuses on the situation, the broader context of global events in which he stepped into the Pentagon. The late 1960s represented the convergence of many factors, internal and external to the Pentagon. The purpose of Part I and Part II is to frame the conditions in which acquisition reform took place collectively. Understanding both Packard and the context of the era in which he served as DEPSEC provides a framework for thinking critically about what conditions may or may not be required for meaningful acquisition reform to take root and what kind of person might be best suited to lead such an effort.

Part III addresses Packard's first line of effort: better aligning DOD procurement efforts with America's strategic commitments and long-term interests. Packard understood that procuring weapon systems was not an end in itself but rather a small cog in the much larger national security machine. During his first nine months in office, Packard led a comprehensive study of national security strategy and its cost, examining alternative military strategies and the force structure and funds required to execute them, known as NSSM-3. NSSM-3 provided Packard the opportunity to travel to West Germany and Korea, where he gained insight into the capabilities and limitations of equipment operated by the US and its allies as well as points of concern on joint developmental programs, specifically the Main Battle Tank (MBT)-70. Although a failed program in the long run, Packard's experience studying the MBT-70 significantly influenced his views moving forward. A key characteristic of Packard's charter from Laird was that it focused him on the future—beyond the Vietnam War—which in turn drove him to look for options to pursue an entirely new generation of airpower rather than incremental improvements to existing airframes.

Part IV addresses Packard's second line of effort: the reallocation of the roles and responsibilities among OSD and the services. Packard made two pivotal changes during his first year at the Pentagon. First, he implemented a mechanism to centralize command and decentralize control of acquisition programs by establishing a committee within OSD in May 1969 with authority to make "go, no-go" decisions at crucial points in the development of a weapon system, known as the DSARC. DSARC was a concept inspired by Bill Hewlett at HP. Second, in October 1969, he established another mechanism to better integrate input from the services into the budget cycle, known as the POM, a concept inspired by Packard's study of former Secretary James Forrestal. Simultaneously, throughout 1969, Laird and Packard had to decide on the path forward for the OSA, an office established by former Secretary Robert McNamara in 1961. Both the services and politicians demanded that Laird

and Packard disband the office. Finally, a third critical cog of the acquisition machine fell into place in October 1969 when a committee within the National Security Council (NSC) was tasked to identify requirements and validate the needs of the war fighter.

Part V provides a closer look at Packard's program by program approach to reform. Given Packard's incremental, step-by-step approach to reform, it became evident that he did not have a clear vision for what the acquisition policy would look like when he stepped into the Pentagon but instead built a comprehensive picture as he gained experience. His ultimate goal was to provide policymakers with a more diverse ecosystem of options than he was provided in 1969 to modernize the force cost-effectively. Given the context of the era, this required that Packard sustain a competitive industrial base and facilitate innovation amid a declining defense budget. Two case studies will be examined: The A-X Program and the B-1 program. Packard released the Packard Memo in the summer of 1970, circulated well in advance, and containing many of the same elements of the DOD Directive 5000.1 he issued in July 1971.

Part VI, "Packard's Hail Mary–the Advanced Prototyping Initiatives," addresses Packard's final months in office during the fall of 1971. This extreme series of events revealed the limits of Packard in his attempt to launch a large number of advanced prototyping initiatives. His request for funding for 12 prototyping efforts represented a high-stakes gamble with a significant probability of failure, similar to a Hail Mary pass thrown into the end zone at the end of a football game. Packard's time in the Pentagon was running out as he would return to HP in Silicon Valley at the end of the year. In the end, Packard achieved only limited success with the initiative—like a football team that settles for a field goal instead of a touchdown. This section delves into an intense series of battles with Congress over a relatively small amount of funding. When the dust settled, only two of the 12 prototyping proposals received funding. The two approved competitions resulted in the rise of the F-16, F/A-18, and C-17, illustrating the potential payoffs of such an approach.

The conclusion pulls forward Packard's experiences to address contemporary acquisition challenges. In many senses, in 2018, the DOD finds itself in a situation mirroring many aspects of 1968. The conclusion attempts to answer two questions. Are there any relevant lessons learned from Packard's experience that can be applied to the present context? And, Are there any implications of Packard's legacy on the way ahead?

Part I: The Man

He's given me many a lecture during my life on happiness not being the only end in life. You have to be doing something that gives you a sense of accomplishment . . . if you mean contented, no, he's definitely not contented. He'd be a lot more so taking care of his cattle.

-Mrs. Lucile Packard
(when asked if her husband was happy as DEPSEC)

In December 1968, a 57-year old Silicon Valley executive, David Packard, picked up the phone. He had never put on a uniform, never served day in the military, and never served a day in the government. Nevertheless, the SECDEF nominee, Melvin Laird, a congressman from Wisconsin and a man whom he met only once in his life almost 10 years earlier, wanted him to be his right-hand man. Laird had heard good things about Packard and needed his help. David Packard had a reputation as an exceptional teammate, a visionary, an innovator, a hard-worker, and a leader. Thirty-one years earlier, he co-founded a company named HP in a one-car garage and built it into an international corporation of 13,000 employees. HP's engine of innovation was its four research and development divisions, with unique identities and areas of expertise—much like the four services within the DOD—the R&D divisions were "the Army, Air Force, Navy, and Marines" of HP. Hewlett and Packard found a way to get the four divisions to innovate independently and relentlessly; by 1969, the company's product line was a diverse ecosystem boasting over 2,000 products. In this sense, David Packard was not like a Steve Jobs or Henry Ford; he was not an "idea man." Packard did not foresee the R&D divisions developing products, such as calculators and computers. Instead, Packard was a natural leader and a master of administration and business management. Hewlett and Packard focused on publishing broad corporate intent, giving each of the R&D divisions the authority to design and build prototypes by themselves. Bill Hewlett (and sometimes Packard) served as a MDA of sorts—only one decision point merited their involvement—the decision at which prototypes moved from development into production. SECDEF Laird realized he would have his hands full with ongoing affairs, such as the Vietnam War, Strategic Arms Limitations Talks (SALT) with the Soviet Union, and Congress. He would lean on Packard to focus the Pentagon's planning efforts beyond the war at hand, transplant the innovative spirit of Silicon Valley into the Pentagon, and write policy to provide the DOD with a path forward to modernize the force cost-effectively.[21]

Packard initially did not want the job. Leading innovation in a free-market economy was one thing, but leading innovation within the DOD was another animal entirely. Packard recognized the political and bureaucratic constraints of the position from the start: "You must realize that managing the DOD is not like running a business. It's also a political job. You have to get funds from Congress. You must implement them the way Congress intends."[22] Reflecting on his decision to serve, Packard stated: "Our country has some very serious and very difficult problems to face over the next few years," and "every citizen in this country has to step up and do what he can—he or she can—to help . . . the country has done many things for me. I thought it was about time that I had to do something in return for my country."[23] "It's unusual and fortunate to have someone like Secretary Laird, who has broad political experience. This leaves me to the job I know best: administration."[24]

Laird and Packard faced significant political constraints. It is unlikely that Packard would have accepted the job or been successful in his duty as DEPSEC if he did not have the opportunity to partner with a statesman as skilled and experienced as Mel Laird. The Battle of Salamis in 480BC, a decisive battle that shaped the future of European civilization, provides a timeless example of the political and paradoxical nature of defense acquisition within liberal democracies.[25] Within liberal democracies, the weapons soldiers carry into battle determines the fate of nations, but the people allocate the resources needed to build specific weapons. Within this context, victory in Salamis depended both on battlefield skill and acquisition choices made years earlier.[26] In a democracy where the legislature controls the budget, Themistocles, an Athenian general, waged a political battle for votes within the Athenian assembly to support building a large fleet of triremes. The struggle was fraught with fog, friction, and uncertainty, influenced by economic factors and job opportunities within specific constituencies as much as matters of national security.

The triremes vote in 483 BC foreshadowed the interaction of politics and acquisition in the United States. While Packard would be charged with writing acquisition policy during his time in the Pentagon, he had little political experience. As the CEO of HP, his role in the private sector was much more analogous to a benevolent dictator than a politician. However, in the Pentagon, while Packard oversaw much more money than he did at HP, that money belonged to the taxpayer. A *Wall Street Journal* article published in 1969 pointed out that "the track record of big business tycoons who take top Pentagon jobs is far from glorious," listing the struggles of former Secretaries of Defense, including Charles Wilson (General Motors), Neil McElroy (Proctor and Gamble), and Robert McNamara (Ford).[27] In short, Packard's success in the Pentagon was not a foregone conclusion. His proposals needed to be politically

viable and sustainable, offering opportunities to centers of influence within various constituencies and interest groups while at the same time not stoking fears within the power bases of established defense industry giants.

Packard recalled later that: "(Mel) was very familiar with the Congress and had many friends on the Hill. He knew all about congressional relations, and liked publicity and news conferences more than I."[28] In other words, Packard benefited from Laird's areas of experience and competency as much as Laird benefited from Packard's.

Mr. Inside: Packard's Conflicts of Interest

The lion cannot protect himself from traps, and the fox cannot defend himself from wolves. One must, therefore, be a fox to recognize traps, and a lion to frighten wolves.

- Niccolò Machiavelli, *The Prince*

Mel Laird did not have a close relationship with Packard before 1969. Before speaking over the phone with Packard in December 1968, Laird had met Packard only once. In 1959, Laird served on the Health, Education, and Welfare and Labor Subcommittee of the House Committee on Appropriations, which authorized overhead allowances on federal research contracts with universities. Packard served as president of Stanford University's board of trustees, while Juan Trippe, president of Pan American Airways, headed the board of Yale University, and Neil McElroy, SECDEF during the Eisenhower administration, served as the president of Harvard University's board. Trippe, McElroy, and Packard believed prestigious private universities, such as Stanford, Yale, and Harvard, should be considered "cowbell" universities, or "leaders of the pack," and approached Congress for financial support in 1959.[29] Laird and John Fogarty (D-RI) met with Packard, and soon after, the committee approved Packard's request to authorize a 15 percent allowance for these universities.[30]

Laird viewed Packard as a talented, experienced candidate for his DEPSEC position, someone with the executive and technical skills to oversee the defense budget and take charge of modernizing the force.[31] When Laird reluctantly agreed to serve as Nixon's SECDEF on 7 December 1968, he did so under the strict condition that Laird could assemble his team. Nixon promised not to interfere with any appointments, military, or civilian, as part of a famous "Napkin Deal" signed between Nixon and Laird on a plane en route to Washington, DC.[32] Laird seized the opportunity and chose Packard as his DEPSEC.[33]

In December 1968, Laird called Packard, asking to put together a list of names from the business community who might be suitable candidates for his staff.[34] On a hunting trip in Merced, California at the time, Packard recalled: "I sent him some names of people he could consider, and he called me back and asked me to meet him in Washington . . . after a few hours of discussion, he said he wanted me to join him as his deputy secretary."[35] Like Laird, Packard reluctantly considered the position. Packard did not seek the post of DEPSEC any more than Laird sought to become SECDEF.[36] Packard did not initially give Laird a decision, asking for some time to think it over but eventually acquiesced. Packard recalled: "I returned to Palo Alto and spent a week or so considering this opportunity."[37]

Some feared that hiring Packard to run defense procurement would not be any different than hiring a fox to guard the henhouse. HP itself was a defense contractor; thus, David Packard was "Mr. Inside," confronted by many potential conflicts of interest. In January 1969, Packard owned more than $300 million ($2 billion in FY2017 dollars) in Hewlett-Packard stock. In 1968, HP made $34 million in direct sales to the DOD, $6.685 million to other federal agencies, and an estimated $60 million in sales to government prime contractors, representing 45 percent of HP's domestic sales.[38] In addition to his positions as chairman of the board, president, and chief executive officer for HP, Packard also served on the board of directors for a few other large defense contractors General Dynamics and US Steel.[39] The Senate was particularly leery of Packard's complex entanglements with the defense industry. Federal law only required that a public official disclose his interest in a firm or corporation with a government contract and promise not to participate in contract negotiations, but "the Senate Committee on Armed Services went further, requiring a nominee to sever associations with any corporation having a contract of $10,000 or more with DOD."[40]

Laird and Packard did as much as possible to alleviate the media and public's concerns about the conflict of interest problems, holding a joint press conference in Washington, DC on 30 December 1968. Packard voluntarily agreed to resign as chairman and CEO of HP and step down from the board of director positions with companies and organizations doing business with the DOD. He also agreed to liquidate his shares of stock in defense contractors, except for his $200 million in HP holdings. Selling 30 percent of HP's outstanding shares would reduce the stock's price and harm other shareholders. Laird persuaded Congress to grant the exception on the issue; as promised, Packard put all HP dividends and appreciation into charities while he was a public employee.[41] Packard issued a written statement to the press, providing financial details. During the press conference, Packard, always candid and outspoken, admitted

he did not know the salary for the position he just accepted. Laird estimated $30,000. "I am taking a helluva cut . . ." Packard joked, "let me just make one thing clear, and, again, I don't want any misunderstandings about this. I will have some other income available. I don't intend to live on $30,000."[42] Regarding the trust, Packard later recalled, "by the end of 1971, after three years in Washington, I handed in my resignation and returned to California. During that time, HP stock had increased in value, and I estimated that I'd given away about $20 million ($120 million in 2017 dollars)."[43]

The Education of David Packard: 1912-1938

Homemade Radios, Stanford, and Vacuum Tubes

Packard brought to the Pentagon credible experience in business management and defense technology as a man who built a multi-billion dollar business out of his garage.[44] Packard's technical expertise and hands-on experience gave him an in-depth understanding of the design, manufacture, and evolution of communications, radar, and other associated technologies between the 1920s and 1960s. Fascinated with radios since his youth, Packard built his first radio while in elementary school, connecting a vacuum tube with a variable condenser, coil, a grid lead, an A battery, a B battery, and a set of headphones. At age 12, he put together a more sophisticated vacuum tube receiver and listened to broadcasts on 1040 WHO radio, Des Moines, Iowa, 600 miles away from his childhood home in Pueblo, Colorado.[45] By high school, a proficient radio operator, Packard became secretary of the San Isabel Radio Club.[46]

Packard studied electrical engineering at Stanford, catching the eye of the legendary Fred Terman, a renowned and influential professor who eventually headed the Stanford Electrical Engineering Department.[47] Terman mentored Packard, encouraging him to accept a job offer from General Electric (GE) in New York in 1934 and then opened up many doors for Packard to support the development of cutting-edge technologies upon his return to the Bay Area in 1938. In particular, Terman got Packard involved in the development of the klystron tube, a game-changing vacuum tube that could operate at higher frequencies, the technology behind advances in early radar, television transmission, and particle accelerators.[48] Packard also met Bill Hewlett at Stanford in the fall of 1930.

Packard's initial work experience at GE in the 1930s left a considerable impression on him, providing insight into the challenges of manufacturing electronic components and the importance of networking, which shaped the way he later ran his own company. Job opportunities were scarce amid the

Great Depression. In January 1935, Packard departed for a GE facility in Schenectady, New York, a small town about 170 miles North of New York City, while Bill Hewlett continued his graduate studies at Stanford and MIT. Thus, the duo put their future business venture plans on hiatus and parted paths. At GE, Packard worked in various test departments: testing refrigerators for leaks and other problems, radio transmitters for the US Army, and finally, vacuum tube engineering. Manufacturing vacuum tube components in the mid-1930s was a difficult task, giving Packard insight into the importance of excellent communication between the engineering department and the factory. After struggling to improve the manufacturing processes for failed batches of mercury-vapor rectifier tubes, Packard recalled: "[I learned that] personal communication was often necessary to backup written instructions. That was the genesis of what became "management by walking around."[49] Through one of his roommates and life-long friends, John Fluke, Packard also later met Hyman Rickover, a naval officer, in Washington. This relationship paid dividends when Packard later worked with Admiral Rickover, an outspoken and abrasive personality, in the Pentagon.

Packard returned to Palo Alto in 1938 wiser and with a network of connections on the East Coast. He quickly rekindled his relationship with Professor Terman who offered him his next big opportunity: the chance to work at Litton Engineering Laboratories testing a new generation of vacuum tubes— the klystron tube. In the summer of 1938, GE gave their blessing for Packard to resume his studies at Stanford. Professor Terman arranged for a Stanford fellowship and connected him with Russ Varian, the young inventor of the klystron tube. Varian's idea was to modify a vacuum tube to operate at higher frequencies, a huge breakthrough that would facilitate the development of radars. The Varian research project opened several doors for Packard; he supported the project at Charlie Litton's company, Litton Engineering Laboratories, in Redwood City, California. Charlie Litton's hands-on style appealed to Packard, and as Litton's company got into vacuum tube manufacturing, Packard jumped at the opportunity to apply lessons from his experience at GE to test Russ Varian's new vacuum tube models. Packard's experience with Varian would also influence his decision to buy Varian Associates' waveguide technologies in the early 1950s. Packard's experience at Litton was short-lived; however, and his last chance to gain experience working for someone else before jumping out on his venture of co-founding HP with Bill Hewlett in 1938 (at the age of 27) in a one-car garage, now marked as the birthplace of Silicon Valley.[50]

Building a Culture of Innovation: Hewlett-Packard (HP), 1938-1969

From Garage to International Corporation

World War II impacted HP before the United States even got involved. In the spring of 1941, the US Army called Bill Hewlett to active duty, where he spent the duration of the war as an officer in the Army Signal Corps. Although HP never relied entirely on defense contracts, HP proliferated contracts during the war, starting with 10 employees in 1940 to a total of 200 by the end of the war. HP's defense contracts during World War II included producing a servo system to control antenna dishes for the US Navy, designing microwave signal generators, and producing a device developed by the Naval Research Laboratory that could jam an enemy's shipboard radar (code-named the Leopard project). HP left the war determined to get into the forefront of the microwave instrumentation business, "a move that paid handsome dividends for the company after the war."[51] Other products HP developed included wave analyzers, distortion analyzers, vacuum tube voltmeters, and instruments designed to measure and test electronic equipment. Hewlett did not return to Palo Alto until the end of 1945, but his time as a Signal Corps officer gave HP insight into many scientific and engineering projects. After World War II, HP continued to push microwave related technologies, acquiring Varian Associates in the 1950s and integrating their waveguide business into HP microwave operations.

Packard's business experiences in West Germany and Japan in the 1950s and 1960s shaped his understanding of the manufacturing and production capability of allied nations. This experience would come in handy as Nixon cut the defense budget, reduced global defense commitments, and shifted the defense burden to US allies (in both materiel and personnel). From Packard's perspective, the 1950s marked a period of rapid growth for HP, in part because of the Korean War but also because of the Treaty of Rome in 1957. This treaty helped pave the way for HP in developing foreign markets for HP products. The Treaty of Rome established the European Economic Community, a predecessor to the European Union.[52] After the signing of the treaty, HP set up its European headquarters in Geneva, Switzerland, and a small instrumentation-assembly plant in the town of Böblingen, near Stuttgart, West Germany.[53]

HP also expanded into Asia, forming a joint venture with a company in Japan in 1963.[54] While establishing duplicate manufacturing and assembly capabilities could be perceived as barriers to efficiency, HP saw the benefits of

multiple assembly lines in facilitating internal competition and as a mechanism to drive efficiencies and improve product quality in the long run. HP's first few years in Japan were not promising, as Yokogawa-Hewlett-Packard (YHP) performance was mediocre; Packard later recalled: "It was neither at the top nor the bottom in product-failure rates or warranty costs."[55] However, as HP allowed Japanese management to take over, product quality skyrocketed. HP's best failure rates on printed circuit boards were about four in 1,000 (or a little less than 0.5 percent). However, YHP's failure rate on its printed circuit boards was only 10 per million, or "four hundred times better than anything we had been able to do."[56] From a business perspective, these international experiences shaped Packard's understanding of the economic potential and manufacturing quality that could be expected in foreign countries. From a defense perspective, these experiences enabled Packard to foresee how Nixon's policies could be translated into action.

During his first year as DEPSEC, two of Packard's three international trips took him to familiar territory; first, to Wiesbaden, West Germany in April, and then to Japan and Korea in June 1969. The German and Japanese economies boomed after World War II, and his international experiences while at HP likely provided him a mental framework to assess the efficacy of cooperative armament efforts with West Germany. For example, the German-American Main Battle Tank (MBT-70) project, and the feasibility of producing M-16 rifles in Korea.

Management by Objective: The HP Way

How Packard Learned to Lead Large Organizations

> *The potential of troops skillfully commanded in battle may be compared to that of round boulders which roll down from mountain heights.*
>
> -Sun Tzu, *The Art of War*

The 1960s marked a period of tremendous growth for HP. By 1969, HP was "an international organization with 17 manufacturing plants, more than 13,000 employees . . . the company and its subsidiaries produce more than 2,000 different test instruments and accessory devices."[57] By comparison, HP sold 380 distinct products in 1959.[58] In the 1950s and 1960s, HP executives honed and scaled their leadership approach to meet the demands of a large organization, as neither Hewlett nor Packard could be involved in every decision. The growth from 380 to over 2000 products in a decade indicated HP's

decentralized approach to product development and that innovation could be scaled, offering potential benefits to the DOD's procurement process. "In our company, we operated with some fairly independent divisions, not unlike the Army, Navy, and Air Force. They were competitive; sometimes, it was difficult to get them to put the welfare of the parent company first."[59] Similar to how the DOD was comprised of three departments (the Army, Navy, and Air Force), HP divided its product development activities into four divisions. In the 1960s, HP was structured into four divisions: first, frequency counters and related instruments; second, microwave equipment; third, audio and video products; and finally, oscilloscopes. Each division was held responsible for its own family of products, headed by a manager reporting to the vice president of R&D. The divisions independently and autonomously developed a diverse set of products, from quartz thermometers that could measure temperature with a resolution of 0.0001 degrees Celsius to laser interferometers that could take measurements accurate to a millionth of an inch, to light-emitting diodes.[60] Trends across the divisions of HP kept Packard abreast of the latest technologies and perhaps more significantly helped him gain an appreciation for the pace at which technology was advancing. The miniaturization and automation of an increasing number of processes had many potential applications—both in the commercial market and on the battlefield.

To capitalize on the rapidly changing nature of these advances, Hewlett and Packard devised a management strategy designed to "unleash" rather than "control" the HP divisions. Technology was evolving so quickly that Packard failed to predict the significance and potential implications of several trends himself. This likely influenced his desire to embrace a decentralized approach to management at HP. Packard failed to foresee the significance of the both the handheld calculator and personal computer. In the early 1960s, Packard recalled: "I didn't think HP should get into the calculator business."[61] Concerning computers, Packard admitted: "It would be nice to claim that we foresaw the profound effect of computers on our business and that we prepared ourselves to take early advantage of the computer age. Unfortunately, the record does not justify such pride."[62] While these oversights may have left similar companies in a vulnerable position, HP's decentralized approach to product development enabled the company to not only maintain pace with the dynamic evolution of computing technologies but also to become a market leader. By September 1964, HP developed its first minicomputer—the Model 2116—an automatic controller for measurement systems. Later HP developed calculators, first the Model 9100 desktop calculator and then the HP 35, the world's first pocket-sized calculator.[63] The miniaturization of the Model 9100 into the HP 35 marked a massive shift in electronics, as printed

circuit boards gave way to large-scale integrated circuits with more memory and more powerful integrated circuit processors.[64] The rapid pace of advancements within electronics and computing likely helped Packard, as DEPSEC, understand the need to break the development of the airframe, engine, and avionics into separate blocks. If concurrently developed, the avionics would become obsolete by the time the airframe and engines reached maturity.

Moreover, Packard also came to the Pentagon understanding the importance of facilitating a maverick spirit within his subordinates. Not only did Packard decentralize authority and decision-making within HP, but also he allowed dissent and sometimes rewarded it. Two noteworthy examples of Packard's tolerance for mavericks within HP included Cupertino's Omega project and Chuck House's Oscilloscope Display Monitor project. Omega was HP's late 1960s quest to develop the world's first 32-bit computer. The project was expensive and risky and threatened to put HP into direct competition with IBM's mainframe business. Omega required significant funds, and Bill Hewlett advised against the program: "Don't try to take a fortified hill, especially if the Army on top is bigger than your own." Therefore, Omega was canceled. However, several HP employees rebelled, and kept the project alive and hidden in a back room. They kept working on it. Later, management reexamined the project and concluded that the computer architecture had promise and could be scaled down into a sophisticated, low-cost, 16-bit machine for processing small to medium-sized online business transactions. Introduced in 1972, the HP 3000 became a hugely successful product line.[65]

Similarly, HP management tried to abandon the efforts of an engineer working to develop oscilloscope display technology. Instead, the engineer, Chuck House, took his vacation time to interact with potential customers and continued with the project. Management reviewed the project, rushed the monitor into production, and sold more than 17,000 units. This included a unit purchased by NASA that showed man's first step on the moon in July 1969.[66] Years later, Packard presented Chuck with a Medal of Defiance, celebrating his "extraordinary contempt and defiance beyond the normal call of engineering duty."[67]

Packard's tolerance for countering opinion extended beyond his generation. One writer noted: "Although he is 57, Packard gets along well with young people." According to one anecdote, Packard once hired a radical college newspaper editor and told him to look around and find what was wrong about HP. The young man reported that a front receptionist was discouraging African-American job applicants by ignoring them; Packard promptly had her transferred.[68]

In sum, by the time Packard arrived at the Pentagon, Hewlett and Packard had created a self-sustaining, bottom-up process that facilitated innovation within HP and enabled the company to drive technology instead of reacting to disruptive technologies. In his memoir, Packard opined on the degree of autonomy and independence exercised by HP's divisions: "It has been my experience that most business executives are quick to praise the concept of decentralization. However, when it comes to their organization, many are reluctant to adopt it. Perhaps the idea of turning over a portion of their authority to others is too unsettling."[69] Packard's leadership philosophy, "Management by Objective (MBO)," illustrated the role of the individual leader in facilitating decentralization in management across a large organization. Packard explained:

> MBO is the antithesis of management of control. The latter refers to a tightly controlled system of management . . . where people are assigned—and expected to do—specific jobs, precisely as they are told and without the need to know much about the overall objectives of the organization. MBO, on the other hand, refers to a system in which overall objectives are clearly stated and agreed upon, and which gives people the flexibility to work toward those goals in ways they determine best for their own areas of responsibility.[70]

At the individual level, Packard noted:

> I have noticed when we promote people from a routine job to a supervisory position, there is a tremendous likelihood that these people will get carried away by authority. They figure that all they have to do now is tell everyone else what to do and quite often this attitude causes trouble. We must realize that supervision is not a job of giving orders; it is a job of providing the opportunity for people to use their capabilities efficiently and effectively.[71]

The opportunity for Packard to test the boundaries of MBO would come at the Pentagon; "unleashing" the services and defense industry would be easier said than done and would take Packard nearly three years to achieve—with mixed results.

Throughout his time at the Pentagon, Packard's heart stayed in California. In California, he lived on a secluded 50 acres of apricot trees and owned two ranches, which together covered 42,600 acres, enough land to cover the Pentagon and all its associated land nearly 200 times over.[72] In Washington, Packard bought a $300,000 sprawling California-style home near American University, but Mrs. Lucile Packard never acclimated well to life inside the Beltway.[73] Packard often joked: "(Mrs. Packard) gets up in the morning and reads the Washington Post and that spoils her breakfast. She sees me on early morning TV and that spoils her lunch. I come home and tell her my problems, and that spoils her dinner. So she lost 20 pounds in the first month we were here."[74]

As Packard departed Silicon Valley for the Pentagon in January 1969, the 13,000 employees of the company he led likely seemed small compared to the

4,850,000 uniformed and civilian personnel that served the United States in 1968; for every one HP employee stood 373 defense personnel.[75] Also, the scale of the defense budget was daunting. For every $1 in HP sales in 1968, the DOD spent $267, nearly $75 billion, $30 billion of it on RDT&E and procurement.[76] Thus, while Packard won accolades with his leadership at HP, the six-foot four-inch, 250-pound former college football player faced a daunting challenge as he embarked on a new chapter of his life.[77] However, while few could argue his qualifications, Packard had a long way to go before he could prove he was the right man for the job.

Part II: The Situation

The Late-1960s: Uncertain Times

> *This great nation of ours was indeed in a great state of shock . . . when I came to Washington. There was rioting and burning in the streets. Inflation was rampant and had already eaten away at the economic progress of the previous decades. We had 540,000 men and women in Vietnam, and no plan to bring them home . . . now that I have the opportunity to reflect . . . it has become evident to me there is nothing so unusual about this period if it is viewed in the long course of history.*
>
> -David Packard
> March 1972

Mel Laird and David Packard stepped into the Pentagon during an era of volatility, uncertainty, complexity, and ambiguity. The 1968 presidential campaign came during a year of international tension and civil unrest. At home, the Civil Rights Movement reached an uncertain climax as riots erupted after the 4 April assassination of Dr. Martin Luther King Jr. in Memphis, Tennessee. Two months later, in Los Angeles, Democratic presidential candidate Robert Kennedy was assassinated on 5 June. In the previous year, the 1967 Arab-Israeli War highlighted the potential for conflict in the oil-rich Middle East. Abroad, Soviet tanks rolled into Czechoslovakia in August 1968, putting Western Europe on edge, while North Korea's capture of the *USS Pueblo* in January 1968 raised tension in Northeast Asia. Meanwhile, there was not an end in sight for the Vietnam War.[78]

Although Nixon's predecessor, Lyndon Johnson, assured his inner circle, "I am not going to be the first president to lose a war," his administration struggled to craft a clear plan to win it.[79] In August 1967 and early in 1968, Johnson's

desire to end the war in Vietnam as well as his bid for a second term were dealt a pair of significant blows: highly publicized hearings organized by Senator John C. Stennis (D-MS), which highlighted the tension between the White House and the Pentagon over the Vietnam War, and the Tet Offensive, which illustrated the failures of US military strategy in Vietnam. In the aftermath of these events, Johnson announced he would not run for reelection on 31 March 1968.[80] Someone else would have to figure a way out of the war.

Upon entering office in January 1969, Nixon embarked on a complex and ambitious strategy to disentangle the nation from the unpopular war while simultaneously cutting the defense budget and rebuilding the US military to counter the growing Soviet threat. Without a clear exit strategy for the war in Southeast Asia, the tense events in the Middle East, Northeast Asia, and Eastern Europe created the possibility of potential entanglements in multiple corners of the world. This forced Nixon to take a hard look at US foreign policy. Solidifying in 1969, the Nixon Doctrine sought to shift the burden of some of the costs of defending America's allies to the allies themselves. The approach involved scaling down from a two and one-half war to a one and one-half war posture; America could not afford to be in the middle of every fight any longer.[81]

Nixon promised to end Vietnam with "Peace with Honor" on the campaign trail, and leaned heavily on his national security advisor, Henry Kissinger, and his SECDEF, Melvin Laird, to help achieve that vision once in office. Melvin Laird, a 16-year congressman, faced three immediate challenges as he took office as SECDEF.[82] First, he needed to overcome the palpable tension between top civilian and military leadership, highlighted by the August 1967 Stennis hearings. Second, he needed to address the shortfalls in Vietnam; failures in military strategy became painfully clear in January 1968 as the North Vietnamese launched the Tet Offensive across most of South Vietnam.[83] Third, Laird needed to modernize the force to counter the Soviet Union's ongoing military build-up. The Soviets unveiled five new aircraft and four significant revisions to existing aircraft at the Domodedovo Air Show in July 1967, while defense procurement initiatives launched under McNamara, such as the C-5 and F-111, remained mired in cost and schedule problems.[84] Less than a decade earlier, Nixon was vice president when President Eisenhower decried the establishment of a permanent US "military-industrial-complex." Now, as president, Nixon needed to demonstrate the complex was capable of producing results.

Laird found himself in an unexpected position. As a congressman, he had been an outspoken member of the House Appropriations Committee and a frequent critic of defense management during the McNamara era. Now, as SECDEF, Laird found himself on the hot seat he often criticized.[85]

From the outset, Mel Laird believed that David Packard was a man capable of co-captaining the journey and explicitly taking charge of failing force modernization efforts.

Challenge Accepted: Overcoming Civil-Military Tension

As Laird and Packard settled into the Pentagon, the new defense leadership faced challenges listed above: overcoming civil-military tension, addressing the shortfalls of US military strategy, finding an exit strategy for Vietnam, and modernizing the force. Concerning civil-military tension, Packard was well aware of the disagreement between the White House and the Pentagon over the early conduct of the Vietnam War, writing in his memoir: "I knew that Robert McNamara—secretary of defense during the Kennedy and Johnson years—had alienated the professional military people in the department. There were many stories of McNamara's clashes with the brass."[86] The hearings held by Senator Stennis in August 1967 illustrated the extent of the division, as relations between top civilian and military officials reached an impasse.[87] The hearings lasted nine days, pitting 10 high-ranking military officials against McNamara. Testimony showed that the Pentagon wanted to expand the war to expedite a peace agreement, but McNamara did not believe Vietnam was winnable.[88] Stennis sought to use the testimony of the generals as a means to provide the military with more latitude to prosecute the war.

The Pentagon's disdain for McNamara trumped traditional interservice rivalries. The top leaders from the services: Air Force Gen John P. McConnell, Army Gen Earle Wheeler, and Adm U. S. Grant Sharp banded together and launched a high-pressure verbal offensive against the failing strategies of their commander-in-chief and SECDEF. The military demanded an expansion of the war and a reduction in political controls on target lists. McNamara responded in his 25 August testimony, rebutting the Pentagon's claims one-by-one and warning that an expanded war: "Would not only be futile but would involve risks to our personnel and to our nation that I am unable to recommend."[89] The Senate Investigating Subcommittee of the Senate Armed Services Committee sided with the military and criticized McNamara's policy of gradualism, urging the president to aggressively unleash the US military to expedite a peace agreement with the North Vietnamese. Johnson's restraint of military power was intended to prevent Soviet or Chinese intervention; however, from the Pentagon's perspective, the White House's limitations hampered the ability of the US military to apply decisive military power to achieve desired objectives and effectively pressure the North Vietnamese into a peace agreement.

President Johnson attempted to reconcile the tension between McNamara and the Joint Chiefs of Staff (JCS) through a series of strategic compromises. He approved bombing targets around Hanoi and Haiphong but rejected mining Haiphong harbor. He provided 55,000 additional troops to General William Westmoreland but not the 200,000 the Pentagon requested.[90] In essence, the Stennis hearings aimed to provide the Pentagon opportunity to more effectively wage war but only partially succeeded; they failed to address the root causes of disagreement between the White House and Pentagon.

The unresolved tension confronted the LP team with a problem they would try to solve together. According to Packard: "There are strong diverse forces in and around the DOD. It is hard to work to keep them headed in a common direction in times of peace. When Secretary Laird and I took on this job in 1969, that was our most important goal."[91] Laird advocated "participatory management," where he got information by talking to people rather than reading and refused to micromanage. In his first six months in office, Laird attempted for forge a closer working relationship between the JCS and OSD: "I have been consulting with the Joint Chiefs of Staff and the Chairman of the Joint Chiefs of Staff on a closer basis than has been the practice, and I think this is important." Early in his tenure, Laird reported that he attended two meetings of the Joint Chiefs each week and had taken each of the chiefs, individually, to at least one National Security Council meeting."[92] Packard also made a concerted effort to improve relations between OSD and the services. To tear down the divides and mistrust, Packard invited the JCS on a deer hunt in 1969. Packard tried to convince the JCS: "I wanted to work with them and that I needed their help."[93]

Challenge Accepted: The Failing Military Strategy in Vietnam

> *...the military does not deserve criticism for the policy—it was dictated and completed directed from the very beginning by the civilians . . . the officers and other servicemen and women . . . simply did what they were asked to do. They were asked to do an almost impossible job, and they did it well.*
>
> -David Packard

A second significant dilemma that the Nixon administration confronted upon arrival was the failing US military strategy in Vietnam. [94] On 30 January 1968, the North Vietnamese and Viet Cong launched the first phase of their Tet Offensive. Ho Chi Minh and leaders in Hanoi used the Tet holiday

to provide cover for a significant movement of South Vietnamese National Liberation Front (NLF) forces who supported the Communist forces. NLF forces simultaneously attacked several populated areas and US military outposts. The NLF even breached the outer walls of the US Embassy in Saigon, showing that the enemy was much stronger than the Johnson Administration had claimed.[95] The Tet Offensive revealed the utter failure of the Rolling Thunder strategic bombing campaign to blunt the ability of the North Vietnamese to move war-fighting materiel into South Vietnam.[96] On 31 March 1968, the same day Johnson abandoned his hopes for reelection, he also abandoned the bombing campaign, announcing he would cease bombing in the North except in direct tactical support of United States and South Vietnamese troops positioned along the 17th parallel.[97] Johnson recalled: "my biggest worry was not Vietnam itself; it was the divisiveness and pessimism at home."[98]

The Nixon administration sought to reverse the war's course. In a television address on 3 November 1969, Nixon laid out a plan to end the war through diplomatic negotiation and Vietnamization, the gradual transition of military responsibility to the South Vietnamese, calling on the support of the "great silent majority" of Americans.[99] As the Nixon administration sought to gain such political support, the DOD sought to build a clear and effective plan moving forward in Vietnam.

Although Laird rarely involved Packard directly in the prosecution of the war, Packard faced the challenge of aggressively reforming defense procurement processes during a challenging and complex chapter in American history. Achieving reform required Packard to unify stakeholders within the military-industrial-complex, shifting the focus of politicians and the defense industry away from Vietnam and back toward the Soviet threat. The Nixon Doctrine and Vietnamization entailed reducing worldwide commitments from a two-and-a-half front to a one-and-a-half front posture, a strategy relying heavily on providing materiel, arms, and equipment to US allies. Foreign military sales would boom under Nixon, and Packard was at the heart of these efforts.

Packard's rhetoric already deflected the narrative away from Vietnam early in his tenure. He explained to reporters that the balance of power between the United States and Russia as the "nation's most important strategic problem" and "the overriding consideration is to avoid a nuclear confrontation. If we get in a nuclear war, nothing else will matter." However, this meant that the US would need to prioritize funding for weapons research; "when solutions are found," Packard explained: "we want to be sure we are the ones that find them rather than the Russians."[100]

Challenge Accepted: The Need for Acquisition Reform

The Soviet Air Show at Domodedovo Airport on 9 July 1967 was a *Sputnik*-like shock for Western militaries. The Soviet Union unveiled five new aircraft and four significant upgrades to aircraft already in their inventory.[101] The US air attaché departed as soon as possible from Moscow, arriving at Dulles International Airport late in the evening on 9 July with rolls of undeveloped film in hand. After developing the film and analyzing the photos, the Defense Intelligence Agency sent a high priority message to NATO, listing the new and modified aircraft, notably a sizable twin-engine fighter, the Mikoyan-Gurevich (MiG)-25 Foxbat.[102] The Foxbat had a range of 1,610 miles, a service ceiling of 80,000ft, and could reach Mach 2.8.[103] Also, the Soviets unveiled the MiG-23 Flogger, a single-seat, air combat fighter with a range of 1,200 miles and a service ceiling of 61,000ft. It was armed with a twin-barrel 23mm GSh-23 cannon and four air-to-air missiles and powered by a single Tumansky R-29 afterburning turbojet with a Mach 2.2 capability.[104] Meanwhile, the MiG-21 Fishbed series of fighters entered their third stage of development.[105] The implication to the Pentagon was clear: it needed to modernize.

Meanwhile, the United States floundered in several well-publicized procurement fiascos, notably the General Dynamics F-111 fighter-bomber and the Lockheed C-5A cargo transport programs.[106] After three of the six aircraft were lost between March and April 1968 during their operational debut in Vietnam, the DOD pulled F-111s from Vietnam altogether.[107] A myriad of developmental issues, including structural problems with the sweep-through wing-box, advanced avionics, and engine-inlet compatibility issues plagued the program. Concurrency in the F-111 program proved costly and time-consuming. The Air Force accepted production F-111As while testing was ongoing; five in 1967; 36 in 1968; and 86 in 1969.[108] On 22 December 1969, the Air Force grounded the fleet for over seven months when they lost their fifteenth F-111A to structural issues.[109] Three hundred and forty F-111's were recalled for structural inspection and proof testing between April 1970 and December 1971, a $31.2 million effort known as the Recovery Program.[110] Post-delivery modifications added about $800,000 to the cost of each unit.[111]

A second attempt to deploy the F-111 to Vietnam in September 1972 was equally problematic. None of the six aircraft reached their primary target on their first assigned strike mission. Three of the six aircraft ground-aborted the mission with equipment failure. The fourth aircraft aborted in the air after Electronic Countermeasure (ECM) equipment failed. The fifth aircraft never returned from the mission. The sixth aircraft failed to get to its primary target and bombed an alternate target.[112] Secretary of the Air Force Robert Seamans

recalled: "In order to provide all-weather capability, the F-111Ds were provided a television-like monitor, which blended radar signals with prestored mapping information . . . the Air Force had [accepted] 96 F-111Ds ready to fly except for this missing equipment."[113] For the Air Force, the unit cost of each F-111A reached $11.8 million (more than double its original per-unit estimate of $4.5 million). [114] In the end, the cost of the F-111 program reached almost $5.5 billion for 541 F-111s (excluding 23 test aircraft), exceeding original estimates by about $3.2 billion.[115] Secretary McNamara originally championed the joint program, centered on commonality, because a conventional aircraft would intuitively cost less.[116]

Six months before Laird and Packard arrived at the Pentagon, the C-5A program completed its first flight in June 1968. Similar to the F-111 program, the concurrent approach to acquisition on the C-5A program meant that the test and evaluation of the aircraft, from October 1965 through November 1973, would deliberately overlap with production, scheduled August 1966 through January 1973. At the height of production, two C-5As were delivered per month.[117] The C-5A program suffered from structural issues in the inner, mid, and outer wing boxes limiting the fleet to 80 percent of design air-load limits.[118] Problems ultimately necessitated a complete redesign of the wings and an extensive wing modification program, replacing the wing boxes tip-to-tip between 1982 and 1987.[119] Structural issues were identified very early in the program. By mid-1966, Lockheed reported that changes to the aerodynamic details of the wing, fuselage, and empennage required the addition of 14,000 pounds to the weight of the empty airplane. However, because of a contract that included an operational weight empty guarantee, the Air Force refused Lockheed's requests to exceed the weight.[120] Packard recalled: "the C-5A was a large transport plan whose specifications could have been relaxed in a number of places without seriously reducing its capability."[121] Because of these issues, cost overruns plagued the C-5A program from the start: original estimates (between $1.71 and $1.86 billion) rose to an actual cost of $3.5 billion.[122] On 15 November 1969, the USAF reduced the second production run aircraft from 57 to 23, reducing the total number of planes being purchases from 115 to 81.[123]

Granted, high inflation through the late-1960s and early-1970s also adversely affected the two programs. In August 1969, *Fortune* magazine estimated that inflation alone accounted for $627 million of the C-5A's reported $1.3 billion overrun.[124] Furthermore, the ongoing war in Vietnam stressed supply chains and exacerbated the backlog of aircraft orders across the industry.[125] The point of contention with the F-111 and C-5A programs was not their long-term operational track record but rather their method of

procurement. Concurrency created a bind for senior leaders, a situation whereby the DOD was accepting production aircraft that it knew needed to be fixed and the root cause of many problems were untested and unknown.

Moreover, the challenging technical nature and complexity of the programs could not be understated. Both aircraft were ambitious projects, demanding a level of ingenuity and perseverance from America's greatest minds and most exceptional engineers. The F-111 was an extremely complicated design, bringing four new technologies to the table: variable-sweep wings, afterburning turbofan engines, a capsule ejection system, and an all-weather terrain following radar system.[126] Requirements dictated that the aircraft boast unparalleled range and endurance, flying seven hours and 15 minutes without refueling and a ferrying a range of between 3,200 and 4,000 miles depending on the model, the ability to complete transatlantic flights without refueling or external tanks, and an ability to lift a payload of 30,000 pounds.[127] In other words, four F-111As would deliver the bomb loads of 20 F-4s and not require Wild Weasels or ECM escort aircraft.[128] Because of these characteristics, once developmental problems were resolved, the aircraft became an invaluable part of the inventory, the star of Operation El Dorado Canyon, and the workhorse of Operation Desert Storm. [129] However, the status of the F-111 program in 1969, compounded by the ongoing delivery of production aircraft contributed to Packard's belief that defense programs that were too complex, tolerated too much concurrency, and were not a sound approach.

The C-5A was equally ambitious and a significant development in the US military's strategic airlift capability. The promise of carrying tanks, large helicopters, fighter aircraft, other outsized equipment, and the capability to air-launch Intercontinental Ballistic Missiles (ICBMs) anywhere in the world represented combat capability on a scale never seen before.[130] For Laird and Packard, the successful development of the C-5A was a critical part of creating the Nixon Doctrine. This required increased dependency on strategic mobility which was a viable strategy. Even when restricted to 80 percent of its design air-load limits, the air-refueling-capable heavy cargo aircraft accomplished an array of feats unimaginable before its introduction in 1969. In January 1971, it delivered three CH-47 Chinook helicopters to Vietnam. The CH-47s were airborne 10 hours after arrival as the C-5 returned three damaged CH-47s to an Army Depot in Pennsylvania for repair.[131] However, like the F-111 program, the concurrent nature of the program was costly, bringing the Lockheed Corporation to the brink of insolvency in the summer of 1970.

It would quickly become apparent to Packard and other senior acquisition officials that the concurrent approach to acquisition was not working. Concurrency resulted in costly retrofits, unacceptable initial performance on the

battlefield, and the inability to control costs. Most significantly, it inflicted a great deal of uncertainty upon America's senior leaders and limited their options. The USAF was accepting fighter-bomber and mobility aircraft it knew was not ready for the fight. C-5As and F-111s rolled off the production line as problems were still being discovered as well as the final performance of the systems and final costs of the program unknown. Arguably, the C-5 did not demonstrate full operational capability until 1982. The F-111 and its excessively complicated avionics did not prove reliable or useful in combat operations until 1986. Therefore, prospects of modernization were grim when Laird and Packard arrived at the Pentagon in 1969; the DOD would continue to rely on legacy platforms, such as C-141s and F-4s.

The approach to the acquisition of the C-5A and F-111 was known as TPP. During the early to mid-1960s, McNamara centralized authority and planning for defense procurement within the OSD. Under TPP, the DOD contracted with defense companies on a fixed-price basis for both program development and production stages simultaneously. The concept was proposed by Robert H. Charles, assistant secretary of the Air Force for Installations and Logistics, and informally introduced at a management conference at Wright-Patterson Air Force Base on 25 June 1964. [132] On 21 November 1964, Secretary of the Air Force Eugene M. Zuckert proposed using TPP to procure the C-5, and on 25 February 1965, McNamara approved. [133] Assistant Secretary Charles had worked for McDonnell Aircraft Corporation and believed TPP would incentive cost-efficient programs by rewarding contractors for controlling development and production costs.[134] Once a contract was secured, defense contractors did not face competition moving from development into production.[135] A similar contract was signed for the F-111 program several years earlier on 21 December 1962.[136] The services resisted the joint nature of the F-111 program and McNamara eventually abandoned the approach in 1966; however, his successors, namely LP, were left to deal with the contracts signed under TPP.[137]

Both the military services and contractors shared the blame on the C-5, F-111, and other troubled acquisition programs. TPP contracts offered defense contractors little incentive because of the absence of competition for production contracts. The military services also exacerbated the problem by introducing or allowing contract changes into the programs and not enforcing the fixed-price nature of the contracts because they were reluctant to incur further delays by shifting to a new contractor.[138] More significantly, the TPP approach failed to provide industry the opportunity to conduct significant re-designs and re-builds before production started. It did not recognize that the C-5A,

F-111, and other complex weapon systems were "wicked problems" that naturally required an iterative approach to resolve initial design flaws.[139]

Regarding the joint acquisition programs chartered under McNamara, Packard later remarked: "I feel very strongly that decisions must be made as close as possible to the point of execution. It is difficult for anyone to carry out a decision imposed from above. The F-111 is an example. The Navy was never very enthusiastic about it. It wasn't a Navy decision."[140] Because of weight gain and other issues, the US Navy successfully abandoned the carrier variant of the program years earlier when the Senate Armed Services Committee voted on 28 March 1968 to cancel the F-111B contract.[141] With the defense budget expected to decline, the DOD could not afford costly and ineffective approaches to modernizing the force. Experiences with the C-5A and F-11 had taught the DOD that concurrent approaches and joint programs were not viable. As Packard got settled as DEPSEC, he would first need to orient himself within the defense acquisition machine; then, he would look for opportunities to build and employ mechanisms (reforms) to improve it.

Laird Assembles His Team

Meanwhile, throughout December 1968, Laird worked tirelessly to assemble the team he would take to the Pentagon. On 8 January 1969, Laird announced his three service secretaries—Stanley Resor (Army), John Chafee (Navy), and Dr. Robert Seamans (Air Force).[142] On 18 February 1969, Laird and Packard held a joint press conference to announce Thaddeus Beal (Army), Dr. John L. McLucas (Air Force), and John Warner (Navy) would be appointed in undersecretary roles.[143] While the top Navy and Army civilian leaders—Resor, Beal, Chafee, and Warner—came from backgrounds as politicians and lawyers, Dr. Seamans and Dr. McLucas arrived at the Pentagon with highly distinguished technical pedigrees. In other words, technocrats assumed the top civilian leadership posts within the Air Force. Packard recalled: "we had a good close working relationship with the service secretaries. We selected all of them . . . we worked with them to decide what their policies should be, what we wanted to do, and then let them do it."[144]

Laird delivered a strong message to the media that he expected the service secretaries to play a more significant role within OSD than in the previous administrations. "These are outstanding men who have been selected to serve as secretaries of the three services, and I intend to hold them responsible along with the chiefs of the various services to a much greater extent than has been the case in the last two years." Laird continued: "I don't believe the Secretary of Defense can make every decision in this building . . . We should

make the service secretaries share a greater responsibility in the decision-making process."[145] A year into Packard's tenure, *Government Executive* observed that the Air Force was quicker than the Navy and Army in taking advantage of Packard's reforms: "[The] Air Force is making greater progress generally than Army or Navy implementing Defense Deputy Secretary Packard's program of decentralizing project management authority."[146] Packard stated: "All I can do is show the way. If they [the military] don't find ways to do most of the implementation themselves, they simply won't get the full benefits of what they are being offered."[147] Air Force Systems Command commander, Gen James Ferguson agreed: "I can say that both the Chief of Staff and the Secretary of the Air Force have taken the position that matches exactly what Mr. Packard has said, and it's really my job to keep working the problem as best I can."[148] Ferguson provided examples of the F-15, F-111, and the Minuteman program offices moving from the Pentagon to Air Force Systems Command (AFSC) at Wright-Patterson Air Force Base, Ohio.

Before becoming secretary of the Air Force, Dr. Seamans spent most of his career at MIT and NASA. He received his undergraduate degree in engineering at Harvard in 1939, a master's degree in aeronautics from MIT in 1942, and a doctorate in instrumentation from MIT in 1951.[149] He taught at MIT until 1960 while also gaining experience at the Radio Corporation of America within the Airborne Systems Department and Missile Electronics and Controls Division in Burlington, Massachusetts. Seamans then transitioned to NASA, where he managed a myriad of research and development programs, field laboratories, assembling and launching facilities, and a worldwide network of tracking stations. From 1966 to 1969, Seamans was a National Delegate to NATO for the Advisory Group for Aerospace Research and Development. Commenting on the differences between NASA and DOD, Seamans recalled: "the biggest difference was the scale of the activity, measured then in financial terms $25 billion (for the Air Force) versus $6 billion at NASA, or in personnel terms 1.3 million compared with 33,000."[150] Seamans' systems acquisition experience from NASA gave him insight into key steps of the acquisition process, such as project definition, procurement planning, contractor (source) selection, contract administration, development, and operations. In a 1987 interview, Packard recalled: "I had a good rapport with Bob Seamans . . . he was an engineer; in his case, we had a number of important programs—the F-15 was going to start, the B-1, AWACS, and other things—and we worked closely with Bob to get a general agreement on what the overall program was going to be and then expected him to work with his people to get it done."[151]

McLucas was an equally qualified technocrat, with the ability to effectively navigate academia, the private sector, and the bureaucracy of the DOD. Thus,

he got along well with Packard. McLucas served as an officer in the US Navy from 1943 to 1946, completed a doctorate in physics from Pennsylvania State University in 1950, served as vice president, technical director, and then president at an electronics firm (Raymond and Brown Incorporated later HRB-Singer Inc.), and joined the DOD in 1962 as deputy director of Defense Research and Engineering until 1964. McLucas's assignment as assistant secretary for scientific affairs at NATO Headquarters in Paris, France, provided him international experience, and in 1966, he became president of MITRE Corporation, where he remained until his appointment as undersecretary of the Air Force on 17 March 1969.[152] McLucas's appointment as secretary of the Air Force after Seaman's departure in 1973 was significant as it provided continuity in leadership and ensured continued support for Packard's ongoing prototyping initiatives through 1975, although Packard departed from the Pentagon in 1971.

Seamans met with Laird and Packard twice a week. On Mondays, Laird held a large meeting in his conference room while on Wednesdays, Laird, Packard, Seamans, and McLucas met to discuss Air Force specific issues for about an hour. At the Monday meetings, Laird sat at one end of the conference table and Packard at the other end with the service secretaries and the JCS in between. Key staff and service undersecretaries sat around the perimeter of the room. The Wednesday meetings were "informal."[153] Laird and Packard also established a rhythm and quickly solidified their working relationship which did not require them to formalize their roles and responsibilities within the Pentagon: "Mel and I had an understanding. We never wrote it down."[154] Packard added: "Mel and I met quite often. We had lunch together almost always when both of us were there."[155]

Packard attended dinner parties as necessary but avoided the Washington cocktail circuit.[156] Although friendly, he abhorred small talk.[157] Instead, Packard preferred to read. Mrs. Packard said that in California, he kept two thick books at his bedside, which he frequently read until he became drowsy, one on cattle breeding and the other on feed grass. Two of his military aides accompanied him on a visit to one of his California ranches, where they described a man in his element—hoisting 100-pound sacks of feed into the back of a jeep and then driving on mountain trails and through gullies to feed stray cattle. "You could see he loved it; he had bulldozed many of the roads himself," explained one of the military assistants.[158]

Part III: Devising an Approach

Aligning Force Structure & Procurement with Commitments

> *Organizations of people are born and develop when people are bonded together with a common objective—a common goal. Their talents, their energies become fully attuned to their aspirations—and working together they can surmount unbelievable obstacles. This has been the history of the United States.*
>
> -David Packard
> March 1972

A distinct delineation of roles within the LP team emerged within the first two months of the duo taking office. Laird stayed focused on the war at hand, while Packard became the architect for the future. Packard assumed responsibility for long-term force structure planning and reforming the acquisition system.[159] During his first year, Packard worked to develop strategic guidance, understand the operational environment, and define problems with ongoing acquisition programs. Furthermore, he worked to implement an approach to acquisition that could provide future decision makers with affordable options for modernizing the force.[160]

In February 1969, Laird announced that he would travel to Vietnam with General Wheeler from 5 March to 12 March, while David Packard would lead "a budget revision study" to be completed by March and a "long-range, overall strategic study" to be completed by May.[161] Packard's effort became known as NSSM-3—a comprehensive study of national security strategy and its cost—which examined alternative military strategies, the force structure, and funds required to execute them. Packard led a steering group between January and September 1969 with representatives of the NSC, State, Treasury, the JCS, the Central Intelligence Agency (CIA), and the Bureau of the Budget.[162] NSSM-3 played a critical role in how the Nixon Doctrine transitioned from rhetoric to reality as it evolved from the Guam Doctrine in the summer of 1969 to the FY 1971 defense budget.

Through the NSSM-3 process, Packard gained a strategic understanding of the DOD and a look beyond Vietnam within months of becoming DEPSEC. If the department was viewed as a ship, then Laird steered from the command deck, focusing on the immediate situation, while Packard sat below deck in the Pentagon studying navigational charts and maps to plot the course for the days ahead. NSSM-3 centered on the analysis of five alternative military

strategies for employing conventional forces—providing a range of manpower and costs: "Strategy 1," the cheapest, entailed a force of 1.94 million at an annual cost of $72 billion; "Strategy 5," the most costly, entailed a force of 2.86 million at $102 billion.[163] The Nixon administration inherited a force of 3.46 million personnel and a defense budget of $76.9 billion and looked to the withdrawal from Southeast Asia as a means to achieve cost savings and drawdown the size of the force.[164] It was cost-effectively modernizing the force while achieving personnel and budget goals that compounded Packard's dilemma. Given the state of defense procurement efforts inherited from McNamara, Packard calculated that the introduction of new aircraft, such as the F-14, F-15, F-111, and E-2C, and nuclear-powered ships at current spending levels would result in substantial force cuts. The DOD would need to cut the Air Force from 23 to 15 wings; the Navy from 15 to 12 attack carriers and from 12 to 10 air wings; and shrink each Marine Corps wing from 139 to 103 aircraft.[165] It was clear the DOD was headed toward tricky waters. Packard awaited the preferences of each of the services: would they desire a larger quantity of more straightforward, less expensive aircraft, or a smaller quantity of more expensive aircraft?

In other words, how could the services modernize on the cheap while innovating a budget? In 1969, there was not an end to the Vietnam War in sight, and the pending cuts to the defense budget made the daunting task of retooling the US military for conventional warfare against a peer competitor even more challenging. Within the familiar acquisition triumvirate of cost, schedule, and performance, cost became paramount. Packard needed to create processes and programs that fostered, facilitated, and incentivized innovation within a fiscally austere, cost-conscience budget landscape. Packard knew the issue was mind over matter; to him, abundance was a mindset, not a financial condition. For example, his company, HP, had always operated from a mindset of abundance, even as a modest start-up operating out of a one-car garage with limited capital. However, while Packard brought the Pentagon a great deal of experience scaling innovation on limited resources in the private sector, the problem he faced in the Pentagon was much more complicated. He needed to figure out how to scale innovation within the bureaucracy of the US government. Packard expressed confidence in his ability to get the job done: "this does not trouble me too much because I am sure we can get more defense for our dollar . . . we can develop better procedures on which to build our budgets for the future." Regarding the future of tactical airpower, Packard did not provide any promises to the Navy or Air Force on the direction ahead: "I do not expect all parties to come to a happy agreement on these matters, but I predict they will be influenced heavily by budgetary restraints."[166]

While working on NSSM-3, Packard traveled to West Germany and Korea to gain insights into the nature and status of US commitments abroad. Packard realized very early on that: "Our defense budget is determined by our commitments around the world." [167] Thus, the trip served to enhance his ability to frame procurement efforts within the context of current operational capabilities of both US and allied forces as well as how future US forces were projected to meet long-term, post-Vietnam War strategic interests. Of note, the trip to Europe provided Packard with an opportunity to learn details about the troubled development of the Main Battle Tank (MBT-70), a cooperative program between the United States and West Germany. Packard's understanding of the MBT-70 program, as well as the equipment operated by the forward-based US and allied soldiers significantly influenced his understanding and opinion of defense acquisition programs moving forward. Specifically, this fueled his desire to procure simple, reliable, and effective equipment for the battlefield.

Between 7 and 12 April, Packard traveled to Europe to visit Army, Air Force, and Navy units in West Germany, London, and Scotland.[168] On 7 April, Packard arrived in Stuttgart, West Germany, and received briefings from five generals, including Gen Lyman L. Lemnitzer, Supreme Allied Commander, Europe, on the posture, readiness, capabilities, limitations, and major problem areas of US forces in Europe. The next day, he visited a Nike-Hercules battery at Kleingartach, West Germany. Although impressed by the vast responsibility assumed by junior officers, he showed concerns that the equipment was unnecessarily complicated and "believed there should be a concerted effort to simplify it." Packard also visited armor, cavalry, infantry, artillery, and border security units. On 10 April, the party toured a supply depot, Seventeenth Air Force headquarters, three tactical fighter wings, and a tactical reconnaissance wing. Packard and his party concluded the trip by visiting London and then Holy Loch, Scotland, to observe *Polaris* submarine operations.[169] In a press conference, Packard showed interest in the troubled MBT-70, noting the complexities inherent in joint acquisition: "I think it's a desirable thing to have joint programs to the extent this can be done in a practical manner. But whenever you get two or three parties in the design of a piece of equipment, it makes I think a little more difficult to come out with the necessary agreements to make the program efficient in terms of its development and also in terms of the time it takes to get from the initial stages into production."[170]

On 9 September 1969, Packard addressed the Senate Armed Services Committee on the status of the troubled MBT-70 program, initiated in 1963.[171] Designed to fight at night, demonstrate superior ability and mobility on the

battlefield, have a low silhouette and heavy armor, and kill targets at greater range than legacy tanks, the requirements for the design were as ambitious as the F-111 and C-5A programs. Packard recommended that the MBT-70's design be simplified. "Complexities in the design" and "complexities in the management arrangements" had resulted in cost overruns that needed attention. He explained that design trade-offs should be made: "the joint design team tried to include all the desirable features which should be built into a new generation tank . . . what we need is to get the program down to a more realistic basis . . . offered by the work that has been done." Packard provided examples of successful subsystem development efforts—the stabilized gunsight, night vision, and the primary weapon, and recommended continued development on those specific systems before integrating them into a simplified design. Packard then explained the opportunity to cancel less successful subsystems and components in development, particularly those which had multiple developmental efforts ongoing—specifically an engine, a suspension system, and a secondary weapon. For example, of the three engine developments—a water-cooled diesel created by the Germans, an air-cooled diesel being initiated by the United States, and a turbine engine for the future power plant—Packard recommended canceling the air-cooled diesel based on the success of the water-cooled design.[172]

Halting program expenditures while the design team put together their final recommendations, Packard promised to decide on whether or not the MBT-70 program would go forward or be canceled by December 1969. "I asked our design people to make a complete review of this program to identify what features could be eliminated while still retaining adequate capability." [173] Packard directed the review team to focus on five areas: cost, performance, survivability, an analysis of alternatives, and a component technology readiness review. Packard closed his statement by stressing the importance of design trade-offs and streamlined program management in achieving cost goals—"it does appear that with certain modifications, the MBT-70 can be reconfigured to achieve essential cost reductions in production through design simplifications and an improved program management structure."[174]

On 20 January 1970, Packard officially announced the way ahead for the MBT-70 program—a focus on simplified operation and maintenance and improved reliability. Cost goals, rather than requirements, would drive the program.

One thing we impress on (our project managers) is the trade-offs between operational and engineering design. Cutting costs is the ultimate goal. The question they have to answer is "Do we need that extra percent of engineering design to get the job done?" What has happened time and again is that the

military wanted the best possible operational weapons. The scientific and technical people wanted the best design. The two kept banging heads, pushing costs up higher than really necessary.[175]

In making the decision, Packard and Secretary of the Army, Stanley Resor, considered four alternatives. This included the legacy M-60 tank, an upgraded M-60 tank, the original MBT program, and the modified MBT program; the modified MBT program was selected.[176] By April 1971, the program had been restructured as XM-803.[177]

Packard learned several key lessons from his analysis of the MBT-70 program. First, the experience reconfirmed his existing belief from the F-111 and C-5A—that there was a trend within the DOD to procure weapons that were unnecessarily complex which resuleted in reduced operational reliability. "I think this is going to be an area where we are going to continue to keep emphasis. We want to have the equipment good enough, but if it gets so complex, you can't keep it working—and it's expensive to make—you'd be better off with something a little less complex that would be more reliable." [178] Second, Packard reinforced his opposition to concurrency by initiating production too early. The DOD and the contractors "find out there are a good many details that have not been worked out yet, so you get a high volume of change orders, and sometimes delays in the production process, which adds up the cost." [179] To counter concurrency, Packard desired sequential flow development to ensure that the major problems have been worked out before starting production.

Next, Packard visited Korea. Tensions escalated on the Korean Peninsula on 15 April 1969, when two North Korean MiG-21 fighters shot down a US Navy EC-121 reconnaissance aircraft, killing 31 US service members.[180] The EC-121 was shot down over the Sea of Japan as it flew a regular surveillance mission in international airspace 80 miles from the North Korean coast. The Nixon administration responded by dispatching aircraft carriers and other Navy ships to the Sea of Japan as a show of force. In early June, Packard traveled to Korea and Japan to attend the second annual meeting of the defense ministries of the United States and the Republic of Korea.[181]

In a 12 June 1969 news release, Packard stated: "My visit to the Republic of Korea was extremely worthwhile . . . the trip gave me firsthand insight into the situation in Korea. I can best describe it as tense but hopeful."[182] The news release documented the status of continued "aggressive acts" of North Korea; South Korea reported that the North Koreans had violated the Armistice numerous times, including commando-type incursions along the coast using high-speed boats and other means.[183] The United States responded cautiously to South Korean pressures for another military aid increase comparable to the

emergency $100 million program announced after the *Pueblo* seizure.[184] Although Packard was impressed with South Korean plans for a two-million-man militia, he asked for time to finalize a modernization program for the Korean armed forces. Plans included the delivery of patrol boats, helicopters, and other counterguerrilla assistance designed to restore recent congressional cuts in the military aid program. Packard later explained that the Koreans desired updated equipment as they had difficulty maintaining and getting spare parts for their World War II-era equipment.[185]

Although hesitant to make any other official announcements, Korean Defense Minister Im Chung Sik and Packard concluded that providing additional small arms to support South Korea's counter-infiltration program was essential. The DOD agreed to arrange for a follow-on visit by Colt Industries to negotiate for the establishment of a plant in Korea to produce M-16 rifles and ammunition.[186] Republic of Korea (ROK) military leaders expressed concern that the North Koreans had AK-47s, while the South Koreans still used M-14 rifles. Packard estimated that M-16 factories could be implemented in South Korea for roughly $10 million.[187] Packard also confirmed the ROK military was still on track to receive F-4 Phantoms starting in August 1969.[188]

Visiting Korea and West Germany provided Packard the opportunity to understand the challenges of foreign aid, whether via the direct provision of equipment, licensed manufacturing, cooperatively developed equipment, or some combination of all three. The trip also revealed the interconnected nature of commitments abroad; Korea and other partner nations provided troop contingents to Vietnam to offset US expenses, while partner nation readiness and capabilities impacted US strategy. These considerations would become extremely important as Packard finalized NSSM-3, and the Nixon Doctrine slowly took shape.

Nixon Doctrine Solidifies—Reducing Commitments Abroad

On 25 July 1969, President Nixon caused a stir among the press and the public in both Asia and the United States, by announcing a potential reduction of US commitments abroad during a tour of Asia.[189] Nixon informally met reporters in Guam after watching the splashdown of the *Apollo* astronauts after their return from the first landing on the moon. Regarding his tour in Asia: "Asians will say in every country that we visit that they do not want to be dictated from outside, Asia for Asians. That is what we want, and that is the role we should play. We should assist but not dictate." Everyone, including Henry Kissinger, was surprised by Nixon's remarks. Nixon would refine and restate his message throughout his presidency, becoming one of the main

foreign policy themes of the Nixon administration. Initially called the Guam Doctrine, it later became known as the Nixon Doctrine.[190]

In the State of the Union Address to Congress on 22 January 1970, Nixon clarified his rationale: "We have based our policies on an evaluation of the world as it is, not as it was 25 years ago at the conclusion of World War II. Then . . . America had to assume the major burden for the defense of freedom in the world." Nixon continued: "in two wars, first in Korea and now in Vietnam, we furnished most of the money, most of the arms, most of the men to help other nations defend their freedom . . . today the great industrial nations in Europe, as well as Japan, have regained their economic strength." While promising to protect existing treaty commitments, Nixon announced he would reduce US involvement and presence abroad and called on other nations to assume the "primary responsibility" for their defense.[191]

Packard's trips to Korea and West Germany put him in a good position to implement the Nixon Doctrine; it soon became clear that in addition to M-16s rifles and MBT-70 battle tanks, the United States would also have to provide various forms of airpower to allied nations. One such program was the "new free world fighter aircraft," the F-5. In a letter to Congressman L. Mendel Rivers (D–SC), Chairman of the House Armed Services Committee, on 24 September 1969, Packard wrote: "over the past few months we have been studying the question of how we can provide an appropriate fighter for our free world allies . . . we believe we will need about 325 for Korea, Taiwan, South Vietnam, and other countries over the next five or six years."[192]

Given the budget cuts that accompanied the Nixon Doctrine, Packard emphasized the importance of the US commitment to NATO as well as the need to maintain sufficient naval forces to protect freedom of navigation.[193] Reflecting on studies conducted during his first year to determine appropriate levels of nuclear forces and conventional forces, Packard concluded: "out of this came a conviction that the strategic forces already planned were about right; they did not require significant change, with the exception of Safeguard until we could make some assessment of where the SALT negotiations with the Soviets might be headed." The DOD concluded it could have significantly smaller conventional forces in the post-Vietnam era; vastly oversimplified, this equated to a one and one-half war posture instead of the old two-and-one-half war stance.[194]

The reduction of US force strength was accompanied by an increase in military aid and assistance to US allies. Between 1966 and 1969, under Johnson and McNamara, the United States expended a total of nearly $7 billion in "support of other nations." Between 1970 and 1973, this amount increased to nearly $10 billion, a 40 percent increase.[195] Between the 1967 and 1973 Israeli-

Arab wars, the Soviets increased their aid to Egypt and Syria, including establishing and operating an air defense system in Egypt. As a war of attrition unfolded from March 1969 to August 1970 between Israel and Egypt along the Suez Canal, the United States felt compelled to increase aid to Israel. US military assistance to Israel increased from $40 million a year for the three years after the Six-Day War (June 1967) to $400 million a year, providing 28 percent of Israel's total defense spending.[196]

On 14 April 1970, Packard explained to a crowd in St. Louis the Nixon Doctrine's impact on defense spending, DOD workforce, and policy abroad. Packard noted the shift in government spending toward domestic programs, reminding the crowd that for the first time in 20 years, defense spending was second place behind domestic human resource programs.[197] Packard highlighted in another interview: "our defense spending is only 34% of the Gross National Product."[198] Comparing FY1971 to FY1969, Packard explained that DOD manpower had been reduced by 600,000 military personnel and 100,000 civilian employees.[199] The defense industry also prepared for cuts. According to the Department of Labor statistics, 3.4 million Americans held jobs generated by DOD spending at the beginning of 1970; Packard estimated 1 million defense contractor employees would need to find work elsewhere.[200] The FY1971 budget was $71.8 billion, down from $78.7 billion in FY1969 ($6.9 billion less); however, Packard noted that the purchasing power of the defense budget was reduced by $12.3 billion because of inflation.[201] Regarding the impact of the Nixon Doctrine abroad, the DEPSEC stated that South Vietnamese troops had already replaced 115,000 US troops. [202]

Consistent with the tenets of the Nixon Doctrine, Packard stated: "The cuts that are being made in our armed forces are made possible, not because threats to peace have lessened, but because we expect other nations to assume more of the responsibility which we have been carrying for their defense." He concluded by saying: "There are some who say we must neglect our needs at home to discharge our international responsibilities. Others say we must return to isolationism to give adequate attention to domestic problems. President Nixon rejects both of these extremes."[203]

Although the DOD appeared to be handling the budget cuts in stride, in August 1970, Packard warned that further cuts in defense spending could jeopardize America's national security and position as a world leader. When asked by media if it would be possible to reduce the defense budget further as the Vietnam War was winding down, Packard admitted it could be cut further but warned:

> We must keep our military capability up, because the world is no less hostile just because we are withdrawing from Vietnam. In fact, the world may be growing more hostile . . . for a number of reasons: the growing danger in the Mideast, the heavy defense spending that continues in the Soviet Union, especially, the continuing build-up of Russia's strategic nuclear forces; and Red China's massive efforts to develop nuclear weapons and missiles . . . [204]

Packard explained that if the United States continued its path of budget cuts and isolation as "Fortress America," it would risk forfeiting its position as a world leader and be unable to support NATO and its other friends and allies. Packard also highlighted how inflation compounded the effects of the budget cuts: "Even if the defense budget does not fall below the 70-billion-dollar level, the purchasing power we will have—the capability we will have to provide manpower, equipment, and military power—will be significantly less because of inflation."[205]

As of 1970, the Nixon administration was only one-third of the way into making its desired cuts in DOD manpower. Between 1969 and 1972, the administration worked to reduce the number of uniformed personnel from 3.4 million to under 2.5 million and the number of DOD civilians from 1.2 million to 1.1 million. However, as Packard states, manpower cuts "get into the basic problem of how many divisions we will have available to support NATO and how many divisions we will have available to support whatever future military requirements there might be in other parts of the world."[206] While reduced manpower requirements enabled the Nixon administration to end the draft and achieve their goal of an all-volunteer force, Packard admitted that the pay and other incentives required to create an all-volunteer force would cost between $1 and $2 billion. Thus, although the all-volunteer force would be smaller, it would not necessarily result in significant budget efficiencies or cost savings.[207]

Defense contractors faced an uncertain future, as Packard's efforts to look beyond Vietnam and modernize the force naturally tilted funds away from labor force intensive activities, such as aircraft production. Packard looked to salvage as much of the highly-skilled labor force as possible—the labor force that would be desperately needed to advance aircraft developmental efforts and prototyping during a protracted period of budget austerity.

Packard's first year as DEPSEC provided him a valuable opportunity to observe and orient himself within the Pentagon. Particularly it helped him discover how he might arm the US military and its allies to meet long-term strategic interests. From the licensed manufacturing of small arms in Korea to the increased provision of foreign aid to Israel, to the modernization of tanks in West Germany, to the need for improved supersonic long-range strike

aircraft, to the development of a large cargo aircraft, the breadth and complexity of the task at hand was not a small undertaking. Also, Packard would have to balance modernization efforts amid defense budget cuts, a move he knew would induce a political backlash at home. Incredibly, a total of 2 million American jobs were laid on the chopping block as Nixon attempted to withdraw from Vietnam. Packard needed to devise a strategy that would keep skilled labor and competition intact, which implied significant cuts to production while keeping as many jobs as possible alive within the defense industry using RDT&E funds. Above all, Packard needed to unravel the riddle of the defense acquisition system. Once he framed the problem at hand, he needed to reduce it to simple terms and communicate in a way that the nation could understand.

The Three Problems of DOD Acquisition Programs

Packard's Axis of Evil—Overly Complex, Too Much Concurrency, Poorly Managed

Military procurement programs were in a bind in the late 1960s. Packard was immediately confronted with some tough decisions: "Almost all of the programs under the TPP policy were in trouble, and we had to figure out a way to deal with them."[208] In his first appearance before a congressional committee on the defense budget, Laird delivered the bad news and announced $16.2 billion in cost overruns on 34 major defense weapon systems.[209] Major defense programs, such as the F-111 fighter-bomber and the C-5A air transport were suffering from developmental problems and cost overruns.[210] The overruns were particularly troublesome in the face of the shrinking DOD budget. In April 1969, Nixon cut DOD's FY1970 budget by more than a billion dollars and then by another $3 billion in August.[211] As of March 1970, the problem compounded, as costs on 27 significant weapons programs soared $20 billion above planning estimates.[212]

Based on his early experience with the MBT-70, the F-111, the C-5A, and other programs, Packard identified three primary problems with DOD acquisition programs: complexity, concurrency, and poor management. First, "We must stop designing weapons that are too complex."[213] Packard understood that military planners typically wanted to push technology to the extreme to get the best performance possible, while the defense industry tended to be too optimistic about what could be achieved. Packard admitted this approach was possible if "you have unlimited time and money," but both were limited.[214] Also, Packard wanted the services to consider the merits of reliability and

maintainability on the battlefield rather than focus on weaponry dependent on high-tech gadgets. Alluding to the MBT-70, Packard explained "a computerized fire control may increase the accuracy of tank gunnery, but so far it does not give evidence of increasing the reliability of gunnery. A tank with its gun out of order is no tank at all." [215] Practical applications of this principle included Packard and the secretary of the Army scaling back the MBT-70—to a simpler, more austere version, and Packard ordering the Air Force to put a less sophisticated fire control system on the F-15.[216]

Second, Packard demonstrated zero tolerance for concurrency by discontinuing the "costly shortcut of running into production before resolving development problems." [217] Packard argued that the DOD could not afford to continue to make commitments on production contracts without first having a firm grasp of unit cost. He slowed several programs, such as the S-3A, B-1, and the *Minuteman* III missile, to allow for more developmental work and testing. Packard explained that by setting firm dates on production, substantial cost overruns occurred when whole factories and production teams had to sit by while specific problems were sent back to the developmental labs.[218] Packard believed that by shifting from a schedule based on a performance-based acquisition system that, "it should be possible to save quite a lot—and we'll probably get the equipment just as fast as otherwise." The new contracts stipulated that money would not be freed to go onto the next phase unless the previous technology milestone was successfully achieved.[219] In one interview, Packard explained

> [concurrency] results from anxiety on the part of the services to get the weapon into operation. All the projects I have looked at since I came here had that same problem . . . we've asked the services to stretch out the time schedules; it's not so important to save a few dollars in development as it is to get the job done right. Then you don't have to go back and redo some development work once production has started, which can be even more costly. Also, once the development work is done properly, then it is possible to assess production costs realistically.[220]

Third, most projects suffered from poor management practices, precisely the inability to hold any one person responsible for critical decisions made along the way and the regular service pattern of rotating men to new assignments every two years or so.[221] Regarding the first issue, "one of the problems inherent in the (present) system is that the project manager doesn't have enough authority." Packard explained that DOD project managers needed signatures from various places within the formal command organization, such as the reliability group, the maintenance group, and the value engineering group. "Soon, the project is nothing but a guy who steers papers in the direction of these fella; and the project ends up being designed by committee."[222]

In addition to providing project managers with more authority and responsibility, Packard felt that the services failed to provide adequate incentives to attract "first-rate" personnel willing to be project managers. Also, he felt that the services did not provide sufficient continuity once in position.[223] In his memoirs, Secretary of the Air Force Robert Seamans Jr. noted: "The Air Force conducted a study in 1969 of how long project managers were serving before reassignment. The more senior members were serving less than three years . . . we definitely needed to extend the time spent by the project team before reassignment."[224] For Packard, "only three years" was insufficient.[225] Seamans added: "Avoidance of mistakes, an early transfer, and a clean record should not be the modus operandi. I don't really believe many officers had that point of view."[226] Packard added: "(OSD) is trying to get military people to concentrate on specialized areas. We also are trying to get military people to specialize early in their careers."[227]

Part IV: The Three Cogs

Reallocating Roles and Responsibilities Among the Services and OSD

To address the three problems in acquisition, Packard employed two mechanisms, one in May 1969 and one in October 1969. A third mechanism conveniently fell into place soon after Packard's completion of NSSM-3 in October 1969. The first mechanism, the DSARC—the predecessor to the modern-day MDA—simultaneously provided the services with more day-to-day authority and responsibility to run their programs while also retaining authority at crucial checkpoints in a program's development.

The DSARC: Hewlett's "Three Hats" Meet the Pentagon

The DSARC, a council of four members, advised Laird and Packard on the status of major acquisition programs as they progressed from design to full-scale production but did not interfere with the day-to-day management of programs within the services.[228] The DSARC enabled OSD to prevent extremely complicated or unproven hardware from proceeding into production before it was ready. DSARC became a key component within Packard's new acquisition framework, as it provided Packard the ability to exercise centralized control and decentralized execution within the realm of defense acquisition. In this sense, Packard envisioned DSARC as the JCS of the acquisition forces, a committee entrusted with the authority to make strategic "go, no-go"

decisions on the fate of weapon systems as they reached various stages in development known as checkpoints.[229] Packard stated, "I envision that there will always be at least two critical checkpoints on major programs at which authorization to proceed will be obtained from the SECDEF. The first checkpoint is the decision to go into full-scale development on a new program. The second is the decision to go into production."[230]

Members included the Director, Defense Research and Engineering (DDR&E), Dr. John Foster; Assistant Secretary for Installations and Logistics, Barry J. Shillito; Assistant Secretary for Systems Analysis, Ivan Selin (and then Dr. Gardiner L Tucker (from December 1969)); and Comptroller (Robert Moot).[231] Three decision milestones were identified: contract initiation, the transition from contract to development, and the transition from development to production. Thus, Packard positioned the DSARC to counter two of the biggest thorns in his side: overly complex designs (being allowed beyond Milestone A) and concurrency (the premature commitment to production, or Milestone C).

For Packard, the DSARC did not represent a novel approach to doing business, as it mirrored Bill Hewlett's role at HP in many ways. At HP, Hewlett held the authority to determine which in-house inventions went from development into production. The production decision or "hat-wearing" process consisted of three sessions, whereby Hewlett donned three separate hats. Other managers called his hats "enthusiasm," "inquisition," and "decision."[232] During the first session, Hewlett would don his "enthusiasm" hat, approaching the inventor with the primary purpose of sharing the "unbridled enthusiasm" for the new idea with the inventor by listening, expressing excitement and appreciation for the effort. A few days later, Hewlett returned to the inventor wearing a hat called "inquisition," where he asked pointed questions to thoroughly understand the idea, a session characterized by "lots of give-and-take." Finally, Hewlett met once again with the inventor with his "decision" hat. Here he would render a verdict to advance the product into mass production, a decision communicated "with appropriate logic and sensitivity." [233]

Packard thought such a process provided the inventor with a sense of satisfaction, even when the invention did not go into production. HP later shifted the "MDA" from Hewlett to the vice president of research and development.[234] In essence, HP functioned with only one decision milestone: the transition from development into production, thus incentivizing bottom-up, grassroots innovation of prototypes from within its divisions. Just as HP divided its product development activities into four divisions—each with responsibility for its own family of products and each headed by a manager reporting to the Vice President of Research and Development—the DOD divisions consisted of the

Army, Navy, Air Force, and Marines. Packard likely saw DSARC as the means to institutionalize Hewlett's "hat-wearing" within the DOD.

The existence of only one decision milestone within HP illustrated the degree of autonomy and authority exercised by the various HP divisions and foreshadowed the amount of bottom-up activity Packard expected from the services concerning the 1971 Advanced Prototype Initiatives. HP's processes provided its divisions the latitude to internally initiate contracts and transition paper studies to hardware development. At HP, management above the division level only got involved in the production decision. HP's division managers exercised such a high level of authority and autonomy that they sometimes pushed products into production without the co-founder's knowledge, as Chuck House's Oscilloscope Display Monitor project illustrated.

To explicitly define the roles and responsibilities of the services and OSD within the new construct, Packard released a table titled: "Functional Responsibilities in Acquiring Major Weapon Systems," which delineated the responsibilities of the SECDEF, the services, as well as responsibilities of various positions within OSD. The DEPSEC was notably absent from formal responsibility or authority within the process, likely an attempt by Packard to institutionalize and implement the reforms before his departure. According to Seamans, an essential mechanism within the milestone decision was "no satisfactory work, no pay."[235] The approach entailed that defense contractors would get progress payments only after meeting specified production or technical milestones, rather than according to the calendar.

In addition to establishing DSARC, Packard moved decisively to decentralize the day-to-day responsibilities of the program offices to the services. In a clear example of the decentralization of the day-to-day management of procurement programs, Packard enabled the commander of the AFSC, Gen James Ferguson, to transfer responsibility for monitoring the development of the F-15 from the Pentagon to Wright-Patterson Air Force Base, Ohio. Packard explained: "The F-15 arrangement was one of my plans that I hope will help." Brig Gen Benjamin N. Bellis was selected to manage the F-15. "Both Secretary Laird and I feel it is important to depend on a less complex system of management. We want the services to pick a good man who will have some responsibility for management of the program, who doesn't have to come back and be second-guessed by a lot of other people."[236] "We've got to pick managers and leave them in place long enough to get a job done."[237] Such an arrangement was unimaginable under McNamara, who clutched programs such as the F-111 tightly. By establishing a system program office in the air staff at the Pentagon, McNamara's arrangement provided an opportunity for senior leadership, such

as the SECDEF or secretary of the Air Force, to take an active hand in its management. Packard looked to reverse course on such initiatives.

Packard also pursued the decentralization of systems analysis staff in service-specific areas of combat, such as tactical air and submarine warfare. "We are moving in the direction of having the services address those subjects which are primarily military matters. We can't do it in the next budget cycle, but in the budget cycle for Fiscal Year 1972, we will have the five-year plan initiated by the services rather than by DOD."[238] Similar to the DOD, HP found success in organizing itself into "integrated, self-sustaining" divisions. Packard wrote: "a primary goal in setting up these divisions was to give each on considerable autonomy, creating an environment that fostered individual motivation, initiative, and creativity, and that gave a wide latitude of freedom in working toward common goals and objectives." [239]

However, Gen Ferguson contended that the shifting of authority and responsibility from the Pentagon to AFSC should not be a one-way street. In return for AFSC receiving program management authority, Ferguson proposed moving analytical tasks to the Pentagon that had been done in the field, including much of the developmental planning. [240] Examples of such tasks included analysis of alternatives, their costs and schedules, and the technical inputs to developing a case for building a new system. [241] Within Packard's new framework, nomenclature was shifting. The old paper-centric contract definition phase was now the hardware-centric validation phase. [242] The implication was a tectonic shift in focus from paper analysis to the demonstration of actual hardware. Ferguson's words implied that AFSC was geared to do the latter, as more test and evaluation activities were required to support the development of actual systems.[243] To General Ferguson, Packard's "fly-before-you-buy" approach would inherently represent an increase in usage of test sites and ranges such as Edwards Air Force Base, Eglin Air Force Base, Holloman Air Force Base, and the Arnold Engineering Development Complex.

The POM: The Fate of the "Whiz Kids"

Packard quickly recognized that a collaborative approach between OSD and the services was desirable to drive acquisition programs more effectively. Laird and Packard inherited an apparatus from their predecessor, Robert McNamara, which centralized the authority and management of all these tasks within one central Pentagon office: the OSA. OSA played a critical role in matching the defense budget to long-term force structure and the procurement of specific weapon systems.

It was difficult to determine who hated OSA more: Congress or the services. McNamara established the OSA under his comptroller in 1961 to independently evaluate each military service's budget. Previously, each service separately identified requirements it needed to meet threats as it set forth its budget.[244] In other words, not a single DOD office or agency could answer whether or acquiring a new aircraft or tank or ship would improve national security.[245] McNamara used OSA as a tool to centralize power by strengthening civilian oversight of military spending. Therefore, when Laird and Packard entered office, they inherited a system where the studies on force structure (i.e., manpower and weapons) were initiated and conducted by young civilian intellectuals within OSD skilled in computer technology. Upon completing their studies, OSD then asked the military services to comment. Early in his tenure, Packard reversed course: the military would conduct the studies and the civilians would comment later.[246]

In an interview in 1987, Packard explained that McNamara would solicit the services for requirements without the services being provided any fiscal guidance or restraints. Then, OSA would take public credit for reducing the budget from what the service chiefs wanted down to some other figure.[247] McNamara did not set a dollar limit for the services to draw up their requirements.[248] It was reported that for FY1969, the JCS asked former Secretary Clark Clifford for $109 billion, an amount that was then trimmed to $80 billion.[249] One high-ranking military officer complained: "We'd put in a big shopping list and Systems Analysis would take out anything it wanted." Said another: "It was a real paper mill, a Byzantine way of doing things."[250] Laird and Packard did not agree with this approach, instead preferring to meet with the service chiefs ahead of time and say "Look gentlemen, this is all the money we're going to have." This approach was popular among the services as it enabled them to work within general constraints, resulting in better levels of cooperation from the services even though everyone did not always get what they wanted.[251] Packard's approach meant each of the three services got a firm spending limit at the start of the annual budget process. If the Army wanted more tanks, it bought fewer helicopters or arranged similar trade-offs.[252]

McNamara's young civilian staff became known as the "whiz kids." The disdain for the civilian "whiz kid" analysts permeated Washington DC, as they had McNamara's ear and as one writer wrote, "his blind confidence."[253] OSA was accused of undermining the role of the military, tactical, and strategic decisions, and taking over functions of the JCS.[254] Politicians and military leaders demanded its dissolution.[255] According to an article in *Navy Magazine*, OSA "effectively smothered the JCS and the services when it came to policy recommendations. It kept the Army, Navy, and Air Force staffs buried

in studies, restudies, and more studies."[256] On 27 March 1969, Congressman Rivers warned Laird: "as sure as the sun rises in the heavens and you are sitting on that seat, if you retain this organization, you are headed for trouble, and with this committee."[257] In May 1969, Rivers sent a stern letter to Packard, writing: "I will not be satisfied with the manner in which OSA functions until I have absolute proof in my hands that that office has not wittingly or unwittingly taken over the functions of the JCS."[258] Laird and Packard faced a tough decision—would they abolish the office?

Packard did not reply for three weeks. When he finally wrote to Rivers, the DEPSEC made clear he would not bring in an outsider to run OSA. Instead, he appointed a current systems analyst, Dr. Ivan Selin, as "acting assistant secretary" for OSA and reported he "was very well satisfied with the way he has been working with me." Packard assured Rivers that he would not decide on important issues where there was disagreement between OSA and the military without allowing the services and JCS to present their case. Two days later, on 28 May, Rivers warned Packard: "I am not at all satisfied with your reply." Rivers demanded "proof," not promises.[259] Selin served as assistant secretary for OSA until Dr. Gardiner L. Tucker, a veteran DOD official, filled the post permanently in December 1969.[260]

Despite the disappointment expressed by Rivers, military leaders responded positively to the new direction of OSA chartered by Packard. "Now the military people, the so-called experts in weapon warfare can come forward," said one Air Force general. "We'll get better weapons for our money."[261] The military also admitted that OSA forced the military services to adopt modern computer technology so they could match wits with them, perhaps one of the most significant benefits of the McNamara era.[262] Even those within OSA admitted "there's good reason for change. The past system was not ideal." Many within OSD felt OSA could have a decisive role within the Nixon administration. An anonymous official rationalized: "OSA can still have an impact if Laird and Packard are willing to give weight to the office's advice."[263]

Packard's handling of the OSA dilemma provided insight into the roles and responsibilities he expected of specific organizations and positions. Packard saw the services as organizations responsible for initiating their studies regarding force levels, military strategy, and for carrying out the development of new weapons, arms, vehicles, ships, and aircraft. Packard then relied on OSA to analyze and evaluate those studies on his behalf. While the services focused on development work on current projects and programs, Packard leaned on the office of the DDR&E, Dr. John Foster, to provide top policy advice and concentrate on research efforts reaching further into the future. The precise delineation of lines of roles responsibility within the services and OSD

reflected Packard's attempts to mirror the approach he found success with at HP. This included decentralizing power among the services—just as he decentralized power among his divisions at HP—and building partnerships with highly capable individuals—just as he had done with Bill Hewlett at HP and Fred Terman at Stanford.

Although Laird and Packard decided to keep OSA intact, they made significant changes in OSA's roles and responsibilities within OSD resource management. Packard revised the Planning, Programming, and Budgeting System (PPBS) in October 1969. In simple terms, OSD kept OSA intact while increasing the services' role in PPBS via a mechanism known as the POM. As one article noted: "The men at Systems Analysis found temporary solace in his answer. But as one official noted, Systems Analysis is now the only Pentagon office still operating with a temporary director, and Laird seems in no hurry to fill the position permanently."[264] OSD's changes enabled the military departments, the JCS, and defense agencies to comment on the initial fiscal guidance and receive revised fiscal guidance during a collaborative process with the service secretaries. Such a process was formulated based on feedback from OSD staff, the JCS, and service secretaries.[265] In contrast, McNamara used basic force planning documents prepared by OSA, known as Draft Presidential Memoranda (DPM). While the DPM remained, Packard stripped OSD and OSA of the authority to initiate proposals and shifted power back to the services by granting them a charter to initiate analytical documents known as the POM. Starting with the FY1972 budget, OSD staff reviewed the POMs before Laird or Packard made decisions.[266] Packard and Laird retained OSA in an advisory capacity, leveraging their robust analytical capabilities to review quantitative requirements for forces, weapons, equipment, and personnel recommended by the services and JCS. They also reviewed service and JCS recommendations, and participated in reviews of the Five-Year Defense Program.[267]

Similar to the DSARC, the POM was not a novel idea. In a dinner speech made before The Aerospace Industries Association in Williamsburg, Virginia, on 22 May 1969, Packard explained the two-stage approach suggested by Secretary James Forrestal in 1948. In the first stage, the JCS prepared their force structure plan— "what they believed to be necessary to properly carry out their military missions." In the second stage, the plan was vetted through budgetary constraints to achieve an agreed upon plan within an acceptable budget. Although Secretary Forrestal proposed this process, Packard believed little progress was made toward actual implementation. Packard felt McNamara's approach relied too much on systems analysis and cost-effectiveness principles. Packard suggested that the services continue systems analysis and

cost-effectiveness studies while also recognizing that "all problems are not solved with analytical procedures alone." [268] Packard's ability to learn from Secretary Forrestal's experience and recognize that a viable solution was identified 20 years earlier but not effectively implemented speaks volumes of Packard's leadership style. Both the DSARC and POM illustrate that Packard was not as focused on developing his solutions as he was on identifying practical solutions elsewhere and applying them to a situation at hand. Both Laird and Packard understood that if their reform efforts were going to have any chance of succeeding, despite how elegant the solution, the primary challenge was implementation. Laird and Packard believed that those who are involved with the implementation of a decision should participate in the decision-making process, as they would be much more likely to do a good job than if the decision was dictated to them.[269] Laird called this approach "participatory management" while Packard referred to it as "management by objective."[270] Packard once commented, "in private business I never had to make day-to-day decisions, my job was picking people to make them. I never felt I had to stay close to the telephone."[271] Similar to DSARC, implementing POM enabled Packard to "kill another two birds with one stone;" he retained a proven analytical capability within the OSD staff while defusing one of the main points of friction between the services and OSD.[272]

Concurrent to the reduction in OSA authority, Laird and Packard implemented additional mechanisms to ease the transition of responsibility and workload to the services. For example, the Development Concept Paper (DCP) was a document developed by the services to capture the overall plan of a program, including certain thresholds which alerted DOD management when a program got out of bounds.[273] To minimize technological risk on future programs, Packard asked the services to submit DCPs to OSD to review for all major acquisition programs. This addressed attention to risk assessment, system and hardware proofing, and trade-offs. Risk assessment relied on technical experts to assess program risk by looking at technical solutions, alternatives, and consequences of failure. The DCP ensured the services conducted systems and hardware proofing consisting of actual engineering design and component testing to demonstrate that technical risks had been eliminated or at least reduced to a reasonable level, ideally through a complete system prototype. Finally, the DCP showed how trade-offs would be made throughout the development of weapon design and testing.[274] DCPs provided OSD assurance that the services were developing the adequate capability to establish and manage defense programs without the direct involvement of OSA.

Efforts to delegate authority to the services also benefited from the existence of OSA throughout the 1960s. One top Army official attributed Laird

and Packard's success in decentralizing decision-making to the services partly as a byproduct of McNamara's legacy: "It was because we developed large numbers of trained systems analysts within the services to survive McNamara's Pentagon," said the Army official, "that we're really equipped today to work up well-balance, well-argued programs under the new decentralization."[275] Within this context, OSA served as an unpopular but useful forceful function that compelled the services to develop more robust in-house planning and analytical capacity.

During Laird and Packard's tenure, other significant changes occurred within the Air Force's procurement process. Of note, Laird and Packard streamlined the source selection process by abolishing the secretary's "Selection Advisory Council," a 10-member group that would travel to review ongoing aircraft source evaluations at Wright-Patterson AFB. The abolishment of the Selection Advisory Council eliminated the risk of leaks, lobbying, and any "advice," which may have influenced Wright-Patterson AFB's evaluation process. Seamans reported the results of the source evaluation group to Laird and Packard, recalling that they "never questioned the outcome from a political standpoint."[276] When once asked if political pressure plays a part in deciding which company gets which contract, Packard answered: "Categorically no. Contractors do not have an influence on what force level [the DOD] approves, what weapon system [the DOD] approves, or the selection of a contractor."[277]

The DPRC: A Third Cog Falls into Place . . . Validated Requirements

In October 1969, a third cog of the LP acquisition machine fell into place. The Nixon administration established the DPRC, part of the NSC, in October 1969. The NSC's Defense Program Review Committee was created to deal with questions of strategic doctrine, diplomacy and resource allocation within the entire federal government. Therefore, it was designed to act as the final arbiter of proposals for new weapons. The committee would not question the design of a new weapon, such as an advanced manned bomber but rather if one was needed.[278] National Security Advisor Henry Kissinger chaired the committee, and it also included Packard, Under Secretary of State Elliott Richardson, Budget Director Robert P. Mayo, Chairman of the JCS, Gen Earle Wheeler, Chairman of the Council of Economic Advisors, Paul W. McCracken, and CIA Director Richard Helms.[279] Packard reiterated, as he often did, that the defense problem should be considered in terms of both domestic and defense priorities.

The DPRC provided the acquisition system with validated war fighter needs, such as the need for a new submarine, tank, or bomber. Within the context of the three legs of the modern acquisition decision support system, the DPRC became the precursor to today's requirement management system (currently Joint Capabilities Integration and Development System). The POM enhanced the resource management system (the present-day Planning, Programming, Budgeting, and Execution (PPBE) process), and the DSARC became the precursor to the MDA within the program management system. Thus, Laird and Packard managed a complete overhaul on the acquisition system within a year of their arrival by rebuilding a single cog system (OSA) with reduced or arguably absent OSD-military interfaces into to an overarching framework of three interlocking decision systems with mechanisms to interface with relevant military stakeholders.

Part V: Packard's Program by Program Approach to Reform

As the cogs of Packard's new acquisition machine fell into place, Packard steadily began to implement his ideas on reforms, changing the way the Pentagon structured contracts and bought weapon systems one program at a time. Rather than allocating large amounts of the defense budget toward a limited number of markedly complex or ambitious designs, Packard began to hedge the DOD's bets by investing in a more diverse portfolio of options. Contracts for the development of new programs stood in stark contrast to their predecessors, such as the MBT-70, F-111, and C-5A. Rather than complex and concurrent approaches to acquisition, Packard implemented a sequential approach and refused to commit the DOD to production until the component technologies demonstrated sufficient maturity. He championed simplicity, reliability, maintainability, and above all, affordability. Packard recognized the inevitability of design changes that occurred during the crucible of development and armed the DOD's program managers with authority necessary to make trade-offs and keep programs moving forward. Most importantly, Packard looked for ways to creatively maintain competition at the system or subsystem level throughout the development phase. Packard explained: "I can take a couple systems, see if the procedures work there, see if those few are running right, then build from that—rather than restructuring the whole weapon system all at once."[280]

Packard arrived at the Pentagon on the heels of the DOD's award of the F-14 contract to Grumman, so he had limited impact on its initial trajectory.

The F-14 represented yet another failed attempt to use concurrency as a means to accelerate the acquisition cycle, but at the same time, the concurrent approach enabled the Navy and Grumman to achieve their ultimate goal of avoiding program cancellation. The US Navy cleverly exploited a narrow nine-month window of opportunity between the departure of McNamara in March 1968 and the arrival of Packard in late January 1969 to escape the F-111 program and move forward with their desired weapon system, a new swept-wing carrier-based fighter aircraft called the F-14. Four days after the departure of McNamara, the Senate Armed Services Committee canceled the carrier variant of the F-111 program, the F-111B.[281] The Navy seized the opportunity, accelerating the standard four-month approval period for an RFP to only 10 days.[282] The Navy received proposals from five contractors in October 1968 and narrowed the field to two competitors by 5 January 1969. Six days before Richard Nixon's inauguration on 20 January, the US Navy and Grumman agreed to a fixed-price-incentive-firm (FPIF) contract, which was a variant of the TPP strategy developed under McNamara.[283] Under the FPIF approach, the first year's production of aircraft was designated for research and development, while the next seven years were allocated for production. Original schedules called for the production of 66 aircraft before the Navy's final tests were complete.[284] As Jon E. McIver wrote, "the [F-14] contract timelines were strict. The pressure to make up for the lost years in the F-111 generated the requirement to produce the F-14 in 24 months. To speed the process further, Navy testing and evaluation of the F-14 was not scheduled to begin until the aircraft was in production."[285]

Within two weeks of Packard's arrival, the RDT&E contract was signed on 3 February 1969. It stipulated that Grumman first build six R&D aircraft before the Navy would commit itself to a possible 463 production models through firm ceiling prices negotiable downward only. The production rate of the F-14 was to be limited to one per month for the first 18 months to complete necessary developmental testing.[286] Although a step in the right direction, Packard felt the terms of the F-14 were weak from the start, and wanted to revisit them to create a "clear separation" between development and production. [287]

Unsurprisingly, the F-14 shared a fate similar to the C-5A and F-111 programs. In September 1969, seven months after signing the F-14 contract, Grumman's president expressed concern over contractual commitments in production lots.[288] In July 1970, Grumman alluded to financial difficulties.[289] In January 1971, Grumman messaged that they might be unable to deliver F-14s at the contractually agreed to price.[290] However, Packard held firm on enforcing the terms of the contract. In April 1971, Packard explained: "it might be disruptive now, but I believe in the long run we will come out with a better

system at less cost."[291] On 27 July 1971, Packard requested that Grumman commit to the production of 48 aircraft for Lot IV. Grumman agreed to build the aircraft at a loss.[292] Although this series of events appears to have illustrated the capabilities of the DEPSEC in the short run, Grumman got their way in the long run. While Grumman initially accepted the loss of $105 million in 1971, they simply waited until Packard left the Pentagon to renegotiate the F-14 contract in 1974. Congress allowed Grumman to renegotiate at the five-year point in 1974—vice waiting for the contracted eight-year period initially— increasing the unit cost of the F-14 from $9.7 million to $17.9 million each.[293]

Meanwhile, in 1972, US Navy and Grumman personnel embarked on the Herculean task of producing flyable hardware in just two years and getting production aircraft into service within four years.[294] The pace was hectic. In December 1970, the F-14 program encountered a significant challenge. Less than two weeks after achieving its first flight, smoke began to billow from the F-14 in-flight as its primary hydraulic system failed early into its second flight test.[295] The test pilots safely ejected on the final approach after unsuccessfully battling a divergent longitudinal oscillation. The loss of the first F-14 in only its second flight test placed additional strain on the flight test program.

From the perspective of the US Navy, however, the concurrent approach for the F-14 came with its advantages. Two months before the F-14 ever took flight, in October 1970, the Navy placed its first order for 26 production aircraft.[296] Of critical significance, the production decision substantially decreased the possibility the program would be canceled. Many politicians and civilian experts in the Pentagon did not understand why the Navy and Air Force could not agree on universal design, inferring that a lighter and cheaper F-15 should be selected.[297] As aviation historian Mike Spick later wrote, "again the historical lesson that the process of converting a land-based fighter for carrier operations involved so much structural redesign, as to make the exercise self-defeating, was being ignored."[298]

Therefore, for the US Navy, concurrency was a rational approach to countering opponents to the program as it minimized chances of the program being canceled and getting entangled in another joint fiasco, such as the F-111 program. Laird also remained an adamant supporter: the Tomcat was the aircraft that the Navy wanted.[299] Thus, senior leaders within the Navy were not as concerned with cost overruns, delayed delivery, and the inevitability of significant retrofits, as they were with getting the weapon system they wanted. Given the circumstances, the US Navy was willing to gamble significant resources and make a production decision on a design that existed only on paper. Similarly, the contractor, Grumman, incurred significant risk in agreeing to the terms of the contract, but concurrency virtually guaranteed them a

production contract entering a decade where production contracts would be hard to come by. Besides, Packard's philosophy of holding the defense industry accountable to their contractual obligations was not likely anticipated by either the defense industry or the services.

The absence of viable alternatives to weapon systems under development placed defense contractors in a position of maximum leverage and control, namely because their products represented significant importance to the security of the nation. Because large, concurrent programs inherently left senior leaders without alternatives or other options, everyone in the situation was mainly held hostage and forced to reach a compromise. This was usually in the form of Congress paying for overruns and the services tolerating schedule delays. Packard understood very early in his tenure that increased competition would be the only option to provide OSD with more leverage in such situations, but the bigger question was how to create competition within a system that opposed it.

Packard started his reform movement with the S-3A, F-15, B-1, and AWACS programs. Packard's first move was to clench the coveted production decision much tighter than his predecessors. On 1 August 1969, the Navy announced a contract to build six research and development Lockheed S-3A aircraft, with an option to procure 193 production models contingent upon a successful development phase.[300] The S-3A contract illustrated how Packard desired a clear break between weapon system development and production.

A similar approach was taken for the Air Force's air superiority fighter program, the F-15. On 31 December 1969, the Air Force contracted McDonnell Douglas to fabricate an initial 20 aircraft for developmental testing only with Pratt and Whitney engines supplied by the DOD. Until the F-15 met technical milestones, the Air Force could defer commitment to production.[301] A cost-plus-incentive-fee (CPIF) contract covered design, development, test, and test support, while a fixed-price-incentive-with-successive-targets (FPIS) contract covered test aircraft, test support equipment, spare parts, and ground support equipment to support the test program. The first wing of 107 operational aircraft would also be produced under an FPIS contract.[302] To increase pressure on the F-14 program by pursuing other options, in July 1971, Laird asked the Navy to investigate the possibility of an F-15SN, a carrier variant for the F-15, as well as improved F-4s.[303] For Packard and Laird, the F-15SN and improved F-4s represented potential leverage points for making the F-14 program more responsive and an indirect way of leveraging competition to drive a favorable decision-making environment for senior leaders.

The "fly-before-you-buy" approach was also used on the B-1 program. On 5 June 1970, the Air Force announced a B-1 contract. North American

Rockwell was to provide five flight test aircraft, one static test airframe, and one fatigue test airframe. Meanwhile, GE was separately contracted to develop and fabricate 40 "preliminary-flight-rated-test" engines. Thus, the engines were primarily seen as government-furnished equipment by the integrator, Rockwell.[304] Of note, an avionics contractor was not awarded, and promises were not made on whether the B-1 would be authorized for production.[305] Avionics were eventually split into two packages, offensive and defensive. Boeing was selected to integrate the offensive avionics in April 1972 and Cutler-Hammer secured the contract for the defensive avionics system in January 1974.[306]

Finally, Boeing was authorized to begin work on Phase I of the AWACS program. The objective of Phase I aimed to reconfigure two standard four-engine 707-320 transports to carry competing random designs. If approved, Phase II would contract Boeing to build five prototypes under a full-scale development schedule. If approved, Phase III would cover the production of 42 aircraft. For the AWACS program, Phase I and Phase II, advanced development and prototyping, were CPIF contracts, while the Phase III production contract was FPIS.[307] Packard set the tone—in direct contrast to TPP—and a flurry of contracts without promises of production and minimal concurrency emerged from the Pentagon.

Packard's personality and leadership style in the Pentagon emerged through his interaction with these programs. Packard's candor and blunt honesty surprised many inside the Beltway. According to a man who knew him well, "Dave hasn't an ounce of guile in his body. He is very direct, very frank, even when it would be to his advantage to shade the truth."[308] "Packard can be devastating if he decides your ideas are foolish or parochial," recalled an Air Force general. Packard had a reputation for stopping debates once he had heard enough: "You haven't made a case—and that's that."[309] Packard was a strong leader and made it clear who was in charge. A Navy official who opposed a Packard decision against his service was told: "We're not here to decide what to do; we're here to decide how to do it."[310] The comment reflected Packard's focus on implementation.

A reporter once stopped Packard in the hall and asked him what President Nixon meant when he said the administration's goal was a "sufficiency" of arms. Packard responded: "It means that it's a good word to use in a speech. Beyond that, it doesn't mean a damned thing."[311] Packard was not without critics; some feared his management practices would lead to too much military and not enough civilian influence. Others claimed that Packard was not as good a listener as he was sometimes described: "not infrequently, he cuts off someone after hearing only 30% of the facts," claimed one critic. [312]

In Packard's view, trade-offs between specifications, schedule, and cost were an inescapable aspect of weapon system development. Within the DOD, Packard believed the pendulum had swung too far toward the pursuit of rigid performance and specifications. He sought to bring cost and schedule considerations to the forefront by setting a clear expectation that program managers should accept reasonable trade-offs in system performance to achieve cost and schedule objectives. Unlike the F-111 and C-5A TPP contracts, Packard wanted to provide flexibility for the DOD to restructure programs that got bogged down during development by capitalizing on the advancement of promising subsystems while shedding problematic subsystems. Such flexibility protected similar overruns. Thus, two critical aspects of Packard's unfolding acquisition strategy were becoming apparent: maintain competition through the research and development phase and base the production decision on hardware demonstrations instead of paper studies.

Case Study: The A-X Program

A Stacked Deck: Laird's Team Ends the Close Air Support (CAS) Debate

The close nature of the relationships between Laird, Packard, and the service secretaries came into play when brokering an interservice compromise between the Army and Air Force that resulted in the A-X competition. Laird's free hand in appointing key positions within OSD paid tremendous dividends for Packard and the unified nature of Laird's team within OSD presented a rare set of conditions. The team provided fertile grounds to break interservice stalemates, specifically the decade and a half long feud between the Army and Air Force regarding the CAS mission. Between 1969 and 1971, Packard brokered a deal between the secretaries of the Army and Air Force to break a most tenuous and long-standing interservice disagreement, giving rise to the A-10 Warthog.

When Packard arrived at the Pentagon, the Air Force, Army, and Marines were pursuing three different aircraft—the Air Force A-X, the Army AH-56 Cheyenne helicopter, and the Marine Harrier. In total, the services looked to buy about 1,000 aircraft at the cost of $4 to $5 billion.[313] Interservice rivalry over the CAS mission had grown increasingly hostile during the 1950s and 1960s. Army commanders increasingly desired a specialized aircraft for CAS. Army Chief of Staff Gen George H Decker had made his stance clear in May 1961: "The Army's requirement is to have CAS where we need it, when we need it, and under a system of operational control that makes it responsive to Army needs."[314]

Army commanders were still upset about Korea. During the Korean War, Marine aviation provided better CAS support to their ground forces than the Air Force provided to the Army.[315] Compared to their Air Force counterparts, Marine Corps aviation was more responsive, loitered over targets longer, provided a higher density of support to their ground forces, and could deliver munitions within closer proximity to ground forces.[316] In the aftermath of the Korean War, however, President Eisenhower resolved that the United States would never again get bogged down in another limited war and prioritized the development of strategic nuclear forces by tailoring the armed forces to meet an all-out nuclear exchange. General conventional war became a secondary consideration.[317]

However, as prospects of limited war increased and the concept of flexible response emerged, the CAS debate grew increasingly hostile in the early 1960s. Divisiveness manifested itself in the form of two conflicting studies. The Army's Howze Board, released in 1962, recommended that the Army procure armed helicopters and fixed-wing assault transports, to create air assault divisions with organic air support capabilities. The Air Force's Disosway Board disagreed, concluding that "armed assault helicopters simply could not function in a high threat environment" and that the Army did not take into consideration the "full capabilities of the USAF."[318] In February 1963, McNamara attempted to broker a compromise between the services by ordering a joint Army-Air Force study. The study covered five areas: Tactics, techniques, and procedures, training and indoctrination, resources, command anc control relationships (C2), and type of aircraft.

The joint CAS group was unable to reach an agreement on the latter two issues, C2 or the type of aircraft. The Army wanted a decentralized C2 system, whereby the ground commander could rely on the supporting aircraft without worrying whether the aircraft might be ordered elsewhere. Meanwhile USAF commanders wanted the authority to designate target priorities in support of theater-level or strategic level objectives, scheduling and controlling air assets accordingly. The Army wanted slower aircraft, with the capability to locate and destroy small, hidden, or fleeing targets and loiter time over the target for an extended period. Conversely, the Air Force preferred a more versatile, multi-role type of aircraft that could handle each of its tactical air missions: counterair, interdiction, and CAS. The Air Force was particularly concerned about helicopter vulnerability in the battle zone.[319] The stalemate persisted as Laird and Packard took office in 1969.

Within 18 months on the job, Packard broke the stalemate. First, Packard canceled the production contract for the Cheyenne in May 1969 because of rotor stability problems.[320] By canceling only the production contract, Packard

essentially enabled Lockheed and the Army to continue working the rotor stability issues and other technical challenges until August 1972. However, the cancellation simultaneously ensured the Army would be unable to procure organic rotary-wing CAS capability in production anytime in the near-term.

Next, in January 1970, Packard made his most significant move when he ordered that the secretary of the Army and secretary of the Air Force develop a "unified DOD position" to resolve the CAS debate.[321] In March 1970, two months after ordering the Army and Air Force to compromise, a joint memorandum was signed by the Secretary of the Army Stan Resor and the Secretary of the Air Force, Dr. Robert Seamans. They agreed to move forward on the A-X program. Packard correctly identified that a compromise could be reached more effectively through a negotiation between the service secretaries rather than attempting to strong-arm the service chiefs. Seamans recalled in his memoir:

> Interservice rivalry [on CAS] was intense. Two service secretaries entered this arena where angels should fear to tread. I met with my counterpart, Stan Resor, secretary of the Army. We agreed that a fixed-wing, close-support aircraft, the A-X was probably needed, and that the Air Force should be responsible for its development. A simple memorandum of understanding to this effect was signed by both parties.[322]

The backlash from the services was significant. The A-X program satisfied neither the Air Force, who loathed the prospect of a CAS-specific aircraft within their inventory, nor the Army, who still wanted their platform. Seamans wrote: "General Ryan wanted me to rescind the memo by claiming I didn't understand the impact of my actions. Stan Resor received similar recrimination from General William Westmoreland, the Army chief of staff, who claimed he was giving away the store." [323] The requirements for the A-X included ease of maintenance in the field, durability, and an armored cockpit to protect the pilot against small armed, the aircraft design wrapped around a powerful 30-mm Gatling gun.

The final RFP was issued in May 1970, and the USAF selected Northrop and Fairchild to build A-X prototypes.[324] In line with Packard's intent, the A-X's weapon was also selected via a competitive prototype evaluation. Four companies responded to the GAU-8 RFP, a 30mm weapon with 4,000 rounds/min rate of fire. A high muzzle velocity (3,500ft/sec) to make up lost impact energy was desired, as 30mm was smaller than earlier airborne anti-tank guns.[325] The RFP for the A-X itself focused on survivability, simplicity, and a "design to cost" approach, where the contractor could increase weight and decrease performance to meet cost targets.[326] Except for the gun, the A-X did

not use any new or untried technology. Six companies initially responded to the A-X RFP, and the USAF selected two for a competitive "fly-off."

In the summer of 1972, The Northrop YA-9 and Fairchild YA-10 competed for 284 flight test hours in a several month competition. In January 1973, Seamans's successor, John McLucas declared the Fairchild A-10 the winner and provided funding for 10 preproduction test aircraft. Seamans recalled: "Fairchild not only won the fly-off, but their aircraft with two outboard engines was given high marks for maintainability."[327] The announcement drew criticism from Senator Lowell Weicker from Connecticut—the home of Lycoming and the engine manufacturer of the A-9—accused Gov Nelson Rockefeller of New York and Vice President Spiro Agnew of undue influence since Fairchild was located on Long Island and nearby Washington in Maryland.[328] In January 1973, the GE TF-34 was selected over the Avco Lycoming F-102 to power the new aircraft. Although the F-102 was being offered at a considerably lower price than the TF34, the GE engine was three years into a full-scale development program and also being looked at to power the Boeing AWACS (using eight TF34s, an idea later dropped).[329] Three days before the decision on the airframe and engine was announced, two GAU-8A prototypes began extensive competitions, with both guns until a firing rate of 4,000 rounds/min was achieved. In June 1973, GE was awarded the Phase 2 GAU-8 development contract. Full-scale production of the A-10 began in 1975.[330] Meanwhile, the purchase of Harriers from the British was reduced from 112 to 60.[331]

The 1970 joint decision between the Army and Air Force enabled the A-X to move into development while the Cheyenne would cease at the end of the prototyping stage even though the Army continued to pursue a production contract on the Cheyenne for nearly three additional years. However, Packard refused to sign an official termination order for the Cheyenne, even when Pentagon officials who worked the issue approached Packard with a draft of the order. Packard explained his approach:

> Have you ever herded cattle? When you herd cattle, you spend a lot of time going over the range rounding them up. After a lot of work, you get alongside the corral fence. Then, acting real cool, you have somebody open the gate kind of slowly. Pretty soon, one of those doggies walks into the corral, and then the rest of 'em follow in. And you're done. But, sure as hell, if you try to push them, they'll scatter all over the fence and you have to do it again. I think we have them alongside the corral fence. Just wait a little longer.[332]

Within a few weeks, the Army told Packard they were ready to consider giving up on the Cheyenne, and in August 1972, the program was finally killed by officially closing the door on AH-56 production.

Packard's decision, combined with the difficulties encountered by the military during the Vietnam War, contributed toward the Air Force and Army confronting and reconciling their long-standing grievances. Six months after McLucas announced the A-10 as the winner of the A-X competition— compounded with dissatisfaction over its performance in Vietnam— in July 1973, the Army established Training and Doctrine Command (TRADOC). It's mission was chartered to better integrate its doctrine with the Air Force.[333] TRADOC located its headquarters at Fort Monroe, a 30-minute drive from Tactical Air Command (TAC) Headquarters at Langley AFB, Virginia. The combination of the A-10 and TRADOC paved the way for new dialog between TAC-TRADOC. This was a new reality both services faced now that TAC would come to own the CAS and interdiction capability upon which the Army's ground operations would rely on in battle.[334] The 1976 edition of FM-100-5, reflected the cultural shift that happened in the wake of the A-X decision with the Army conceding: "the Army cannot win the land battle without the Air Force."[335] Conversely, "development of the A-10 ground attack aircraft represented the most tangible and, in many ways, most significant indicator of the Air Force's commitment to air-ground operations between Vietnam and Desert Shield."[336]

Although Packard was not completely satisfied with the final format of the A-X competition, it foreshadowed the shape of the Advanced Prototypes Initiatives coming in the next year. Packard opined that excessively constrained A-X requirements may have prevented the submittal of a turbo-prop entry: "I think there is something to be said about our probably having a little bit more uniformity in the two entries in this program than we'd like."[337] For future competitions, Packard desired contracts that allowed the contractor the flexibility and authority to make design changes and to later do something different if thought to be a better idea. He said let the new design "stand or fall in the demonstration."[338] As Packard would demonstrate in 1971, the A-X competition was merely a sample of what was to come:

> Now, on the question of getting greater technological innovation, we're looking at another approach that may be better [than going out on a standard RFP]. I think we possible should go out and get a reasonable number of unsolicited proposals against some very general statements of the problem: then hopefully we'll get two or three significantly different responses which we can prove out through hardware, not paperwork.[339]

Packard's template for procurement was clear. He generated options by facilitating hardware-centric competition across multi-dimensions of a weapon system. The A-X essentially represented three separate prototyping competitions: the aircraft itself, the weapon (GAU-8), and the propulsion system. The

RFP provided room for weight growth, the ability for the contractor to trade performance to achieve cost goals, and prized simplicity and survivability. Additionally, the USAF reflected wisdom in their selection of a proven propulsion system, the GE TF-34, despite promises of "cheaper" designs that had yet to be built. The volume of discontent within the acquisition system remained steady throughout the competition—with the sources of discontent merely shifting to other stakeholders within the system—specifically from the losing companies and politicians. However, from Packard's vantage, OSD and the DOD were slowly regaining control of the defense acquisition system. As pilot and co-pilot of the defense acquisition system, the A-X competition was analogous to a controllability check and one in which Packard demonstrated how to create conditions for the system to respond to pilot inputs effectively.

Case Study: The B-1 Program

Applying Packard's Principles to a Highly Complex, Niche Weapon System

The B-1 program demonstrated how Packard's principles could be applied to a highly complex, niche weapon system that was not anticipated to produce a sufficient volume of orders to warrant a full prototype competition. A month after the NSC established the Defense Program Review Committee in October 1969, the Air Force released an RFP in for a new strategic bomber, the B-1. Packard left his mark on the RFP for the B-1 program. "According to the word floating around the Pentagon and industry, the original proposed RFP was one of the largest paper monsters ever produced."[340] Packard went through the document and removed a significant amount of what he felt were unnecessary wasteful Air Force requests. General Ferguson, commander AFSC stated: "I can't say how much he scratched out with his own hand; but we did make a presentation to him on a simplified RFP in which we had removed an awful lot of the documentation."[341] Packard did not have tolerance for paperwork: "I don't want to cite any one project, but I will say this. There's too damn much paperwork. In one case, paperwork accounted for 30% of the program's total cost."[342] On the B-1 RFP, Packard recalled: "I scratched a few things out to get them started, but my approach is to encourage those who are directly involved to look at these things because they're the ones who have to decide whether it's needed."[343] Packard questioned the need for including details on final test and support procedures and spare parts in the draft B-1 RFP, explaining: "the contractor would have had to go through this big exercise on how he going to do all that, when, instead, he ought to be allowed to direct his

full attention to making a better airplane. All the detailed paperwork that needs to be done down the line should be done at an appropriate time." [344]

On 5 June 1970, Secretary of the Air Force Robert C. Seamans announced the selection of North American Rockwell Corporation and the GE Company as winners of the airframe and propulsion contracts. Boeing, General Dynamics, and North American Rockwell competed for the airframe contract, while GE and Pratt and Whitney competed for the propulsion system contract. The CPIF contract was signed only for the engineering development phase of the B-1 Advanced Strategic Bomber which was consistent with Packard's "fly-before-you-buy" approach. The DOD announced: "today's action does not authorize any production."[345]

Rockwell provided five flight test aircraft, one static test airframe, and one fatigue test airframe (later reduced to three), while GE developed and fabricated 40 "preliminary-flight-rated-test" engines (later reduced to 27).[346] Of note, an avionics contractor was not awarded. Brig Gen Guy S. Townsend of AFSC was named program manager.[347] Packard issued a memorandum to Dr. Seamans on the same day reaffirming, "The [B-1] authorization is for development programs only. A decision has not been made whether the B-1 will be authorized for production, when production might be authorized, or what level of production will be authorized."[348]

The DEPSEC concluded the memorandum by giving guidance to the secretary of the Air Force that other factors, such as the progress of SALT talks and the progress and success of the engineering development program would factor into the production decision."[349] Packard understood that production tooling for large and complicated systems, such as the airframe and propulsion systems for any modern aircraft required significant investment and lead time. The "fly-before-you-buy" approach provided programs flexibility in the development phase, which was essential in meeting the key objective of research and development. When a program reaches the point of asking the DOD for a go ahead on production, it will be justified both on cost and equipment performance against an accepted military need.[350] This approach also offered the opportunity to stretch out programs to survive the cuts in defense spending. Packard recognized the challenges in delaying the award of production contracts, particularly concerning big programs, such as the B-1 program. Packard stated:

> [The DOD] can't realistically expect [the defense contractor] to make such huge investments if they aren't going to get the production contract. However, even on these big programs we will have a good deal of control on costs. As much as 50% of these programs are made up of subcomponents. Here we'll use competitive bidding.[351]

The decision to initiate development of the B-1 program demonstrated how Packard viewed OSD's role in defense procurement. He divided the Pentagon's management problems into two areas: decision-making and implementation. "The prime decision has to do with what the national security commitments are and the forces needed to meet those commitments." Packard explained: "Re-establishment of the NSC machinery has enabled the government to address these problems in a much more effective way than in the past, not only to look at security but to relate the cost of defense to other nondefense priorities and relate further to the resources of the government."[352] Within the NSC, the DPRC enabled critical defense issues to be laid out for the NSC and decided upon at the White House. The revision of the PPBE brought the JCS and the services more clearly into the process, "so that we can have the benefit of professional military advice to help guide our decisions, which are based, in turn, on the broad strategic guidance decisions made by NSC and the president." [353] While the A-X competition reflected Packard's ability to quell long-standing interservice rivalries, the B-1 provided a template for how to keep design teams productive as well as how to incubate and slowly mature technologies during declining budgets.

Although the Carter administration did not approve the B-1A for production in June 1977 (the production decision made by DSARC III), the DOD awarded sufficient RDT&E funds to keep the flight test program going and continued to mature component technologies until January 1981.[354] Full-scale development and Lot I production was awarded on 20 January 1982. Advancements made by industry teams on the propulsion systems and the airframe during the 1970s provided an option much closer to production for the Reagan administration that would not have been thought possible otherwise.[355] Between the first flight of the B-1A in December 1974 and April 1981, four B-1A prototypes accumulated 1,895.2 flight hours, more than 25,000 hours of wind tunnel testing, and the structural article had been subjected to fatigue testing designed to simulate three aircraft lifetimes. Also, weapons tests had included the dropping of 61 B-61 inert nuclear weapons and two missiles.[356] Therefore, when SECDEF Caspar Weinberger looked for options in 1982, the Pentagon benefited significantly from the seed planted 12 years earlier by Packard.

In 1971, Packard provided insight into his greenhouse approach to acquisition. During an interview with *Business Week*, Packard posited that if three or four top-notch aerospace design teams each received $25 million annually that they could turn out flying models of new airplanes about every two years. The Pentagon would award production contracts for superior aircraft, and the teams that lost would be kept together to try again for another aircraft project.

According to Packard, "we have got to hold the best design teams together."[357] Packard's ideas essentially meant enabling the defense industry to scale Lockheed's Skunk Works like models to a much broader and competitive level. Of significance, Packard did not envision this type of approach to acquisition as a reactionary one, instead it was one that was contingent on international dynamics. The purpose of developmental programs was not to proceed into production, but rather provide options to future decision makers to draw upon during direr circumstances.

The Packard Memo and DODD 5000.1: Turning Experience into Policy

A good many things that I say on this policy guidance are just plain statements of what good management is.

-David Packard

On 13 July 1971, Packard signed a seven-page policy titled "Acquisition of Major Defense Systems" in black ink.[358] Numbered DODD (Department of Defense Directive) 5000.1, the policy applied to programs with an estimated RDT&E cost over $50 million or estimated production cost above $200 million.[359] Among the policy's fundamental principles:

1. [Section C.5] Progressive commitments of resources which incur program risk will be made only when confidence in program outcome is sufficiently high to warrant going ahead. Models, mock-ups and system hardware will be used to the greatest possible extent to increase confidence level.[360]
2. [Section C.6] It is not possible to determine the precise production cost of a new complex defense system before it is developed . . . when risk is reduced to the extent that realistic pricing can occur, fixed-price type contracts should be issued.[361]
3. [Section C.9] Documentation shall be generated in the minimum amount to satisfy necessary and specific management needs.[362]

The policy did not surprise anyone. Over a year earlier, on 28 May 1970, Packard issued the "Packard Memo," which was a memorandum giving policy guidance on major weapon system acquisition.[363] Within the memo was the familiar acquisition triumvirate of cost, schedule, and performance. Of these, the Packard Memo made it clear that cost was now king. Packard asked the

service secretaries to "impress firmly on defense contractors the need for cost realism in their proposals and the fact that the DOD will make this point a major factor to be considered in source selection."[364] He requested that both the DOD and individual services improve their ability to make their estimates, identifying three main reasons for cost growth: first, "over-optimism;" second, "changes made during both the developmental phase and production phase of a contract;" third, "inadequate identification of the technical risks in major programs" because of early contract definition or advanced development work not yet mature enough for production.[365]

Packard met opposition within the USAF. His decree that cost was king and the prospect of schedule and performance trade-offs, as well as efforts to streamline reporting channels between OSD and program offices within Systems Command clearly irked Air Force Gen George Scratchley Brown.[366] General Brown assumed command of AFSC in September 1970 and well into Packard's revolution. The F-15 project manager, Brig Gen Ben Bellis had grown accustomed to working within flattened communication channels that provided a relatively high level of authority and flexibility to manage his program. However, Brown wanted to see hierarchy return: "I felt he [Bellis] was locking out an awful lot of possible help from our standing organization; generating ill-will instead of building goodwill by cutting a little too often across regular command channels."[367]

In addition, Gen Brown stated his intent to minimize the trade-space offered by Packard to his project managers, stating that: "[The program managers] have certain responsibilities to me."[368] According to Brown, it was the responsibility to deliver performance and operational capability, "we expect from a system," and getting the system within the schedule. Indirectly criticizing Packard's calls for cost control, General Brown mused: "time is money."[369] When Brown met with Packard in January 1971, Brown demanded the authority to "identify losers as soon as possible and divert the funds to likely winners, and tell you about it after we've done it."[370] Clearly, Packard's reforms were unsettling for many senior military leaders, as the authority traditionally held within positions of power, such as command, migrated toward lower-levels within the organization. Packard wanted to improve decision-making by delegating authority. As General Brown's reaction illustrated, not all of the Air Force's top leadership agreed with Packard's approach. Brown's interview indicated that unlike Packard, he would not allow his program managers to trade off schedule and performance requirements to achieve cost goals. It appeared that with General Brown at the helm of AFSC, USAF program managers would soon be back to where they started before Packard and without the authority or ability to make meaningful trade-offs. Ironically, it was Packard

that eased McNamara's tight grip on new program offices and delegated authority back to the services, a decision that came with risk and reward.

Packard demanded that the services minimize changes made between the developmental phase and production phase of a contract by holding the services accountable to ensure system technologies were sufficiently mature before full-scale development began. This implied simplified designs that eliminated "desirable" but unnecessary features along with an increasing emphasis on configuration management and control. The "Packard Memo" demanded cost-certainty and asked the services to show zero tolerance for inaccurately priced design changes. Packard suggested "increasing dependence on hardware demonstration and competition, with some corresponding reduction in dependence on paper analyses." [371] Above all, Packard stressed the importance of making schedule and performance trade-offs to maintain cost goals. During his time in the Pentagon, Packard found program cost "more dependent upon practical trade-offs between the stated operating requirements and engineering design than upon any other factor."[372] Packard's final policy in 1971 updated and solidified guidance issued in 1970. Packard saw the responsibility of OSD "to *approve* the policies which the services are to follow, to *evaluate* the performance of the services in implementing the approved policies, and to *make decisions* on proceeding into the next phase in each major acquisition program."[373]

Packard desired negotiated-fixed-price contracts for production programs with competitive fixed-price subcontracts to maximize the competition in the overall program. For developmental contracts, Packard envisioned cost-plus-incentive contracts, given "the fact that it is just impossible on a big program and very difficult even on a small program to estimate in advance development costs."[374] Detaching advanced development and production decisions ensured "all new programs be kept in the concept development stages until the responsible service secretary, and the OSD can be assured that the program is actually in the proper shape to proceed into full-scale development."[375]

Described as "obvious but necessary," the 1970 "Packard Memo" shook the military-industrial-complex. "A good many things that I say on this policy guidance are just plain statements of what good management is," explained Packard.[376] Top DOD officials noted that the memo contained the combined thoughts of OSD, the services, and industry. Therefore, it represented "another step forward" by the DOD to improve its management. According to Vice Adm Vincent P. de Poix, deputy director of DDR&E (Administration, Evaluation, and Management), "it all gets back to the familiar triumvirate of cost/schedule/performance."[377] He added, "we're not talking about tomahawks, or bows and arrows [but] highly complex weapon systems. Moreover,

they have to be highly complex to meet the threat . . . working on the edge of technology means some of the difficulties are "almost unavoidable."[378] De Poix opined that the DOD needed Packard's restatement of good management concepts to address three reasons that slowed defense procurement efforts: first, confusion of management authority; second, over-centralization; and third, less than satisfactory quality and education of program managers.

A considerable problem Packard faced was the dissemination of the "Packard Memo." One well-known DOD anecdote, attributed to Eugene Fubini, Assistant SECDEF for Research and Development between 1963 and 1965, held that, "when Pentagon policy-makers issued a change in military management operating procedures, it took one year to get the word out to the people in the field who had to carry it out; another year for them to reorient their operation to the new ground rules, and a year after that before word go back to the Pentagon Ivory Tower that what they ordered three years earlier was indeed being done the way they wanted."[379]

The services tended to keep private copies of such guidance within the confines of the corner offices of high-ranking officials. Packard explicitly directed distribution "to all key personnel including all program managers involved in the acquisition of major weapon systems." Packard wanted all personnel across 140 principal program offices to read and internalize the message down to the grassroots level. According to Edward L. Ball, Jr., assistant director for engineering management under de Poix: "that's the only way we are going to get the job done, and to me that's the reason we have not succeeded in the past."[380] As a result of the 1970 "Packard Memo," de Poix expected to see less complicated RFP requesting less sophisticated weapons, with more thought given to customizing and coordinating standard sections on reliability, maintainability, and survivability.[381] De Poix also projected a larger share of RDT&E within the declining defense budget. Finally, Ball raised a more profound question: Given Packard's effort to decentralize defense management responsibility by emphasizing the OSD/services relationship, what "if these thoughts are carried forward, what about the next level, the services/Contractor relationship?"[382]

The release of the "Packard Memo" coincided with the solidification of the Nixon Doctrine with NSSM-3 and NSSM-27. This ensured a global review of US commitments which provided the services fiscal guidance for the FY1971 budget.[383] In the summer of 1970, Nixon ordered the DOD to solidify a path forward to support the Nixon Doctrine. NSSM-27 assessed US commitments in Korea, with Nixon expecting Kissinger and the NSC to produce a plan to cut the number of Americans in Korea in half. Meanwhile NSSM-3 was led by Packard to examine alternative military strategies and the force structure and

funds required to execute them.[384] Although Nixon never spelled out to the media the findings of the study, Packard played an active role in both studies, therefore, he could speak to their details. The wide dissemination of the "Packard Memo" reflected Packard's leadership approach and philosophy at HP. There he strived to distribute broad corporate intent to his divisions and expected all the members of his workforce to vector and tailor their efforts to align with the guidance. The Pentagon's challenge was not issuing directives but instead successfully implementing them as Fubini's statement illustrated. Either way, Packard was leaving an impression across the DOD. One news article captured the prominence of Packard's role the Pentagon by summer 1970:

> Laird, as his predecessor, is increasingly tied down on Vietnam and new issues on the draft and strategic arms talks with the Russians, Packard has emerged very early in his tenure as the central figure articulating and managing the sweeping changes being made in how the Pentagon conducts its business. The spotlight has also come to rest on Packard as the central Department of Defense figure in a new national policy which requires DOD to integrate its budget and operations with other sectors of government to a far greater degree than was ever attempted before.[385]

In an interview in August 1970, Packard spelled out the principle findings of Nixon's defense study by identifying four key elements which informed the Pentagon on the DOD's post-Vietnam force structure. First, strategic nuclear offensive weapons; second, US commitments to NATO in Western Europe; third, "the Asian situation" after hostilities in Southeast Asia ended; and fourth, "the Naval problem."[386] While the NSC conducted the study, the responsibility to steer the Pentagon in the right direction rested with OSD. Laird's hands were kept full by short-term issues and he continually relied on Packard to keep his focus on the acquisition horizon.

The DOD did not plan to pursue the expansion of nuclear weapons programs after Vietnam, instead they aimed to maintain the present-day capabilities and programs pending the results of SALT. Packard ensured the media that the United States would fulfill its commitments in Western Europe through FY1971, but moving forward it would be "very desirable for us to encourage our European allies to carry a larger share of the NATO responsibility, both in terms of manpower and costs."[387] After the drawdown of US forces in Southeast Asia, Packard communicated a clear path of nonintervention moving forward, explaining that the study showed "our allies are capable of providing their own ground forces."[388] He continued: "The Nixon Doctrine contemplates greater reliance by Asian nations on their own manpower, with increased military assistance funds from us."[389] Packard explained that the DOD viewed the "naval program" as somewhat separate. It related that American strategic nuclear capability also involved support of forces both in Europe

and in the Pacific; however, that naval priorities should shift back toward anti-submarine warfare, which directly related to the core role of the Navy to protect shipping in conventional war.[390]

Part VI: Packard's Hail Mary– the Advanced Prototyping Initiatives

I am a little concerned that with all of the 10,000 projects you already have, you ask the services to go back and dream up 12 or 15 more. Why do you have to go out and find these new deals . . .

-Senator Thomas J. McIntyre (D-NH)
Former secretary of the air force

On 6 September 1971, David Packard stood before the Senate Armed Services Committee chaired by Senator John Stennis to testify on the benefits of advanced prototypes.[391] Ten days later, he would testify on the same subject to the House of Representatives.[392] This series of events revealed the limits of Packard more than the advanced prototyping initiatives. Moreover, this series of events provides even more insight into his ideas on defense procurement, innovation, and leadership, as well as his long-term vision of the defense acquisition system as a whole.

Packard arrived at the advanced prototyping initiative hearings with members from each of the services and DDR&E, Dr. John S. Foster Jr. The Army and Navy presented first. Then, Brig Gen K. Chapman, Deputy Chief of Staff, Development Plans, AFSC, presented four prototyping concepts aimed to enhance mobility, surveillance, air combat, and stealth on behalf of the USAF.[393] In all, the $67.5 million Packard requested to support 12 separate and unique advanced prototyping initiatives appeared insignificant and represented less than one percent of the FY1972 RDT&E portion of the defense budget. Packard later recalled in his memoir: "I wanted to build two prototype fighter planes and use the prototype system on a number of other projects. Congress wanted us to take the money for the prototype program out of the overall budget they had approved. I resisted because of the substantial cuts each service had already taken."[394]

The Army, Navy, and Air Force saw Packard's culminating effort with the 1971 initiatives as an opportunity for innovation as defense spending was being reduced. As shown in Table 4, the services sought to further develop and mature technologies leveraging the miniaturization of and advance in

electronics—such as optical sensors, data links, laser target illuminators, thermal imaging sensors, Forward-Looking Infrared (FLIR), and countermeasures.[395] The prototyping initiatives permitted hardware and system demonstrations of new, high-risk technology without a force structure justification.[396]

Table 4. FY1972 Advanced Prototyping Initiatives[397]

Army	**Navy**	**Air Force**
Lt Gen Gribble	**Admiral Davies**	**Brig Gen Chapman**
Unmanned Aerial Scout (with laser target illuminator for designating targets for division artillery units)	*New* Sensors to enhance Anti-Submarine Warfare (ASW) capabilities	*AMST*
Remotely Controlled Attack Missile (with 4.5-6 pound payload to conduct precision strike missions)	*Modular,* lightweight missile launcher system to weaponized ships	*Very* Low Radar Cross Section (RCS) Test Vehicle
Air defense effectiveness demonstrator (integrating FLIR technology into air defense systems)	*A* more powerful V/STOL engine for fixed-wing aircraft (Pegasus 15, designed as an upgrade for the Harrier, a more powerful engine (3,000-24,000lbs) plus a larger lift fan)	*Quiet* Aircraft (aero-acoustically designed wing and acoustically treated engine, either jet or prop, 50,000lb aircraft)
Clean Air Engine (with improved efficiency and reduced emissions)		*Small* LWF
Multi-Mission Missile (M3), a heliborne missile capable of defeating mobile radar-controlled automatic cannons employed by the enemy		
$23.5M (for FY1972) **$61M total** (3 years)	**$20M** (for FY1972) **$134M total**	**$20M** (for FY1972) **$211M total**

The Navy and Army's initiatives reflected the disruptive nature of semiconductor and computing advancements in the 1950s and 1960s, which carried significant implications for national security. Packard perhaps understood these developments better than anyone. He understood that technologies developed in the 1960s, such as cesium clocks and integrated electronics products, would have an impact on the battlefield.[398]

After the Army and Navy presented, Chapman presented four prototyping concepts aimed to enhance Air Force mobility, surveillance, air combat, and stealth. The AMST program was a C-130 size, 150,000-pound aircraft with a box size of 12 feet by 12 feet and designed to provide capability to operate in

and out of 2,000-foot austere landing strips. It had a cargo airframe which sought to further develop and combine the following characteristics: powered lift, low-speed stability and control, low-speed deceleration, and high-speed cruise.[399] AMST design concepts proposed using blown flaps or vectored thrust to achieve greater lift.[400] General Chapman explained that Boeing and McDonnell proposed using B-1 engines, rated at about 16,000 pounds of thrust. The use of engines already available was consistent with Packard's intent that prototype costs could be minimized by using government-furnished off-the-shelf equipment and avionics.[401]

Chapman then explained that the Very Low RCS Vehicle was a small, unmanned system utilizing a stealth platform design and used new materials. The new materials had been proven in a laboratory mock-up, and the Air Force wanted to proceed to flight demonstration to verify initial results.[402] The plan was to fly the unmanned aerial vehicle against radars with known capability.[403] The third proposal, the quiet Aircraft, was to include an aeroacoustically designed wing and acoustically treated engine, either jet or prop.[404] The program's objective was to reduce the noise to the point where it could not be detectable. The Air Force wanted to enlarge an existing Army aircraft design, the Y-3, to carry a heavier payload. General Chapman explained that NASA was actively researching how to reduce noise for the commercial fleet, focusing on a 50,000-pound aircraft. The Air Force desired an aircraft that "you cannot hear it at all," while NASA was interested in meeting noise standards around commercial airports.[405] Dr. Foster added that the Army Y-3 was successful but too small for the desired Air Force mission. The quiet aircraft and unmanned stealth aircraft initiative demonstrated the extent to which Packard desired to support a diverse portfolio of weapon system focused technologies. It also illustrated his desire to push the development of stealth and unmanned air vehicles. The notion of a 50,000-pound quiet aircraft (heavier than a fully loaded modern F-16) and stealthy unmanned aerial vehicles showed how the USAF aimed to nudge ambitious technologies toward battlefield applications.

Meanwhile, the LWF competition aimed to explore high maneuverability and performance, integrated aerodynamic design concepts, high thrust to weight ratios, high "g" cockpits with sidestick controls, and fly-by-wire technology in an aircraft weighing 20,000 pounds or less.[406] Brig Gen Chapman also explained a new high G cockpit design, which involved pilots lying down, mostly horizontal. Designers anticipated that the human body could take nine G's in such a configuration and it would provide greater maneuverability than legacy aircraft.[407] Dr. Foster emphasized the low-cost approach to the prototype competition, explaining, "we currently have fighters that cost $10 million,

$15 million apiece . . . in 1985 and so on, are you going to have $15 and $20, $25 million fighters? The way we see it, we cannot afford that kind of addition."[408]

Fly-by-wire technology represented a paradigm shift and the dawn of the digital era of flight control systems. Unlike traditional analog aircraft controls— where the pilot used the stick and rudder to actuate mechanical linkages connected to control surfaces, such as the elevator and ailerons—fly-by-wire technology interpreted and digitized the pilot's inputs into a processor, which then actuated control surfaces to maneuver the aircraft. The implications of fly-by-wire technology were significant. In a sense, the pilot did not fly the aircraft but instead provided inputs into a computer. However, while the notion of fly-by-wire technology worried pilots, the YF-16 performed spectacularly during the prototyping competition.

In January 1975, the Air Force announced that the YF-16 won the LWF fly-off against the YF-17. Robert Coram wrote: "the YF-16 was the unanimous choice of pilots who flew both aircraft . . . [because] it could flick from one maneuver to another faster than any aircraft they ever flew . . . the most nimble little banking and yanking aircraft the world had ever seen."[409] In his memoir, Packard proudly recalled: "The F-16 has become the best Air Force fighter plane and the F-17—renamed the F-18—has become the best Navy fighter."[410]

Given the divisive nature of the LWF proposal within the Air Force, Packard recalled: "It was impossible to make sense of what the problem was. I decided that the best thing to do was to get some pilots from Vietnam to come in and discuss it with me."[411] Air Force leadership was reluctant but eventually agreed to it. After speaking directly to several fighter pilots with experience in Vietnam, Packard got a better feel for the advantages of the LWF and agreed to support it. [412]

Table 5. The Six Advantages of Prototyping[413]

Packard: The Six Advantages of Prototyping
1. **Creating Options from which to make better choices (improving the ability to make decisions and making the first decision right)**
2. **Minimizing "sunk" costs until the government knew what capabilities the technology could realistically support ("fly-before-you-buy")**
3. **Gain insight into system cost, performance, and reliability.** Understanding how to realistically trade off performance, reliability, and subsequent costs (cost control by trade-offs)
4. **Improving the ability to predict costs more accurately, based on hardware demonstrations rather than paper analysis**
5. **Counter concurrency.** Minimize retrofits and provide industry greater flexibility to make design changes by reducing concurrency between development and production
6. **Preserving competition.** Continuing advancing technology and preserving design excellence in the government and industry.

Often oversimplified as "fly-before-you-buy," Packard's concept of prototyping was much more. After the service representatives presented, Packard explained his approach to acquisition. He defined three distinct types of prototypes desired to mitigate government risk ahead of a full-scale production decision:

(1) Advanced development prototypes

(2) Production (engineering) prototypes

(3) Subsystem and component prototypes

The distinction between types of prototypes was significant, as Packard envisioned dividing the development of a new weapon system into various prototyping stages and activities, with each phase focused on hardware demonstrations rather than analysis on paper. Packard developed this approach by analyzing military weapons acquisition systems used by other countries, such as Dassault Aviation in France, and successful efforts in the DOD, similar to the Skunk Works programs run by Kelly Johnson. After a discussion with Dr. John Foster, the Pentagon's head of research and engineering, Barry Shillito, assistant secretary of the Navy, and others, he concluded that prototyping competitions should be set up. While Packard's approach became known as "fly-before-you-buy," Packard later recalled: "We got mixed up a bit . . . because you cannot do exactly that without stretching the program far too long."[414]

As a caution, Packard warned the committee that "the advanced development prototype will not be a production prototype."[415] The intent of the first prototyping phase, the advanced development prototype, was only to demonstrate the feasibility and utility of technology before committing to full-scale development. Next, the purpose of the second phase, production (engineering) prototypes, was to ensure engineering problems were resolved and thorough testing and evaluation conducted before committing to full-scale production. Packard intended prototyping to be a mechanism that reduced risk before a production decision. Risk was reduced because government funds were not committed until the contractor was able to sufficiently work through technical challenges. Meanwhile it also provided maximum industry flexibility to conduct significant re-designs before entering production. He advocated prototyping not only just for aircraft but also for the component or subsystem level, which "gives us an opportunity to check out parts of a larger system with the prototype approach." In his vision of prototyping, Packard clearly stated: "We are talking primarily about the advanced development prototype. We want to move in the direction of . . . testing it and evaluating it before a commitment is made for either full-scale development or production."[416]

Adaptive Management

A key aspect for managing the advanced prototyping initiatives was the adaptive management approach, as explained by Packard in his testimony. Packard's adaptive approach was unconventional and very different from the highly centralized and bureaucratic nature of the Pentagon's management of procurement effort.[417] Instead, Packard desired to empower the services and the contractor. "If these prototype programs are to be efficient, they must be managed with the minimum of constraints. They should be designed to meet performance goals, not detailed specifications."[418] He wanted the services to retain responsibility for technical objectives, program trade-offs, and performance evaluation. He proposed that the contractor be assigned responsibility to design fabrication standards and management control systems. This included having the government accept contractor formatted data, waiving several hundred procedural policy regulations and directives, and keeping reporting channels as direct and straightforward as possible.

Perhaps most significantly, Packard allowed the contractor to retain the right to make design changes. Instead of 50 to 250 person personnel program offices, Packard envisioned three to five person teams representing the services working closely with the contractors.[419] Eschewing cost-fixed contracts utilized during McNamara's TPP efforts, Packard instead looked to combine cost and fixed-price features, "recognizing that the contractor may not achieve all the goals you set, but we would require that they deliver completed hardware and data within the maximum amount of the contract."[420] Packard recommended that joint service-contractor teams perform both the airworthiness demonstration and flight performance evaluation, with the service entering the program at the "earliest possible point in time." Ultimately, Packard wanted to "replace paper with people" by embedding small teams with the contractor, backed with the support of laboratories and systems divisions. Packard felt that one of the major causes of overruns was the Pentagon commitment of funds before many technological problems had been overcome.[421]

The advanced prototyping initiatives sought to cut down the length of RFPs from about 250 pages to 25 pages, and Packard believed that contractor responses could be reduced from about 2,000 pages to 60 pages. The managerial aspects of the advanced prototyping initiatives were as important as the technologies themselves. At the time, a two-step process was used in the Pentagon to evaluate proposals. First, a committee of multiple stakeholders—technical, logistics, operational, cost, technical, and management—convened to conduct a detailed evaluation of the concept. Next, another team of eight to 12 conducted a weighted analysis. Instead, Packard proposed teams of four-to-six

members who would write a narrative report with the intent to get a prototype under contract within 60 days. Packard lamented that excessive reliance on paper studies and paper reports had kept promising technologies from progressing beyond the labs. Packard summarized: "With such prototypes, a new weapon can be evaluated in terms of what it will in fact do, not what the specifications or the contractors' proposals say it is supposed to do."[422]

Packard also reiterated that the advanced development prototype would not be a production prototype, and additional engineering development and testing would be necessary to achieve a stage where it could be the basis for a production program.[423] As an example, the LWY prototype would not include the avionics, weapons, and other systems which are necessary for a fully operational weapons systems. Packard believed that maintaining design teams within the industry was a critical component to national security. A significant advantage of continuous prototyping was that it would alleviate the "stop-and-go" conditions prevalent in the defense industry and preserve and strengthen the capability of existing design teams.

After the formal presentations came questions from the committee. Senator Stennis probed the problems of the F-14 program, to which Packard bluntly responded: "Too much paperwork in the beginning and too much concurrency between development and production . . . a number of these firms say they will design, test, and deliver two flyable models for $35 million. I submit to you that we have wasted $35 million filling out forms and paperwork."[424] Packard viewed the F-15 as a slightly better approach as it had to reach certain milestones before a production decision was made. Packard explained to the Senate committee that his A-X program was an excellent example of a prototype competition, as it pitted two models—one at $41 million and another at $29 million—against each other in competition without committing either program to production.[425] Packard explained that although the B-1 program displayed many characteristics of a prototype competition—as production was not guaranteed—it also showed the limitations of prototyping competitions for expensive or unique programs.[426] "The B-1 program is, in my view, a commitment to development only. We have plans set up, so we will get three models that will be tested."[427] Packard added the AWACS program as another example of the prototyping approach, as two competing radars were being tested against each other.[428]

Voices of Concern

Some politicians expressed concern toward Packard's new approach (D-NH). St Louis based McDonnell Douglas was in the middle of developing the

F-15. The LWF represented an opportunity for McDonnell Douglas' competitors to develop an air superiority fighter, and Symington wanted to make sure the F-15 program would not be threatened. Symington also did not appreciate Packard's comments which appeared in the *Washington Evening Star*, in which Packard "blamed industry for too often promising more than it could deliver and the armed services for having been exceedingly optimistic about what could be produced with limited time with limited funds."[429] Packard personally responded to the Senator assuring him that the new LWF prototype would not directly compete with or jeopardize the F-15 contract.[430]

During deliberation, Senator Symington ceded that the $67.5 million Packard was requesting for the prototypes represented less than one percent of the RDT&E budget; however, t the Senator preferred the services reallocate funding within their respective budgets rather than receive additional funds.[431] Symington, indirectly referring to the bailout of the troubled Lockheed Corporation reasoned that neither the government nor the contractor took any risk in entering a prototyping contract. He saw that the A-X contracts were fixed-price, and under the flexible performance goals that Packard had presented, there was not a risk if a contractor failed to complete a build of a flyable prototype.[432]

Senator McIntyre also showed concern, preferring that the DOD meet budget requests by reallocating funding internally. He seemed uncertain how the Navy's requested prototyping would impact defense contracts in New Hampshire. He peppered Packard with questions: "I am a little concerned that with all of the 10,000 projects you already have, you ask the services to go back and dream up 12 or 15 more. Why do you have to go out and find these new deals, although some of them look very familiar, like ASW sensors? Why did you have to do that?" [433] The new paths of competition offered the prototyping approach had complex implications for the senators as they thought about their respective support bases. The interchange also highlighted the difference in perspectives between the various stakeholders in the defense acquisition system.

While senior leaders within OSD and the DOD saw the advanced prototyping initiatives as an opportunity to create more options and flexibility to modernize the military, Congress saw it as an unnecessary duplication of effort and a threat to defense-related employment within their respective constituencies. While advantageous to national security, the combination of increased competition within the defense industrial base as well as delaying the production decision until the weapon system demonstrated sufficient maturity significantly increased uncertainty. Specifically within political, military parochial, and defense industry spheres, and with stakeholders who benefited

from large and stable defense contracts. Therefore, as a whole, Packard's reform efforts were an attempt to shift risk *from* OSD and DOD stakeholders *to* political, defense industry, (and other DOD) stakeholders which highlighted the zero-sum nature of the defense acquisition system.

In other words, a "win" for DOD and OSD stakeholders was a "loss" for political and defense industry stakeholders. Seen in this light, defense programs with very complex designs, concurrency, and poor management practices all played to the advantage of specific stakeholders within Congress, the defense industry, and the DOD. Premature commitment to production provided employment stability within many towns and communities. An overoptimistic approach to commit to complex designs resulted in cost overruns, which in turn disproportionately displaced federal dollars to local constituencies. Paradoxically, while cost overruns, concurrency, and schedule delays benefited political and defense industry stakeholders, the actual combat capability of weapon systems played little into the mental calculus of Congress, the defense industry, and even competing spheres of influence within the DOD. In short, the issues that kept senior military leaders up at night were very different from the issues that kept politicians and defense industry executives up at night. Even senior military leaders benefited from concurrency, as illustrated by the use of concurrency by the US Navy to minimize the chance its F-14 program would be canceled. By threatening the existing balance of risk within the system, Packard was a revisionist, and his proposals threatened to upend the status quo.

If successful, Packard's efforts aimed to decrease the amount of risk burdened by the DOD and OSD, and increase the fog and friction placed on other stakeholders in the system. Packard had achieved significant victories in this respect during his first year and a half in the Pentagon by successfully launching several programs that did not commit the DOD to production. Late into his third year at the Pentagon, Packard now stormed the beachhead looking for additional gains. If his frontal attack on Congress was successful, the advanced prototypes initiative would represent an even more significant victory for OSD and the services. In principle, defending the production decision point did not provide more options for senior leaders; however, allowing more companies to transition their designs from paper to hardware did. If Packard could align conditions correctly, the pendulum could reach a point where DOD and OSD leaders were temporarily in a position where they had options and room to maneuver to cost-effectively modernize the force.

In short, risk and uncertainty previously burdened by the military would be shared with politicians and defense industry leaders. Packard's efforts sought to create a set of conditions that effectively and efficiently, albeit temporarily,

aligned procurement efforts with long-term security interests of the nation. This maximized gains for specific groups or stakeholders seeking parochial, profit, or political interests. It was within this context that Packard battled to "fix" the defense acquisition system.

Packard understood that the "three problems" of defense programs he initially identified reflected the natural state of the defense acquisition system based on the conflicting incentives that existed within the system. Therefore, more than anyone else, Packard knew that the two-front war he waged on acquisition reform would be a futile one from a long-term perspective. It was not a durable approach to reform, nor was it intended to be. Packard stormed the beach to open up a window of opportunity. If successful, it would be up to the services to effectively manage the prototyping competitions that received funding.

As for the future of airpower, although Packard's efforts focused on launching a new generation of platforms, he recognized that the digital and electronics revolution underway in Silicon Valley meant that it would not be the aircraft itself, but the devices that the aircraft employed which would achieve combat effects in the decades to come. On 8 April 1971, Packard explained:

> We are trying to place emphasis on areas which, hopefully, give us a quantum jump in our capability. The services would rather have a thousand 500-pound bombs than one weapon that would really do the job that might cost $200,000 or something like that. And we finally, I think are getting our military people to come around to recognize these facts.
>
> If you had six perfect weapons it would require six sorties to destroy six targets . . . we found that if you applied the least expensive weapons, 500-pound bombs or 750-pound bombs, to this mission, it required over one thousand sorties and $15 million to destroy just six targets. However, if we selected the most effective weapons in the inventory, it required only 20 sorties and cost $600,000 to destroy those six targets—reduction of 50 to 1 in the number of sorties and a reduction of 25 to 1 in the cost to do the job.[434]

Packard's comments in 1971 would foreshadow the Linebacker campaigns a year later, where laser and electro-optically guided munitions were used extensively. On 26 May 1971, a single flight of F-4s dropped laser-guided bombs that destroyed three buildings at the Son Tay warehouse and storage area. According to Air Force Maj Gen Eugen L. Hudson, 7th Air Force director of intelligence: "Laser-guided bombs . . . revolutionized tactical bombing." Through August 1972, a raid's strike force averaged only eight to 10 strike aircraft supported by larger numbers of support aircraft, much smaller than the 60 to 80 aircraft strike packages which were previously used to achieve a lesser effect.[435] However, the introduction of Precision Guided Missiles (PGMs) had complex implications for the way the USAF thought about warfare. Likely it made generals, particularly those within Strategic Air Command

uncomfortable. It threatened to undermine airpower tactics that emphasized area bombing which was a manpower-intensive effort that used tonnage of munitions as one of its key measures.

Therefore, Packard's efforts were precarious in the sense that they threatened not only the status quo of political and defense industry stakeholders in the system but also the status quo within the services. In addition to the new generation of platforms, other new technologies threatened to disrupt traditional war-fighting norms. From the introduction of artillery to mechanized units to the aircraft carrier, military history is littered with examples that illustrate how the introduction of paradigm-shifting weapon systems is typically embraced with hesitation by military leaders. New technologies encounter barriers stemming from parochial interests and the deviation from accepted "concepts of war."[436]

The testimonies also illustrated the complex nature of defense procurement as compared to the private sector. Hewlett and Packard had fostered a culture within their company that incentivized and scaled innovation from the bottom-up. As Part I of this paper illustrated, Packard did not fear the rise of disruptive technologies; instead, he designed a way of doing business at HP to harness and exploit those changes. However, as testimonies from the advanced prototyping initiatives revealed, it was natural for political leaders and senior military leaders to fear the uncertainty that increased competition brings. Absent a credible and existential threat; there is little impetus for government decision makers to accept risk or desire change, as most changes within the system would most likely only serve to undermine their power base.

Between 6 September and 23 November, the $67.5 million requested was reduced to $34 million by the Senate-House Conference Committee and then eliminated by the Senate Appropriations Committee.[437] On 14 December 1971, the FY1972 Appropriations Bill was released. Of the $67.5 million Packard originally requested for 12 programs, the bill allocated $12 million for two of the programs: The LWF and the AMST.[438] Even with the high casualty rate, Packard's "Hail Mary"—the advanced prototyping initiatives—was a considerable victory in the sense that it provided the window of opportunity necessary for several additional competitors to enter the hardware development phase of the acquisition cycle. The two approved prototyping competitions ultimately paved the way for the development of the F-16, F/A-18, and C-17. In addition, while the A-X illustrated OSD's ability to resolve interservice stalemates, the LWF program illustrated OSD's ability to resolve intraservice stalemates. In facilitating the introduction of the F-16, Packard provided an opportunity for the rise of digital flight controls—despite initial protests from the pilots within the Air Force. Combined with Packard's push for PGMs, the

significance of his contributions to the DOD cannot be understated. Such examples also provide a rationale for why OSD should take time to listen to the proposals from minority voices within the services. They should also "hedge their bets" by investing in a portfolio of technologies and delay production decisions until the technology is sufficiently mature to warrant it. Packard states:

> Within the Defense Department, there continues to be a degree of competition between the services—and frequently between parts of the services—that is unacceptable because it is inconsistent with the common commitment . . . jealousies and in-fighting will only serve to drain our nation's energies.[439]

Packard Resigns from the Pentagon

On 10 December 1971, several days before the FY1972 budget was announced, Packard submitted his letter of resignation to President Nixon, effective 13 December 1971.[440] President Nixon accepted the letter the next day, thanking Packard for his "great personal and financial sacrifice" in serving the nation.[441] In a press release, Packard expressed his gratefulness for Melvin Laird:

> It has been a great experience as well to work with Mel Laird. I had met him, but I did not know him when I came out here three years ago. I know him now. I know him now not only as a great Secretary of Defense with fine administrative ability combined with a compassion or people. I also know him as one of the great politicians on the contemporary scene, and I know him as a good friend. We have worked well together. I can recall no major issues on which we have disagreed during these last three years. In fact, I can recall no minor ones either.[442]

On his experience in the Pentagon, Packard wrote:

> Things have not been easy here in Defense during these three years, but when I came out here in 1969, no one promised me a bed of roses. Yet I believe we have made substantial progress in many areas—not as much as I hoped we might make. We have better policies, we have better attitudes, more leadership, and more teamwork than we found when Mel and I took over in 1969.[443]

In the year and a half after Packard's departure from the Pentagon and his return to HP in Palo Alto, rumors swirled within the media speculating his return to the DOD as the SECDEF. On 3 May 1973, the White House acknowledged Packard was Nixon's first choice.[444] A cacophony of speculation followed. *The Washington Post* reported that Packard was "undecided," *The Washington Star and News* called Packard's return as "likely," while *the Los Angeles Times* named Packard the "probable new defense chief."[445] As the days passed, speculation turned into expectation. On 7 May *Aerospace Daily* titled an article "Nixon to Packard: An Offer He Can't Refuse?"[446] The same day, *the Wall Street*

Journal reported: "Packard is expected to reluctantly agree to Nixon request that he head Pentagon."[447] However, a week later, Packard quelled rumors by issuing a press release that he would not accept the nomination.[448] Nixon's appeal to Packard in 1973 would not be the last time the White House would ask Packard to help the DOD out of a bind, as Pres. Ronald Reagan would call upon Packard to lead the Packard Commission in the 1980s.

Conclusion

> *… the three years I spent in the Pentagon must be numbered among the most interesting of my life. I'm not sure they can be numbered among the most productive. Only time will tell whether anything useful or permanent has been accomplished.*
>
> -David Packard
> March 1972

The first part of the conclusion will expand upon eight points for consideration.[449] The second part will ascertain the way ahead.

First, critics would argue that Packard's reforms between 1969 and 1971 were limited in effect because he failed to institutionalize durable mechanisms to combat Packard's "axis of evil" effectively—what he identified as the three fundamental problems of defense acquisition (described in Part III)—designs that are too complex and ambitious, have too much tolerance of concurrency, and have poor management of programs because of the lack of the authority provided to the services to manage trade-offs and rapid turnover of uniformed program managers. The institutional memory of the services is short. Acquisition programs continue to suffer the same problems today.[450] However, Packard's legacy as DEPSEC illustrates that the effects of reform do not have to be permanent for them to be meaningful. Instead, acquisition reform is meaningful if it creates a window of opportunity that is exploited to achieve desired effects, that is, to increase or improve the options available to OSD and DOD decision makers in the long run. In the case of Packard, his reform efforts provided a set of conditions leveraged by Air Force leadership to launch much of what the DOD now refers to as fourth-generation airpower—platforms including the F-16, F/A-18, F-15, A-10, AWACS, C-17, B-1, and S-3. Launching these programs between 1969 and 1972 provided the Reagan administration with an increased number of production-ready, combat-ready options to modernize the force in the 1980s.

Critics would also argue that Packard had negligible influence on the rise of fourth-generation airpower, as several of its programs, such as the F-15, were already in various stages of design and development when Packard arrived at the Pentagon in 1969. This paper argues that the method of procurement matters a great deal. The rise of fourth-generation airpower was not inevitable, particularly in the face of significant budget cuts of the early 1970s. Instead, it required Packard to design and implement a deliberate, long-term strategy that enabled the DOD to modernize its forces during a decade of considerable cost constraints. Packard's most significant contribution was his sequential, incremental, "fly-before-you-buy" approach to defense acquisition. This decreased the risk and uncertainty burdened by OSD and the services as part of a broader, more cohesive strategy which this paper refers to as the LP Way. Packard countered the influence of defense conglomerates by breaking large programs into smaller ones, without guarantee of production, and sponsoring competition as far into the acquisition life-cycle as possible. A crucial part of Packard's strategy to enable competition was to increase support for prototyping and the opportunity for more programs to proceed into the initial phases of hardware development. Over three decades of experience building HP helped Packard tackle this problem. His business had survived two budget downturns, first after World War II and then after the Korean War, and therefore, he approached the defense acquisition problem from the perspective of the private sector and devised a solution that maintained competition within the defense industrial base.

Third, critics would argue that it is illogical to speed the defense acquisition system up by slowing it down. Packard's legacy indicates the opposite. Perhaps most significantly—although there was not an end to the Vietnam War in sight in 1969—Packard was not rushed nor asked by Secretary of Defense Melvin Laird for an immediate solution. Instead, from the moment he stepped into the Pentagon, Packard was allowed to look far into the future, beyond Vietnam, to structure the DOD's modernization efforts. While senior leaders are often tempted to demand and expect immediate results within the constraints and context of the current era or conflict, Laird and Packard refused to fall into this trap. Instead, they structured their partnership in a manner to effectively handle issues at hand. This included the Vietnam War and negotiations with the Soviet Union, while at the same time establishing an unparalleled degree of strategic clarity. The prioritization of long-term, strategic goals, instead of building a reactionary culture, is perhaps the essential characteristic of the LP Way. Laird and Packard were not looking for quick fixes; instead, they were looking for a fundamentally sound approach to designing the force of the future.

Just as the fall of Saigon in 1975 compelled veterans of the Vietnam War to think critically about the nature and character of war—as marked by the resurgence of Clausewitz and Sun Tzu in Western military study—the fall of Mosul to Islamic State in Iraq and Syria (ISIS) in 2014 has provided a similar opportunity for the current generation of American leaders. Both the fall of Saigon and Mosul were moments in history where US military leaders questioned the efficacy of the military establishment in achieving long-term strategic aims. Secretary of Defense James Mattis recalls General Sherman's famous quotation, "every attempt to make war easy and safe will result in humiliation and disaster."[451] As the study of David Packard's time in the Pentagon illustrates, there are not any short-cuts in defense acquisition either. Therefore, acquisition professionals should remain leery of recent calls for "rapid" acquisition, specifically if they pressure programs to commit prematurely to production. As this paper illustrates, concurrency is neither a sufficient nor a rapid method of procurement. Instead, Packard characterized concurrency as a position for the desperate, naïve, or a combination of both. He rationalized: "[Concurrency] results from anxiety on the part of the services to get the weapon into operation."[452] Above all, concurrency serves the interests of specific stakeholders more than the greater good—premature commitment to production is a method to procurement that denies competitors the opportunity to prove the worth of their design.

Fourth, critics may contend that the LP Way is not relevant given the advancements in technology and increased complexity of systems developed between the 1960s and 2010s. Although the character of defense acquisition will continually change, the nature of defense acquisition is immutable. Therefore, the LP Way is relevant today and will remain so far into the future. Problems with the F-35 program and other recent acquisition efforts mirror troubled 1960s programs—the C-5A and F-111—encountered as Packard and Laird arrived at the Pentagon. A 2017 interview of the recently retired F-35 Program Executive Officer (PEO), Lt Gen Christopher C. Bogdan's provides insight into the relevance and applicability of the LP Way on new programs.[453] Bogdan's comments can be easily framed within Packard's "axis of evil," the three problems of defense acquisition.

On buying overly complex systems, Bogdan decried the "Big Bang Theory" of acquisition, describing it as: "I'm going to take all these huge requirements, and I'm going to build one single program from start to end, and in the end, I'm going to deliver you everything you want in one fell swoop." It's a "terrible strategy," Bogdan said, and it "never, ever, ever works." To speed things up, Bogdan, like Packard, suggested slowing things down. "You've got to build up; you've got to do things in increments." Bogdan insisted this approach be

applied to hardware and software alike. Although Bogdan encountered resistance to this approach from the user, financial managers, comptrollers, and Congress, he claims: "you'll actually go faster in the end. And you'll get a better weapon system." "There's a lot of institutional resistance to what some people call "spiral:" I call it the "incremental acquisition strategy." Bogdan ordered work stopped on the 3F version of the software, which was being developed concurrently to the previous version, 3i. "Forget 3F for now . . . we've got to fix 3i. Because if you don't get 3i right, you don't get 3F."[454]

On the concurrent nature of the F-35 program: "The 200-plus aircraft already delivered are in many different configurations and will all require modifications to bring them up to 3F standard. It will be a massive

Enterprise . . . even more so than the development effort . . . there's going to an awful lot of airplanes in an awful lot of places in an awful lot of configurations." Compounding the challenge, Bogdan reported that there are parts that only fit a specific batch of airplanes: "some of those parts have moved to a new design, but earlier jets have yet to catch up through retrofit." Some parts, such as the fuel pump, are not meeting reliability and maintainability goals. [455]

On Packard's third problem, the rapid turnover of uniformed personnel, Bogdan and his predecessor, Vice Adm David J. Venlet, secured permission to change the two-year rule so that the PEO could stay longer.[456] They understood that repairing the culture of dysfunction within the F-35 program would take more time. Bogdan describes how the consistency of leadership provided uniformity in the message to Congress, the partners, and the industry. Also, "people have to know, both on the industry side and the government side, that they can't wait you out." Bogdan served as the F-35 PEO for five years, from 2012 to 2017.[457]

Bogdan's interview illustrates that Packard's "three problems"—concurrency, complexity, and poor management practices—persist today. But why? Perhaps it is because Packard's "axis of evil" represents the natural state of the defense acquisition system with a set of conditions that satisfy the largest aggregate amount of stakeholders within the system. Packard's experience as DEPSEC illustrates how stakeholders will naturally seek courses of action that serve their individual political, parochial, or profit-driven interests. There are not any heroes or villains within the defense acquisition system, only rational actors. Perspective matters when reflecting on Packard's "three problems." While concurrency, complexity, and poor DOD management are seen as problems from the perspective of the greater good, these "problems" paradoxically serve the interests of other stakeholders by lowering the risk and uncertainty within their respective spheres of influence. The pervasiveness of

the three problems in the modern era compound calls from senior military leaders to "fix" defense acquisition.

Fifth, critics may argue that the DOD cannot afford an approach involving extensive competitive prototyping. Packard's legacy calls attention to the economic challenges faced during the drawdown from Vietnam and marked by the loss of two million defense-related jobs across the defense industry by the military and government civilians. In 2014, Dr. J. Ronald Fox (Harvard University professor and former assistant secretary of the Army) posited that corrupt management practices, including concurrency, continue because they are aligned with the incentives; "that is, they minimize the risk that programs will be cut back or canceled."[458] It is natural for stakeholders within these spheres to act in a manner to protect their interests, particularly those related to long-term employment prospects and job security. Packard states:

> I visited one plant last year [1971] that was running a year behind its project schedule. After a couple of hours, it was apparent the company knew it would be at least a year off schedule on the day the contract was signed. I asked the manager why he offered to do the job in one year less than was possible. The essence of his reply was—yes, we knew we could not meet the terms of the contract, but there was no way to get the contract if we told the truth.[459]

Such instances illustrate why maintaining competition is essential. Maintaining competition and withholding the production decision until a later point is the only mechanism to ensure the DOD has options to fall back onto when a contractor fails to fulfill contractual obligations. It is the only approach that recognizes competition as the optimal path toward progression. Absence of competition results in programs that are unable to fail. A defense acquisition system that does not accommodate failure or significant restructuring of its programs is inherently ineffective, as failure is a cornerstone of growth and progression. The development of complex weapon systems represents "wicked problems" that require significant redesign and an iterative approach to maximize chances of success.

Moreover, frequent turnover in key military acquisition positions provides the defense industry favorable conditions for which to bargain and conduct negotiations. This paper illustrated how Grumman waited for Packard to leave to renegotiate a more favorable contract for the F-14 program. As Lt Gen Bogdan's 2017 interview illustrates, it is difficult for a uniformed program manager to make meaningful changes if the contractor knows he or she will be gone in less than two years.

Sixth, Packard's legacy illustrates how reform is difficult. Forces within the system inherently seek to defer substantial changes to the status quo. This includes the introduction of new platforms—as reflected by new plans to extend

the service of existing platforms—such as the F-16s until 2046 and the A-10 into the 2030s. Packard's reform efforts inherently shifted risk and uncertainty from OSD to other stakeholders in the system. Therefore, OSD and the DOD can expect to encounter resistance if they hope to become agents for reform, both externally and internally. As this study illustrates, both the Army and Air Force were furious at OSD for their handling of the A-X competition. Military leaders initially opposed Packard's calls to introduce of precision-guided munitions, and pilots within the Air Force initially opposed the introduction of the YF-16 and its paradigm-shifting fly-by-wire technology. Packard's "Hail Mary," the advanced prototyping initiatives, indicated even more disruption was possible within the services. The prospect of the Army operating small unmanned aerial scouts, the Navy weaponizing a higher number of ships with modular missiles, and the Air Force operating stealth remotely piloted aircraft seem inevitable in hindsight, but they were radical notions to the services top brass in 1971. Perhaps most significantly, by attempting to provide windows of opportunity not only for the services themselves but also for minority voices within the services, Packard often moved too fast for comfort.

Seventh, another area where Packard's legacy offers utility is his "axis of evil"—concurrency, complexity, and poor management—it was simple, understandable, had timeless tenets, and a message which quickly permeated and resonated with the acquisition workforce. As the "Packard Memo" demonstrated, David Packard understood the value of delivering broad intent throughout an organization, from top-to-bottom. For Packard, reaching the grassroots level was critical. From his Ivory Tower in the Pentagon, Packard could turn the wheel of the ship, but he knew it took the entire organization to change its direction. Therefore, Packard's "three problems" approach merits consideration for the modern leader as an overarching framework for the problem that can be understood by everyone from second lieutenants to senior leaders.

Eighth, Packard demonstrated time and time again that he did not care what form or shape the future force structure took during his time as DEPSEC, as long as it served the DOD's overarching mission of protecting the interests of America and her allies. For these reasons, Packard was willing to champion paradigm-shifting technologies in front of Congress well ahead of when they would be accepted. This reinforced the notion that Packard was not an idea man, instead he was a process man. Just as he prospered by facilitating the rise of a diverse ecosystem of products at HP, he attempted to facilitate the rise of a diverse ecosystem of weapon systems during his years in the Pentagon. This approach to business made Packard plenty of enemies within the power brokers looking to maintain the status quo of the defense

acquisition system, but it simultaneously garnered him a tremendous amount of loyalty and respect.

Understanding Packard's intent requires the study of the HP Way. Packard was likely surprised and disappointed with the resistance that the services and other stakeholders within the system showed toward change. In California, HP rode the first waves of the digital revolution. More than anyone, Packard wanted to usher the military into the digital era. Packard likely viewed analog systems as obsolete as he stepped into the Pentagon in 1969. Given his experience, Packard's ideas to merge digital technology with warfare were easily three to four decades ahead of senior military leaders. From its earliest days, HP's corporate culture embraced uncertainty and thrived on a broad and diverse ecosystem of products, using processes, such as Hewlett's "three hats" to facilitate and scale a bottom-up approach to innovation. Within this context, Packard had learned to become comfortable with uncertainty.

Throughout his life, Packard also demonstrated an unwavering willingness to bet on the underdog and support David instead of Goliath. Packard was an underdog himself when he co-founded HP out of a one-car garage in Palo Alto. Packard saw the dangers of large defense conglomerates and their patron stakeholders in stifling innovation and competition within the defense industrial base. At the same time, Packard understood that it was often the DOD and OSD that provided incentives for defense contractors, particularly prime integrators, to burden excessive risk and uncertainty.[460] Packard willingly admitted that he initially opposed the products which defined much of HP's future success, such as the handheld calculator and the personal computer. This mindset illustrates that Packard did not have a vested interest in what form or shape HP's products took, as long they served to support his company's overarching mission of contributing to society. Packard was frustrated that the same could not be said of the military.

On the Way Ahead

> *The only sensible course is to hold the contractor to his contract. Although some companies may be forced to suffer financially because of this concept, it will not be a major disaster to the country. It will be a very major disaster to the country if we cannot get the military-industrial complex to play the game straight.*
>
> -David Packard

Quite simply, it means the Army, the Navy, the Air Force, and the Marines must put the welfare of America ahead of their respective service, in peacetime as well as in war . . . it means the great industrial corporations that forge the seams of our military strength must put the long term gains of America ahead of the short term gains of their respective organizations.

-David Packard

Similar to 1969, is there a possibility OSD would ever re-declare war on the "Three Problems," or Packard's "Axis of Evil" of defense acquisition programs? [461] Many would argue, including this author, that OSD always has and always will be in a perpetual struggle among the stakeholders within the defense acquisition system, including with itself.[462] Given the zero-sum nature of the system calls for defense acquisition reform to never cease; instead, sources of discontent flow from one group of stakeholders to another. Recent calls from the DOD and OSD for change is nothing new; it is the predictable consequence of how defense programs have been structured over the last two decades (high levels of complexity and concurrency). Specific symptoms currently experienced by senior leaders include a dearth of options within specific war-fighting domains. Because of a lack of competition, a significant amount of resources are tied up in relatively few, ineffective programs, which in turn creates an overall sense that the system is nonresponsive to the immediate needs of the military services. The bigger question is whether or not the DOD and OSD will ever be able to effectively wage war, to achieve its own aims and interests better. If so, under what conditions and whose leadership?

Packard's legacy illustrates that while change is possible, it requires a unique balance of leadership—a hard-charging leader within OSD who is looking more for long-term payoffs rather than immediate results. It also requires a deliberate and concerted course of action from top leadership within the Pentagon to seek out minority voices within the services and provide the opportunity for their programs to enter prototyping competitions, while at the same time not committing those programs to production. Packard demonstrates how effective reform starts small, program by program. While it can be argued that Packard arrived at the Pentagon during a chapter in history conducive to reform, there is also not a reason to believe that crisis is necessary for meaningful reform to occur. Similarly, although this paper argues that the unique culture at HP and Packard's contributions to the managerial methods it employed translated to relative success in the Pentagon, there is also not a reason to believe a specific pedigree or background is required for

a leader within OSD or the services to affect meaningful change. In other words, Packard's legacy does not exclude someone from an entirely different background from achieving similar success. The barriers that exist within the system are human-made; therefore, the path to overcoming them will remain within the realm of the possible.

Within this context, Packard's legacy asks the reader to think critically about the nature of humanity. The policy is human-made and continuously evolving. Therefore, the policy is imperfect, and its implementation is only as effective as the competence and ability of its workforce. Understanding and implementing policy as it was intended requires not only studying the policy but also developing an understanding of its authors and the era in which they lived. Therefore, this paper contends that understanding the intent of the original DODD 5000.1 is best served by understanding David Packard, his experiences, and the era in which he served in the Pentagon. Within this context, there is room to compare war-fighting doctrine with acquisition policy. War-fighting doctrine is often written at the cost of American bloodshed and lives and the result of hard-fought lessons learned on the battlefield. Therefore, it is intuitive that military officers would study famous battles and military leaders of past generations. Similarly, acquisition policy is written at the cost of hard-earned American taxpayer dollars and the culmination of best practices and lessons learned during the development of new weapon systems. This implies that military officers need not only be versed in military history, current events, and politics but also have a decent grasp of how the DOD procures its weapon systems.

If it takes a general decades to gain enough experience to build his or her ability to lead large and complex military formations in effectively waging war (the battle itself). Does it translate to success in making good decisions within the realm of defense acquisition (the battle before the battle)? The answer is not crystal clear. Can our senior leaders speak as intelligently in the economic and political context in which Alan Mulally, Dutch Kindleberger, and David Packard made decisions to advance the development of new technology as they can about the factors that influenced how Eisenhower, Napoleon I, and Nimitz made decisions on the battlefield? Can our senior leaders distinguish between "total" and "limited" acquisition programs, just as they can speak to the concepts of total and limited war?

As Sun Tzu famously wrote, "if you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle." Sun Tzu's principles are as relevant within the realms of business and defense

acquisition as they are the battlefield. Although incredibly competent and capable leaders on the battlefield, it is natural for military officers to lack the experience and knowledge of their defense industry counterparts.[463]

The LP Way offers some insights into characteristics of favorable acquisition campaigns and lessons learned of the past, but it is also not all-inclusive—although based on fundamentally sound principles—as the influence of the human dimension on the defense acquisition system cannot be understated. Similar to war, defense acquisition is much more an art than a science. There is not any amount of analytical tools and independent cost estimates that can capture the second and third-order effects of human nature. For example, competition is an essential ingredient of the LP Way, but analytical models and cost estimates often fail to capture its inherent value.

In conclusion, the purpose of this paper was not to identify a specific solution or strategy, instead it is to introduce the reader to an important chapter in the history of defense acquisition. As Table 2 illustrates, this study is limited in the sense that it slices through a tiny corner of the defense acquisition system, through a very narrow window of time (1969–71), and is only from the perspective of one stakeholder. It challenges the reader to place Packard's experience within the context of their knowledge and experiences. The barriers to innovation and modernization are inherently baked into the current system as a function of existing incentives, processes, and organizations. Therefore, this study also challenges the reader to question his or her own organization's role and mission within the broader acquisition process as well as apply critical thought to existing acquisition policies. Despite the nature of the barriers within the system, Packard always voiced optimism: "if we want to remain a powerful nation, we can do so. And if we are powerful, we can influence the course of history in a positive way."[464] History has shown us that stakeholders will not willingly sacrifice their interests, particularly if the resources once allocated to them are now at risk to be reallocated to new technology or a way of warfare. The LP Way rectifies this situation as it simultaneously provides an opportunity for each stakeholder to demonstrate the potential worth of their desired weapon system, while also demanding a high level of certainty in system cost and performance before national resources are committed to its production.

Follow-on Research

The following three questions will guide Major Fredrickson's follow-on research:

1. Should defense acquisition policy be studied as a destination point of departure? If a policy is a destination, it is crucial to understand how we got here. If a policy is a point of departure, it is essential to understand where we are going (i.e., focus on the design of future acquisition strategy and perhaps, more importantly, methods of implementation). This paper analyzed Packard's original issuance of DODD 5000.1, both as a destination (by studying lessons learned from acquisition programs of the late 1960s), and a point of departure (by studying Packard's initiatives after issuing the policy (i.e., the advanced prototyping initiatives). Moving forward, Major Fredrickson would like to apply a similar method of study to other critical junctures in defense acquisition history.

2. What does a "good" acquisition program look like? Within the context of the battle itself, war-fighting doctrine offers soldiers a clear image of what "good" operations look like by synthesizing lessons learned by battlefield commanders and war theorists in the past and distilling those lessons learned into a simple and understandable set of principles, tenets, and planning processes. Such principles, tenets, and planning processes influence the way military forces train and fight. As an example, military officers are trained throughout their careers to design operations that adhere to the Principles of War: Mass, Objective, Simplicity, Surprise, Maneuver, Offensive, Unity of Command, Security, and Economy of Force. Military operations that adhere to these principles are usually seen as good, as they often result in victory on the battlefield. Conversely, military operations that violate these principles are usually seen as bad, as they usually are associated with a higher risk of the failure to achieve combat objectives. Although the weapon systems and technologies soldiers employ in war continue to change, the principles of war are timeless; they are as relevant and applicable on the battlefield today as they were hundreds of years ago. With this in mind, looking to the realm of defense acquisition (the battle before the battle), what do senior military leaders think a "good" acquisition program looks like? It is natural for acquisition professionals to focus on achieving cost, schedule, and performance goals, as the delivery of a weapon system within such constraints often constitutes a "victory" within the defense acquisition system. However, similar to victory on the battlefield, the delivery of a weapon system within such constraints represents an end-state or outcome. Moreover, similar to victory in battle,

delivering a weapon system "on-time, on-budget, on-performance" does not offer any insight into the approach, characteristics, or conditions which may have predetermined or at least significantly influenced the ability of an acquisition campaign to achieve its initial cost-schedule-performance goals. Moving forward, Major Fredrickson wants to answer the following: "If there are principles or tenets of defense acquisition, what are they? Furthermore, how can the DOD align its acquisition campaigns with those principles and tenets to maximize chances for success?"

3. Finally, should the DOD explicitly integrate political ends into the crafting of acquisition strategy? Within the context of the battle itself, the ability for the military commander to have a clear understanding of the political situation and distinguish between "limited" versus "total war" is imperative. Throughout history, governments have employed warfare to achieve political aims; therefore, political aims explicitly drive the resources, appetite for risk, and priority allocated to war efforts. Therefore, senior military leaders are expected to develop an acute sense of the political context in which a conflict is occurring and synchronize military means to achieve the desired political ends of the nation's elected leaders. Major Fredrickson believes the same framework can be applied to the defense acquisition system. The acquisition workforce should have a clear understanding that programs are often designed, and resources are allocated primarily to achieve political aims. Of the three questions, this is the most controversial. However, if the senior military leader views "total war" as the exception and not the rule, then applying such an analogy to gain insight into the nature of constraints and limitations that exist within the defense acquisition system may offer utility and provide rationale for why the system may not be as responsive as the services desire. Usually the battles that the DOD fights within the realm of defense acquisition are much more analogous to "limited" war than they are to "total" war. Therefore, the DOD is perhaps better served if it crafts acquisition strategy with this in mind.

Notes

(All notes appear in shortened form. For full details, see the appropriate entry in the bibliography.)

1. "Air Force Senior Leaders Unveil New Priorities."
2. Betts, "Is Strategy an Illusion," 39.
3. Nixon, *Annual Message to the Congress of the State of the Union.*
4. Senate, *Advanced Prototype Initiatives.*

5. Milestone C: The decision to enter production follows development and testing. For DOD, the production decision is normally broken into two DOD decisions: (1) Low-Rate Initial Production, called Milestone C by DOD, or Limited Deployment; and (2) the Full-Rate Production or Full Deployment Decision, see https://web.archive.org/, 7. Milestone B: A decision to award the contract(s) for development. Formally, the development contract award authorized at DOD's Milestone B is the critical decision point in an acquisition program because it commits the organization's resources to a specific product, budget profile, choice of suppliers, contract terms, schedule, and sequence of events leading to production and fielding, see https://web.archive.org/, 7.

6. Milestone A: Risk Reduction Decision, called Milestone A by DOD, is an investment decision to pursue specific product or design concepts, and to commit the resources required to mature technology and/or reduce any risks that must be mitigated before decisions committing the resources needed for development leading to production and fielding, see https://web.archive.org/, 7.

7. Packard, "Toward Better Management of the Development and Acquisition of New Weapon Systems." Adapted from testimony before the House Appropriations Committee, 18 March 1971, 179.

8. "*Moore's Law* is the observation made in 1965 by Gordon Moore, co-founder of Intel, that the number of transistors per square inch on integrated circuits had doubled every year since the integrated circuit was invented. Moore predicted that this trend would continue for the foreseeable future. In subsequent years, the pace slowed down a bit, but data density has doubled approximately every 18 months, and this is the current definition of Moore's Law, which Moore himself has blessed. Most experts, including Moore himself, expect Moore's Law to hold true until 2020-2025." See https://www.webopedia.com/.

9. Coram, *Boyd, 280.*

10. Coram, *Boyd*, 280.

11. "Interview with David Packard, Deputy Secretary of Defense. Military Spending: Impact on Business."

12. Butkus, "Packard: Defense on a Diet."

13. Butkus, "Packard: Defense on a Diet."

14. Watts, *Strategy for the Long Haul,* 31.

15. Beecher, "What is a Man This Rich Doing Running the Pentagon?"

16. See *Operation of the Defense Acquisition System*, DOD Instruction 5000.02, 2003, https://web.archive.org/; O*peration of the Defense Acquisition System*, DOD Instruction 5000.02, 2008, https://web.archive.org/; and *Operation of the Defense Acquisition System*, DOD Instruction 5000.02, 2015, https://web.archive.org/.

17. DOD Directive (DODD) *5000.1, Acquisition of Major Defense Systems.*

18. Borklund, "Defense Management."

19. For information on the "Packard Memo" contents, see "Document 46, Action Memorandum From K. Wayne Smith of the National Security Council Staff to the President's Assistant for National Security Affairs (Kissinger)," in *Foreign Relations of*

the United States, 1969–1976, Volume IV, Foreign Assistance, International Development, Trade Policies available at https://history.state.gov/.

20. Packard, "Toward Better Management of the Development and Acquisition of New Weapon Systems," Adapted from testimony before the House Appropriations Committee, 18 March 1971, 179–185.
21. Beecher, "What is a Man This Rich Doing Running the Pentagon?"
22. Butkus, "Packard: Defense on a Diet."
23. Press Conference, Deputy Secretary of Defense-Designate David Packard with Secretary of Defense-Designate Laird in Washington DC, 30 December 1968.
24. Butkus, "Packard: Defense on a Diet."
25. "483 BC–Athens Builds a Navy,"
26. "483 BC–Athens Builds a Navy,"
27. Keatley, "Pentagon Power."
28. "Oral History Interview with Mr. David Packard." Interview by Dr. Alfred Goldberg and Dr. Maurice Matloff. Washington DC: Office of the Secretary of Defense, 9 November 1987. 3.
29. Packard, *The HP Way, 1*68.
30. Packard, *The HP Way,* 167–68.
31. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 9.
32. Van Atta, *With Honor,* 5.
33. Van Atta, *With Honor,* 144.
34. Malone, *Bill & Dave,* 242–43.
35. Packard, *The HP Way,* 175.
36. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 5.
37. Packard, *The HP Way,* 175.
38. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 9.
39. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 10.
40. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 10.
41. Van Atta, *With Honor,* 145.
42. Press Conference, Deputy Secretary of Defense-Designate David Packard with Secretary of Defense-Designate Laird. Washington DC, 30 December 1968.
43. Packard, *The HP Way,* 185.
44. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 9; Van Atta, *With Honor,* 44.
45. Packard, *The HP Way,* 7.
46. Packard, *The HP Way,* 8.
47. Levy, "Biography Revisits Fred Terman's Roles in Engineering, Stanford, Silicon Valley."
48. Packard, *The HP Way,* 33.
49. Packard, *The HP Way,* 27.
50. Packard, *The HP Way,* 22-44.
51. Packard, *The HP Way,* 60.
52. See "Treaty of Rome," *Britannica.com,* https://www.britannica.com/.

53. Packard, *The HP Way,* 72.
54. Packard, *The HP Way,* 122.
55. Packard, *The HP Way,* 123.
56. Packard, *The HP Way,* 124.
57. Senate, *Nominations of Laird, Packard, and Darden, Hearings before the Committee on Armed Services United States Senate,* 39.
58. Packard, *The HP Way,* 77.
59. "Mr. Packard Would Rather Listen."
60. Packard, *The HP Way,* 140.
61. Packard, *The HP Way,* 105.
62. Packard, *The HP Way*, 101.
63. Packard, *The HP Way*, 102.
64. Packard, *The HP Way*, 105.
65. Packard, *The HP Way*, 104.
66. Packard, *The HP Way*, 108.
67. Eric Wasatonic, "HP Origins #0119."
68. "Mr. Packard Would Rather Listen."
69. Packard, *The HP Way*, 148.
70. Packard, *The HP Way*, 152.
71. Packard, *The HP Way*, xxiii.
72. "Mr. Packard Would Rather Listen."; Beecher, "What Is a Man This Rich Doing Running the Pentagon? and "Facts & Figures: Land Area and Facilities."
73. "Mr. Packard Would Rather Listen,"; Beecher, "What is a Man This Rich Doing Running the Pentagon."
74. "Mr. Packard Would Rather Listen."
75. Comptroller General of the United States, "Table 7-5: Department of Defense Manpower." *National Defense Budget Estimates for FY 2017*, 258, Comptroller.defense.gov, https://comptroller.defense.gov/.
76. Comptroller General of the United States, "Table 6-1: Department of Defense TOA by Public Law Title," *National Defense Budget Estimates for FY 2017*, 80, Comptroller.defense.gov, https://comptroller.defense.gov/.
77. Boyd, "Outward Bound: A Less Complex System."
78. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 4.
79. Brigham, "Lyndon Johnson vs. the Hawks."
80. United States Department of State, Office of the Historian "U.S. Involvement in the Vietnam War: The Tet Offensive, 1968."
81. Getler "David Packard."
82. Cheshire "The Pentagon's Powerful No. 2 Man."
83. Clodfelter, *The Limits of Airpower,* 112.
84. Doyle, "1967 Soviet Air Show: Naming the Planes."
85. Getler, "David Packard."
86. Packard, *The HP Way*, 176

87. "The Stennis Era, 1969–1980."
88. "The Stennis Era, 1969–1980."
89. Brigham "Lyndon Johnson vs. the Hawks."
90. Brigham "Lyndon Johnson vs. the Hawks."
91. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 8.
92. "Decentralization at the Pentagon."
93. Packard, *The HP Way*, 176.
94. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 9.
95. "US Involvement in the Vietnam War: The Tet Offensive, 1968."
96. Clodfelter, *The Limits of Airpower,* 134.
97. Clodfelter, *The Limits of Airpower,* 113–15.
98. Clodfelter, *The Limits of Airpower,* 115.
99. Clodfelter, *The Limits of Airpower,* 115.
100. "Packard Sees Arms Balance as Chief Aim."
101. Doyle, "1967 Soviet Air Show: Naming the Planes."
102. Doyle, "1967 Soviet Air Show: Naming the Planes."
103. Gething, *Modern Fighting Aircraft: F-15,* 4.
104. Gething, *Modern Fighting Aircraft: F-15,* 4.
105. Gething, *Modern Fighting Aircraft: F-15,* 4.
106. Fox, *Defense Acquisition Reform 1960-2009,* 37.
107. Miller, *General Dynamics F-111, 5*7.
108. Miller, *General Dynamics F-111,* 26.
109. Miller, *General Dynamics F-111*, 47.
110. Miller, *General Dynamics F-111*, 36.
111. Miller, *General Dynamics F-111*, 36.
112. Miller, *General Dynamics F-111*, 283.
113. Seamans, Robert C. *Aiming at Targets,* 170.
114. Logan, *General Dynamics F-111 Aardvark,* 283.
115. Logan, *General Dynamics F-111 Aardvark,* 9.
116. McIver, *The F-14 Contract,* 18.
117. Launius and Dvoscak, *The C-5 Galaxy History,* 34.
118. Launius and Dvoscak, *The C-5 Galaxy History,* 41.
119. Launius and Dvoscak, *The C-5 Galaxy History,* 43.
120. Launius and Dvoscak, *The C-5 Galaxy History,* 41.
121. Packard, *The HP Way,* 179.
122. Griffin, *C-5A Galaxy Systems Engineering Case Study, 22.*
123. Launius and Dvoscak, *The C-5 Galaxy History,* 35.
124. Launius and Dvoscak, *The C-5 Galaxy History,* 37.
125. Launius and Dvoscak, *The C-5 Galaxy History,* 37.
126. Logan, *General Dynamics F-111 Aardvark,* 14.
127. Logan, *General Dynamics F-111 Aardvark,* 36.

128. Logan, *General Dynamics F-111 Aardvark,* 284.
129. Logan, *General Dynamics F-111 Aardvark,* 286.
130. Launius and Dvoscak, *The C-5 Galaxy History,* 11.
131. Launius and Dvoscak, *The C-5 Galaxy History,* 6.
132. Griffin, *C-5A Galaxy Systems Engineering Case Study, 22.*
133. Griffin, *C-5A Galaxy Systems Engineering Case Study,* 21.
134. Griffin, *C-5A Galaxy Systems Engineering Case Study,* 21.
135. Fox, *Defense Acquisition Reform 1960-2009,* 37.
136. Miller, *General Dynamics F-111,* 47.
137. Fox, D*efense Acquisition Reform 1960-2009,* 37.
138. Fox, D*efense Acquisition Reform 1960-2009,* 38.
139. "Wicked Problems:" A 2008 US Army document, "Commander's Appreciation and Campaign Design" is useful the framing the fundamental flaws of concurrency in acquisition. Designed to aid military commander's conduct sound operational planning, the document identifies three types of problems: well-structured "puzzles," medium-structured "structurally complex problems," and ill-structured "wicked problems." Initially conceived to characterize socially complex problems, concept of "wicked problems"—not wicked in the sense of evil but it terms of being extremely difficult—can also be applied to the development of complex weapon systems, such as the F-111 and C-5A. The two easier types of problems, "puzzles" and "structurally complex problems" can be solved in one iteration—by learning to perfect a technique or learning to perfect technique and adjusting the solution. For solving a "structurally complex problem," therefore, adjusting the solution may require a redesign of individual components, which is possible within the constraints of the original design. In other words, flexibility exists within the original design to adjust, redesign, and fix a problematic component or parts. Major redesign is not required. However, solving a "wicked problem" conversely requires that an iterative, cyclical approach be applied to problem solving, such that the entire original problem be "reframed" entirely. In such instances, major redesign is often required. The concurrent approach locks engineers and designers into the original design, preventing them from conducting significant re-designs or applying an iterative, cyclical approaches to solving the problems at hand. The fatal flaw of concurrency is the inability to iterate between the designing and engineering steps at a system level. Prototyping and a sequential approach to development enables engineers to test the design, identify poor assumptions or limits in the original design, and go back to the drawing board to conduct necessary design changes to the primary architecture of the system.
140. "Mr. Packard Would Rather Listen."
141. Miller, *General Dynamics F-111,* 55.
142. Seamans, *Aiming at Targets.,* 156.
143. News Conference by Secretary of Defense Mel Laird and Deputy Secretary of Defense David Packard. Pentagon, 18 February 1969.
144. "Oral History Interview with Mr. David Packard," 15.
145. "Decentralization at the Pentagon."

146. Borklund, "Defense Procurement Trends."
147. Borklund, "Defense Procurement Trends."
148. Borklund, "Defense Procurement Trends."
149. "Dr. Robert Channing Seamans Jr.," *United States Air Force Official Biography.*
150. Seamans, A*iming at Targets,* 156.
151. "Oral History Interview with Mr. David Packard," 5.
152. "Dr. John L. McLucas," *United States Air Force Official Biography.*
153. Seamans, *Aiming at Targets,* 161–62.
154. "Oral History Interview with Mr. David Packard," 3.
155. "Oral History Interview with Mr. David Packard," 11.
156. Keatley, "Pentagon Power."
157. Beecher, "What is a Man This Rich Doing Running the Pentagon?"
158. Beecher, "What is a Man This Rich Doing Running the Pentagon?"
159. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 20.
160. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 5.
161. News Conference by Secretary of Defense Mel Laird and Deputy Secretary of Defense David Packard.
162. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 256–57.
163. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 259.
164. Comptroller General of the United States, "Table 6-8: Department of Defense Budget Authority by Public Law Title" and "Table 7-5: Department of Defense Manpower," in *National Defense Budget Estimates for FY 2017*, 133 and 258.
165. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 256.
166. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 256.
167. Deputy Secretary of Defense David Packard Interview for Station WLWT, Cincinnati, Ohio, Pentagon, Washington DC., 25 September 1969.
168. "Secretary Packard Impressed with US Forces in Europe."
169. "Secretary Packard Impressed with US Forces in Europe."
170. Press Conference. Deputy Secretary of Defense David Packard. Wiesbaden, Germany, 10 April 1969.
171. "Main Battle Tank Development Program Reoriented."
172. Senate. *Statement by the Deputy Secretary of Defense Honorable David Packard on the Main Battle Tank Development Program before the Senate Committee on Armed Services*.
173. Senate. *Statement by the Deputy Secretary of Defense Honorable David Packard on the Main Battle Tank Development Program before the Senate Committee on Armed Services*.
174. Senate. *Statement by the Deputy Secretary of Defense Honorable David Packard on the Main Battle Tank Development Program before the Senate Committee on Armed Services*.
175. Butkus, "Packard: Defense on a Diet."
176. "Main Battle Tank Development Program Reoriented."

177. Borklund, "Defense Management."

178. Packard, interview with Newsmen in Japan, 6 June 1969, Transcript, Tokyo, Japan.

179. Packard, interview with Newsmen in Japan, 6 June 1969, Transcript, Tokyo, Japan.

180. . Martinez, "North Korea Shot Down a US plane in 1969, Killing 31 Americans."

181. Packard, interview with Newsmen in Japan, 6 June 1969. Transcript. Tokyo, Japan.

182. News Release. No. 501-69. *Office of Assistant Secretary of Defense (Public Affairs)*, Washington DC. June 12, 1969.

183. News Release. No. 501-69.

184. Harrison, "Packard Wary of S. Koreans' Arms Request."

185. Packard, Briefing for the Press on Trip to Korea and Japan, 12 June 1969, Transcript, Pentagon, Washington, DC.

186. Harrison, "Packard Wary of S. Koreans' Arms Request."

187. Packard, Briefing for the Press on Trip to Korea and Japan.

188. Packard, Briefing for the Press on Trip to Korea and Japan.

189. See Document "29. Editorial Note," in *Foreign Relations of the United States, 1969–1976*, Volume I, Foundations of Foreign Policy, 1969-1972, , available at https://history.state.gov/.

190. See Document "29. Editorial Note."

191. Nixon, Annual Message to the Congress of the State of the Union, 22 January 1970.

192. Packard, David, deputy secretary, DOD, letter 24 September 1969, to the Honorable L. Mendel Rivers, chairman, House Armed Services Committee.

193. Packard, interview with Station WLWT, Cincinnati, Ohio, 25 September 1969, Transcript, Pentagon, Washington, DC.

194. Cheshire, "The Pentagon's Powerful No. 2 Man."

195. Comptroller General of the United States "Table 6-4: Department of Defense TOA by Major Force Program," in *National Defense Budget Estimates for FY 2017*, 101.

196. Posen, "The Sources of Military Doctrine," 28.

197. Packard, David, (address at the Joint Meeting of the St. Louis Chamber of Commerce and the St Louis Chapter, American Ordnance Association, St. Louis, MO, 14 April 1970). Transcript. *News Release: Office of Assistant Secretary of Defense Public Affairs.* No 298-70.

198. Packard, David. Interview with Newsmen, 18 July 1969, Transcript, Pentagon, Washington, DC.

199. Butkus, "Packard: Defense on a Diet."

200. Butkus, "Packard: Defense on a Diet."

201. Butkus, "Packard: Defense on a Diet."

202. Butkus, "Packard: Defense on a Diet."

203. Packard, (address at the Joint Meeting of the St. Louis Chamber of Commerce and the St Louis Chapter, American Ordnance Association).

204. "Interview with David Packard, Deputy Secretary of Defense. Military Spending: Impact on Business."
205. "Interview with David Packard, Deputy Secretary of Defense. Military Spending: Impact on Business."
206. "Interview with David Packard, Deputy Secretary of Defense. Military Spending: Impact on Business."
207. "Interview with David Packard, Deputy Secretary of Defense. Military Spending: Impact on Business."
208. Packard, *The HP Way,* 179.
209. Van Atta, *With Honor,* 502.
210. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 20.
211. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 15.
212. Cheshire, "The Pentagon's Powerful No. 2 Man."
213. Cheshire, "The Pentagon's Powerful No. 2 Man."
214. Beecher, "What is a Man This Rich Doing Running the Pentagon."
215. Butkus, "Packard: Defense on a Diet."
216. Cheshire, "The Pentagon's Powerful No. 2 Man."
217. Cheshire, "The Pentagon's Powerful No. 2 Man."
218. Beecher, "What is a Man This Rich Doing Running the Pentagon."
219. Beecher, "What is a Man This Rich Doing Running the Pentagon."
220. Butkus, "Packard: Defense on a Diet."
221. Beecher, "What is a Man This Rich Doing Running the Pentagon."
222. Borklund, "Defense Procurement Trends and Myths."
223. Borklund, "Defense Procurement Trends and Myths."
224. Seamans, *Aiming at Targets,* 165.
225. Borklund, "Defense Procurement Trends and Myths."
226. Seamans, *Aiming at Targets,* 165.
227. Butkus, "Packard: Defense on a Diet."
228. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 21.
229. Packard, "Toward Better Management of the Development and Acquisition of New Weapon Systems,"179.
230. Packard, "Toward Better Management of the Development and Acquisition of New Weapon Systems,"179
231. Getler, Michael. "David Packard."
232. Packard, *The HP Way,* 100.
233. Packard, *The HP Way,* 100.
234. Packard, *The HP Way,* 140.
235. Keatley, "Pentagon Power."
236. Boyd, "Outward Bound."
237. Boyd, "Outward Bound."
238. Boyd, "Outward Bound."
239. Boyd, "Outward Bound."
240. Borklund, "Defense Procurement Trends."

241. Borklund, "Defense Procurement Trends."
242. Borklund, "Defense Procurement Trends."
243. Borklund, "Defense Procurement Trends."
244. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 15.
245. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 15.
246. Albright and Schram. "Military Regains Planning Role."
247. "Oral History Interview with Mr. David Packard," 3.
248. Cheshire, "The Pentagon's Powerful No. 2 Man."
249. Keatley, "Pentagon Power."
250. Albright and Schram. "Military Regains Planning Role."
251. "Oral History Interview with Mr. David Packard," 5.
252. Keatley, "Pentagon Power."
253. "Decentralization at the Pentagon."
254. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 15.
255. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 15.
256. "Decentralization at the Pentagon."
257. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 15.
258. "Decentralization at the Pentagon."
259. "Decentralization at the Pentagon."
260. Getler, "David Packard."
261. Albright and Schram, "Military Regains Planning Role."
262. Albright and Schram, "Military Regains Planning Role."
263. Albright and Schram, "Military Regains Planning Role."
264. Albright and Schram, "Military Regains Planning Role."
265. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 16.
266. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 17.
267. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 17.
268. Packard, David. (address before the Aerospace Industries Association, Williamsburg, VA. *News Release. No 432-69,* 22 May 1969.
269. "Oral History Interview with Mr. David Packard," 4.
270. "Oral History Interview with Mr. David Packard," 4.
271. "Mr. Packard Would Rather Listen."
272. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 18.
273. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
274. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
275. Beecher, "What Is a Man This Rich Doing Running the Pentagon?"
276. Seamans, *Aiming at Targets,* 162–63.
277. Butkus, "Packard: Defense on a Diet."
278. Getler, "David Packard."
279. Getler, "David Packard."
280. Borklund, "Defense Procurement Trends."
281. McIver, *The F-14 Contract*, 30.
282. McIver, *The F-14 Contract*, 33.

283. McIver, *The F-14 Contract*, 33.
284. McIver, *The F-14 Contract*, 47.
285. McIver, *The F-14 Contract*, 85.
286. "Packard's Effect on Recent Contracts," 665; Spick, *Modern Fighting Aircraft,* 14.
287. Borklund, "Defense Management."
288. McIver, *The F-14 Contract*, 88.
289. McIver, *The F-14 Contract*, 45.
290. McIver, *The F-14 Contract*, 45.
291. Borklund, "Defense Management."
292. McIver, *The F-14 Contract*, 89.
293. McIver, *The F-14 Contract*, 108.
294. Spick, *Modern Fighting Aircraft,* 11.
295. Spick, *Modern Fighting Aircraft,* 11.
296. Spick, *Modern Fighting Aircraft,* 11.
297. Spick, *Modern Fighting Aircraft,* 11.
298. Spick, *Modern Fighting Aircraft,* 11.
299. Spick, *Modern Fighting Aircraft, 11.*
300. Keatley, "Pentagon Power."
301. "Packard's Effect on Recent Contracts," 665.
302. "Packard's Effect on Recent Contracts," 665.
303. Gething, *Modern Fighting Aircraft, 7*.
304. "Packard's Effect on Recent Contracts."
305. "Packard's Effect on Recent Contracts."
306. Spick, *B-1B,* 16.
307. "Packard's Effect on Recent Contracts."
308. Beecher, "What is a Man This Rich Doing Running the Pentagon?"
309. Keatley, "Pentagon Power."
310. Keatley, "Pentagon Power."
311. "Mr. Packard Would Rather Listen."
312. "Mr. Packard Would Rather Listen."
313. Van Atta, *With Honor,* 502.
314. Sbrega, "Southeast Asia," 414.
315. Crane, *American Airpower Strategy in Korea, 1950-1953,* 8.
316. Crane, *American Airpower Strategy in Korea, 1950-1953,* 8.
317. Sbrega, "Southeast Asia," 411.
318. Sbrega, "Southeast Asia," 416.
319. Seamans, *Aiming at Targets,* 174.
320. Van Atta, *With Honor*, 503.
321. Van Atta, *With Honor*, 503.
322. Seamans, *Aiming at Targets,* 174.
323. Seamans, *Aiming at Targets,* 174.
324. Dahl, "The Warthog," 4.
325. Sweetman, *A-10 Thunderbolt*, 8–9.

326. Sweetman, *A-10 Thunderbolt*, 8.
327. Seamans, *Aiming at Targets,* 174.
328. Seamans, *Aiming at Targets,* 174.
329. Sweetman, *A-10 Thunderbolt,* 12.
330. Dahl, "The Warthog," 4.
331. Van Atta, *With Honor,* 503.
332. Van Atta, *With Honor,* 503.
333. Winton, *The Paths of Heaven,* 404.
334. Winton, *The Paths of Heaven,* 405.
335. Winton, *The Paths of Heaven,*407.
336. Winton, *The Paths of Heaven,*407.
337. Borklund, "Defense Management."
338. Borklund, "Defense Management."
339. Borklund, "Defense Management."
340. Borklund, "Defense Management."
341. Borklund, "Defense Management."
342. Butkus, "Packard: Defense on a Diet."
343. Getler, "David Packard."
344. Getler, "David Packard."
345. "Contractors Selected for Development of Air Force B-1 Advanced Strategic Bomber."
346. Spick, *B-1B,*18, 39.
347. "Contractors Selected for Development of Air Force B-1 Advanced Strategic Bomber."
348. Packard, David, deputy secretary, Department of Defense, to Robert Seamans, secretary of the air force, memorandum, 5 June 1970.
349. Packard to Seamans, memorandum.
350. Borklund, "Defense Procurement Trends."
351. Butkus, "Packard: Defense on a Diet."
352. Butkus, "Packard: Defense on a Diet."
353. Butkus, "Packard: Defense on a Diet."
354. Spick, *B-1B*, 23.
355. Spick, *B-1B*, 23.
356. Spick, *B-1B,* 21.
357. "Using the Trick that Built U-2s".
358. Epigraph, Kudock, "DOD Sets New Policy on Weapons Acquisitions;" Packard, *DODD 5000.1, 13.*
359. Packard, *DODD 5000.1,* 1.
360. Packard, *DODD 5000.1,* 5.
361. Packard, *DODD 5000.1,* 5.
362. Packard, *DODD 5000.1,* 6.
363. Packard, "Toward Better Management of the Development and Acquisition of New Weapon Systems," 179.

364. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
365. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
366. "Decision Maker," 32-33.
367. "Decision Maker," 32.
368. "Decision Maker," 32.
369. "Decision Maker," 32.
370. "Decision Maker," 32.
371. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
372. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
373. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
374. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
375. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
376. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
377. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
378. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
379. Pace, "Eugine Fubini, 84"; Kudock, "DOD Sets New Policy on Weapons Acquisitions."
380. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
381. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
382. Kudock, "DOD Sets New Policy on Weapons Acquisitions."
383. Getler, "David Packard."
384. Hunt, *Melvin Laird and the Foundation for the Post-Vietnam Military,* 257, 349.
385. Getler, "David Packard."
386. "Missiles . . . Troops Overseas . . . Naval Forces—What Nixon Defense Study Turned Up," 675.
387. "Missiles . . . Troops Overseas . . . Naval Forces—What Nixon Defense Study Turned Up," 675.
388. "Missiles . . . Troops Overseas . . . Naval Forces—What Nixon Defense Study Turned Up," 675.
389. "Missiles . . . Troops Overseas . . . Naval Forces—What Nixon Defense Study Turned Up," 675.
390. "Missiles . . . Troops Overseas . . . Naval Forces—What Nixon Defense Study Turned Up," 675.
391. Senate, *Advanced Prototype Initiatives,* 24.
392. House, *Department of Defense Appropriations for 1972.*
393. Senate, *Advanced Prototype Initiatives, 2.*
394. Packard, *The HP Way,* 181–82.
395. Senate, *Advanced Prototype Initiatives,* 5-10.
396. Senate, *Advanced Prototype Initiatives,* 22.
397. Senate, *Advanced Prototype Initiatives,* 11-15.
398. "Timing had been one of the great challenges in electronics ever since the Second World War." World War II had spurred the rapid growth of communication technologies, with every communication protocol requiring exact synchronization of

the signal between the transmitter and the receiver. Quartz-crystal oscillators encountered two problems. First, they had to be regularly recalibrated as frequency drift increased with age, temperature, and environment. Second, commercial and defense demand was rapidly approaching the physical limits of quartz crystals themselves. Atomic clocks were developed by the end of the 1950s, however, their long-term reliability was unproven and they were too expensive and complicated for commercial and defense market applications. HP introduced the model 5060A for wider-application in 1964. It was a considerable technological breakthrough with "breathtaking" accuracy: less than one second of error in 3,000 years. As of 2006, descendants of the 5060A still accounted for 80 percent of the world's standardized timekeeping, with HP cesium clocks used for critical timing tasks in NASA space missions, the testing and fusing of nuclear weapons, telecommunications, airplane collision avoidance systems, deep-space astronomical measurements, and countless other applications. Other nations, both friend and foe, were believed to start intelligence operations in Silicon Valley as a result of the HP 5060A: The Soviet Union, China, Taiwan, Japan, France, Germany, and Israel. HP's cesium clock "took the issue of security to a whole new level." In Malone, *Bill & Dave,* 204–206.

399. Senate, *Advanced Prototype Initiatives, 17.*
400. House, *Department of Defense Appropriations for 1972,* 541.
401. Senate, *Advanced Prototype Initiatives,* 49.
402. Senate, *Advanced Prototype Initiatives,* 27.
403. House, *Department of Defense Appropriations for 1972,* 542.
404. Senate, *Advanced Prototype Initiatives,* 27.
405. House, *Department of Defense Appropriations for 1972,* 544.
406. Senate, *Advanced Prototype Initiatives,* 18.
407. House, *Department of Defense Appropriations for 1972,* 542.
408. House, *Department of Defense Appropriations for 1972,* 543.
409. Coram, Richard. *Boyd,* 305–306.
410. Packard, *The HP Way,* 182.
411. "Oral History Interview with Mr. David Packard," 12.
412. "Oral History Interview with Mr. David Packard," 12.
413. Senate. *Advanced Prototype Initiatives,* 43.
414. Packard, *The HP Way,* 181.
415. House, *Department of Defense Appropriations for 1972,* 521.
416. House, *Department of Defense Appropriations for 1972,* 519.
417. How much influence did Packard have on John Boyd? In Boyd's later years, his advice for organizational culture, structure, leadership, and communication processes mirrored many aspects of Packard's suggested "adaptive" management approach for advanced prototypes. One scholar notes that "Boyd not was not an airpower theorist; his work has a much broader scope and aim." He points to Boyd's presentation titled Organic Design for Command and Control, which illustrated how Boyd advocated for "adaptable, open learning organizations consisting of people with varied background cooperating in informally networked teams," whereby "each level

and each unit must have autonomy and repertoire of resources it needs to enable individual initiative and creativity." Many would also call this The HP Way, a method Packard had been employing for decades in the Silicon Valley. From Osinga, "The Enemy as a Complex Adaptive System: John Boyd and Airpower in the Postmodern Era," in *Airpower Reborn: The Strategic Concepts of John Warden and John Body*, 73.

418. Senate, *Advanced Prototype Initiatives,* 19.
419. Senate, *Advanced Prototype Initiatives,* 19.
420. Senate, *Advanced Prototype Initiatives,* 20.
421. Senate, *Advanced Prototype Initiatives,* 33.
422. Senate, *Advanced Prototype Initiatives,* 23.
423. Senate, *Advanced Prototype Initiatives,* 23.
424. Senate, *Advanced Prototype Initiatives,* 19.
425. Senate, *Advanced Prototype Initiatives,* 31.
426. Senate, *Advanced Prototype Initiatives,* 31.
427. Senate, *Advanced Prototype Initiatives,* 31.
428. House, *Department of Defense Appropriations for 1972,* 547.
429. Senate, *Advanced Prototype Initiatives,* 33.
430. Senate, *Advanced Prototype Initiatives,* 34.
431. Senate, *Advanced Prototype Initiatives,* 37.
432. Senate, *Advanced Prototype Initiatives,* 38.
433. Senate, *Advanced Prototype Initiatives,* 46.
434. Senate, *Advanced Prototype Initiatives,* 12.
435. Clodfelter, *The Limits of Airpower,* 85–88.
436. In *The Masks of War: American Military in Strategy and Analysis*, RAND analyst Carl H. Builder posits that the dominant concepts of war held by military institutions have a significant effect upon the kinds of forces they acquire and train, and therefore, the kinds of war they are prepared to fight. Dominant concepts include, for the US Army: From Normandy to the collapse of Germany; For the US Air Force: Gaining air superiority over Germany in early 1944 . . .; "For the US Navy: The last year of WWII in the Pacific, a fleet 100 carriers strong . . . Midway may have been its most decisive victory, but during the last year, it could do what it wanted, the way it wanted to do them." In Builder, *Masks of War,* 128, 132.
437. Stevenson, *The Pentagon Paradox,* 122–23.
438. Stevenson, *The Pentagon Paradox,* 133–34.
439. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 10.
440. Packard, to President Richard Nixon, letter.
441. Nixon, to Packard, letter.
442. Packard, to the press, memorandum.
443. Packard, to the press, memorandum.
444. "Packard Says 'No' on Defense."
445. "Packard Is Undecided On Heading Pentagon;" "Packard Seen Likely to be Defense Chief;" *and* "Packard Called Probable New Defense Chief."

446. "Nixon to Packard: An Offer He Can't Refuse?"

447. "Packard Is Expected to Reluctantly Agree to Nixon Request That He Head Pentagon."

448. Packard to the press, memorandum.

449. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 3.

450. "Defense Acquisition Reform: Where Do We Go from Here?" 4–6.

451. Mattis, "USFJCOM Commander's Guidance for Effects-Based Operations," 19.

452. Butkus, "Packard: Defense on a Diet."

453. Tirpak, "Clear of Turbulence?"

454. Tirpak, "Clear of Turbulence?"

455. Tirpak, "Clear of Turbulence?"

456. Tirpak, "Clear of Turbulence?"

457. Tirpak, "Clear of Turbulence?"

458. "Defense Acquisition Reform" 4–6.

459. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 10.

460. Offsets: To build strategic relationships in key markets, domestic and international, defense companies may outsource bigger and bigger chunks of their products to achieve 'offsets.' Through offsets, defense companies strengthen their political position to win defense contracts, but at the same time embrace 'increased risk' and 'decreased control' during product development. It is unsure whether customers (the DOD or foreign militaries) are aware of risks associated with increased supply chain complexity, but in many instances incentives within the defense acquisition system support or even dictate this behavior.

461. Packard, epigraph, transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 11.

462. Fox, *Defense Acquisition Reform 1960-2009,* 37; Senate, *Testimony of Honorable Frank Kendall.*

463. *Sun Tzu: The Art of War.*

464. Packard, Epigraph, Transcript from (address at the Forrestal Award Dinner, Washington, DC, 9 March 1972), 12.

Abbreviations

AFSC	Air Force Systems Command
AMST	Advanced Medium Short Take-off and Landing
AWACS	Airborne Warning and Control System
C2	Command and Control
CAS	Close Air Support
CPIF	Cost-Plus-Incentive-Fee
DCP	Development Concept Paper
DDR&E	Defense Research and Engineering
DEPSEC	Deputy Secretary of Defense
DOD	Department of Defense
DODD	Department of Defense Directive
DPM	Defense Presidential Memorandum
DPRC	Defense Program Review Committee
DSARC	Defense Systems Acquisition Review Council
ECM	Electronic Countermeasure
FLIR	Forward-Looking-Infared
FPIP	Fixed-Price-Incentive-Firm
FPIS	Fixed-Price-Incentive-with-Successive-Targets
GE	General Electric
HP	Hewlett-Packard
ICBM	Intercontinental Ballistic Missile
ISIS	Islamic State in Iraq and Syria
JCS	Joint Chiefs of Staff
LP	Laird-Packard
LWF	Lightweight Fighter
MBO	Management by Objectives
MBT	Main Battle Tank
MDA	Milestone Decision Authority
MiG	Mikoyan-Gurevich (Soviet aircraft)
NFL	National Liberation Front
NSC	National Security Council

NSSM	National Security Study Memorandum
OSA	Office of Systems Analysis
OSD	Office of the Secretary of Defense
PEO	Program Executive Officer
PGM	Precision Guided Missiles
POM	Program Objective Memorandum
PPBE	Planning, Programming, Budgeting, and Execution
R&D	Research and Development
RCS	Radar Cross Section
RDT&E	Research, Development, Test, and Evaluation
RFP	Requests for Proposal
ROK	Republic of Korea
SALT	Strategic Arms Limitations Talks
SECDEF	Secretary of Defense
STOL	Short Take-off and Landing
TAC	Tactical Air Command
TPP	Total Package Procurement
TRADOC	Training and Doctrine Command
USS	United States Ship
WHO	White House
YHP	Yokogawa-Hewlett-Packard

Bibliography

"483 BC–Athens Builds a Navy." Empires. PBS.org. http://www.pbs.org/.

Advanced Prototype Initiatives, Hearing Before the Committee on Armed Services, United States Senate, 92nd Congress, 1st sess., Congressional Record. US Government Printing Office. Washington, DC, 6 September 1971.

"Air Force Senior Leaders Unveil New Priorities," Af.mil. 2 August 2017. https://www.af.mil/.

Albright, Joseph and Martin Schram. "Military Regains Planning Role." *Newsday Washington Bureau,* 24 June 1969.

Beal, Vangie. "Moore's Law." Webopedia.com. https://www.webopedia.com/.

Beecher, William. "What is a Man This Rich Doing Running the Pentagon?" *Washingtonian,* August 1970.

Betts, Richard D. "Is Strategy an Illusion." *International Security, 25 No 2* (Fall 2000): 5–50.

Borklund, C.W. "Defense Management." *Government Executive,* April 1971.

_____."Defense Procurement Trends and Myths." *Government Executive,* January 1970.

Boyd, Max. "Outward Bound: A Less Complex System." *Government Executive,* September 1969.

Brigham, Robert K. "Lyndon Johnson vs. the Hawks." *The New York Times*, 29 August 2017. https://www.nytimes.com/.

Builder, Carl. *Masks of War: American Military Styles in Strategy and Analysis.* Baltimore: Johns Hopkins University Press, 1989.

Butkus, Alvin. "Packard: Defense on a Diet." *Dun's Magazine,* August 1970.

Cheshire, Herb. "The Pentagon's Powerful No. 2 Man." *Business Week, 21* March 1970.

Clausewitz, Carl Von. *On War.* Edited and translated by Michael Howard and Peter Paret. Princeton, NJ: Princeton University Press, 1976.

Clodfelter, Mark. *The Limits of Airpower: The American Bombing of North Vietnam.* Lincoln: University of Nebraska Press, 2006.

Comptroller General of the United States. "Table 6-1: Department of Defense TOA by Public Law Title," *National Defense Budget Estimates for FY 2017*. Comptroller.defense.gov. https://comptroller.defense.gov/.

_____. "Table 6-4: Department of Defense TOA By Major Force Program." *National Defense Budget Estimates for FY 2017*. Comptroller.defense.gov. https://comptroller.defense.gov/.

_____. "Table 6-8: Department of Defense Budget Authority by Public Law Title." *National Defense Budget Estimates for FY 2017*. Comptroller.defense.gov. https://comptroller.defense.gov/.

_____. "Table 7-5: Department of Defense Manpower." *National Defense Budget Estimates for FY 2017*. Comptroller.defense.gov. https://comptroller.defense.gov/.

"Contractors Selected for Development of Air Force B-1 Advanced Strategic Bomber." *News Release. Office of Assistance Secretary of Defense (Public Affairs).* No. 479-70. 5 June 1970.

Crane, Conrad C. *American Airpower Strategy in Korea, 1950-1953.* Lawrence: University of Kansas Press, January 5, 2000.

Coram, Richard. *Boyd: The Fighter Pilot Who Changed the Art of War.* New York: Back Bay Books, Little, Brown and Company, 2002.

Dahl, Arden B. "The Warthog: The Best Deal the Air Force Never Wanted." National Defense University. National War College. 2003. https://apps.dtic.mil/dtic/tr/fulltext/u2/a442118.pdf

"Decentralization at the Pentagon." *Navy Magazine,* July-August 1969.

"Decision Maker: AFSC's Brown: And Then the System Took Over." *Government Executive,* April 1971.

"Defense Acquisition Reform: Where Do We Go from Here?" Staff Report. *United States Senate. Permanent Subcommittee on Investigations. Committee on Homeland Security and Governmental Affairs.* 2 October 2014.

Department of Defense (DOD) Directive *5000.1. Acquisition of Major Defense Systems,* 13 July 1971.

Department of Defense (DOD) Instruction 5000.2. DOD Records Management Program, 12 May 2003. https://web.archive.org/.

_____. 8 December 2008. https://web.archive.org/

_____. 7 January 2015. c.

Department of Defense, Pentagon Tours. "Facts & Figures: Land Area and Facilities." *Pentagontours.osd.mil*. https://pentagontours.osd.mil/.

Doyle, James W. "1967 Soviet Air Show: Naming the Planes." *A History of National Air and Space Intelligence Center (NASIC*). http://nasicaa.org/.

"Dr. John L. McLucas." *United States Air Force Official Biography.* AF.mil. http://www.af.mil/.

"Dr. Robert Channing Seamans Jr." *United States Air Force Official Biography.* AF.mil. http://www.af.mil/.

Foreign Relations of the United States, 1969–1976, Volume IV, Foreign Assistance, International Development, Trade Policies, eds. Bruce F. Duncombe and David S. Patterson (Washington: Government Printing Office, 2001), Document 46. https://history.state.gov/.

Foreign Relations of the United States, 1969–1976, Volume I, Foundations of Foreign Policy, 1969-1972, eds. Louis J. Smith, David H. Herschler, and

David S. Patterson (Washington: Government Printing Office, 2001), Document 29. https://history.state.gov/.
Fox, J. Ronald. *Defense Acquisition Reform 1960-2009: An Elusive Goal.* Washington, DC.: Scholars Choice, 2015.
Gething, Michael J. *Modern Fighting Aircraft: F-15.* New York, NY: Acro Publishing, Inc. 1983.
Getler, Michael. "David Packard: Presiding Over a Revolution." *Armed Forces Management,* March 1970.
Griffin, John M. *C-5A Galaxy Systems Engineering Case Study.* Wright-Patterson Air Force Base, Ohio: Air Force Institute of Technology (AFIT/SY), https://www.dau.edu/.
Harrison, Selig S. "Packard Wary of S. Koreans' Arms Request." *Washington Post,* 5 June 1969.
House. *Department of Defense Appropriations for 1972. Hearings Before a Subcommittee of the Committee on Appropriations. 92*nd Congress. 1st sess., 1971.
Hunt, Richard A. *Melvin Laird and the Foundation for the Post-Vietnam Military: 1969-1973.* Washington, DC.: Historical Office, Office of the Secretary of Defense, 2014.
"Interview with David Packard, Deputy Secretary of Defense. Military Spending: Impact on Business." *US News and World Report*, 3 August 1970.
Keatley, Robert. "Pentagon Power: Tycoon Packard Looms Large in Role as Defense Aide." *Wall Street Journal,* 12 December 1969.
Kudock, Robert. "DOD Sets New Policy on Weapons Acquisitions." *Aeronautics and Astronautics,* August 1970.
Launius, Roger and B.J. Dvoscak. *The C-5 Galaxy History: Crushing Setbacks, Decisive Achievements.* Paducah, Kentucky: Turner Publishing Company, 2001.
Levy, Dawn. "Biography Revisits Fred Terman's Roles in Engineering, Stanford, Silicon Valley." *Stanford News*, 3 November 2004. https://news.stanford.edu/
Logan, Don. *General Dynamics F-111 Aardvark.* Atglen, PA: Schiffer Publishing Ltd., 1998.
"Main Battle Tank Development Program Reoriented." *News Release. The Office of the Secretary of Defense (Public Affairs)*. No. 49-70. 20 January 1970.
Malone, Michael S. *Bill & Dave: How Hewlett and Packard Built the World's Greatest Company.* New York: Portfolio, 2008.
Martinez, Luis. "North Korea Shot Down a US plane in 1969, Killing 31 Americans." *ABC News,* 26 September 2017. https://abcnews.go.com/.

Mattis, James N. "USFJCOM Commander's Guidance for Effects-Based Operations." *Parameters, 38, no.5* (Autumn 2008): 18-25. https://www.hsdl.org/?view&did=233314

McIver, Jon E. *The F-14 Contract: A Case Study in Major Weapon Systems Acquisition and Program Management.* Monterey, CA: Naval Post Graduate School, 1993. http://www.dtic.mil/dtic/tr/fulltext/u2/a272669.pdf.

Meilinger, Peter S. The Paths of Heaven: The Evolution of Airpower Theory. Maxwell Air Force Base, AL: School of Advanced Airpower Studies: Air University Press, 1997. https://www.airuniversity.af.edu/.

Miller, Jay. *General Dynamics F-111.* Fallbrook, CA: Aero Publishers, Inc., 1981.

"Missiles . . . Troops Overseas . . . Naval Forces—What Nixon Defense Study Turned Up." *US News and World Report,* 3 August 1970.

"Mr. Packard Would Rather Listen." *Washington Daily News*, 18 September 1969.

News Release. No. 501-69. *Office of Assistant Secretary of Defense (Public Affairs)*, Washington DC. June 12, 1969.

Nixon, Richard. "Annual Message to the Congress of the State of the Union." 22 January 1970. Washington DC. https://millercenter.org/.

Nixon, Richard, President. To David Packard, deputy secretary of defense. Letter, 11 December 1971.

"Nixon to Packard: An Offer He Can't Refuse?" *Aerospace Daily,* 7 May 1973.

Olsen, John Andreas, ed. *Airpower Reborn: The Strategic Concepts of John Warden and John Boyd*. Naval Institute Press, 2015.

Pace, Erin. "Eugine Fubini, 84; Helped Jam Nazi Radar." *New York Times.* 6 August 1997. https://www.nytimes.com/.

Packard, David. Address. Aerospace Industries Association, Williamsburg, VA. *News Release. No 432-69.* 22 May 1969.

_____. Address. Joint Meeting of the St. Louis Chamber of Commerce and the St Louis Chapter, American Ordnance Association, St. Louis, MO. 14 April 1970. Transcript. *News Release: Office of Assistant Secretary of Defense Public Affairs.* No 298-70.

_____. Epigraph. Transcript from address. Forrestal Award Dinner, Washington, DC. 9 March 1972.

_____. deputy secretary, DOD. To Honorable L. Mendel Rivers, chairman, House Armed Services Committee. Letter, 24 September 1969.

_____. deputy secretary, DOD. To the press. Memorandum to Correspondents, 13 December 1971.

_____. deputy secretary, DOD. To the press. Memorandum for Correspondents. 10 May 1973.

_____. deputy secretary, DOD. To Richard Nixon, President. Letter, 11 December 1971.
_____. deputy secretary, DOD. To Robert Seamans, secretary of the air force. Memorandum, 5 June 1970.
_____. *The HP Way. How Bill Hewlett and I Built Our Company.* New York, NY: HarperCollins, 2007.
"Packard Called Probable New Defense Chief." *Los Angeles Times,* 4 May 1973.
"Packard Is Expected to Reluctantly Agree to Nixon Request That He Head Pentagon." *Wall Street Journal,* 7 May 1973.
"Packard Is Undecided On Heading Pentagon." *Washington Post.* May 4, 1973.
"Packard Says 'No' on Defense." Associated Press. *Washington Star and News,* 10 May 1973.
Packard Seen Likely to be Defense Chief." *Washington Star and News,* 4 May 1973.
"Packard Sees Arms Balance as Chief Aim." *Washington Post,* 31 December 1969.
"Packard's Effect on Recent Contracts." *Aeronautics and Astronautics.* August 1970.
Posen, Barry R. "The Sources of Military Doctrine: France, Britain, and Germany between the World Wars." *The Use of Force: Military Power and International Politics (8th Edition).* Lanham: Rowman & Littlefield Publishers, Inc.
Sbrega, John J. "Southeast Asia." *Case Studies in the Development of Close Air Support.* Ft. Belvoir: Defense Technical Information Center, 1990.
"Secretary Packard Impressed with US Forces in Europe." *Commander Digest,* 26 April 1969.
Seamans, Robert C. *Aiming at Targets: The Autobiography of Robert C. Seamans Jr.* Washington, DC.: US Government Printing Office, 1997.
Senate. *Advanced Prototype Initiatives, Hearings before the Committee on Armed Services*. 92nd Congress, 1st sess., 1971.
_____. *Nominations of Laird, Packard, and Darden. Hearings before the Committee on Armed Services.* 91st Congress, 1st Session, 1969.
_____. *Statement by the Deputy Secretary of Defense Honorable David Packard on the Main Battle Tank Development Program before the Senate Committee on Armed Services*. 91st Congress, 1st sess., 1969.
_____. *Testimony of Honorable Frank Kendall. Hearings before the Committee on Armed Services. 113th Congress, 2nd sess.,* 2014. https://www.armed-services.senate.gov/.
Spick, Mike. *B-1B.* New York, NY: Prentice Hall Press. 1986.

_____. *Modern Fighting Aircraft: F-14 Tomcat.* New York, NY: Arco Publishing, Inc. 1985.
Stevenson, James P. *The Pentagon Paradox: The Development of the F-18 Hornet.* Naval Annapolis: Naval Institute Press, 1993.
Sun Tzu: The Art of War. Vol. 39. London: Oxford University Press, 1963.
Sweetman, Bill. *A-10 Thunderbolt.* New York, NY: Acro Publishing Inc., 1984.
"The Stennis Era, 1969-1980." The Center for Legislative Archives. Archives.gov. https://www.archives.gov/.
Tirpak, John A. "Clear of Turbulence?" *Air Force Magazine,* August 2017. http://www.airforcemag.com/ .
"Treaty of Rome." *Britannica.com.* https://www.britannica.com/.
United States Army Training and Doctrine Command. Pamphlet 525-5-500. *Commander's Appreciation and Campaign Design*, 28 January 2008. https://pdfslide.net/.
United States Department of State, Office of the Historian. "U.S. Involvement in the Vietnam War: The Tet Offensive, 1968." *Milestones in the History of Foreign Relations*. History.state.gov. https://history.state.gov/.
"Using the Trick that Built U-2s: The Pentagon Wants to Revive its 'Crash Team' R&D Approach." *Business Week,* 15 May 1971.
Van Atta, Dale. *With Honor: Melvin Laird: In War, Peace, and Politics.* Madison: The University of Wisconsin Press, 2008.
Wasatonic, Eric. "HP Origins #0119." YouTube Video, 25:46. 30 October 2013. https://www.youtube.com/.
Watts, Barry D. *Strategy for the Long Haul. The Defense Industrial Base: Past, Present, and Future.* Washington, DC.: Center for Strategic and Budgetary Assessments. 2008. 31.