Creating the Capacity for Innovation:

U.S. Army 1945-1960

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Abstract

This dissertation argues that in the years immediately following the Second World War, the United States Army created a set of intellectual, organizational, and ultimately institutional processes, which are essential to military innovation. Prior to the Second World War, innovation in the army had remained isolated, ad hoc, and difficult to harness towards a common goal. That changed substantively in the period after the war.

Unlike most studies of military innovation, this work does not follow the efforts of a single genius but rather three interrelated activities that when fully developed provide the institutional foundations for an ability to change. First, the army adopted the field of operations research as an essential element of military analysis and decision-making. Second, the army created a set of activities known collectively as 'combat developments', where new ideas moved through a deliberate process of deliberation, analyses, testing, and prototyping in order to deliver a new military capability to the field. Finally, this dissertation describes the modernization of officer education and the change in doctrine development from a focus on near-term doctrine for a mobilizing force to forward-looking doctrine appropriate to a standing force in a time of technological change.

Most historians have judged the army of early Cold War to be an innovative failure with a readiness crisis at the beginning of the Korean War, a spectacular failure with its Pentomic concept, and its supposed inability to anticipate and prepare for large-scale counterinsurgencies in the 1960s. However, as this dissertation demonstrates, it was during this same period that more fundamental changes occurred that set the pattern for how the institution would change over the course of the remainder of the century.

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ACRONYMS

AAF	Army Air Forces	HumRRO	Human Resources Research Office
AEC	Atomic Energy Commission	ICR	Institute for Cooperative Research
AEF	American Expeditionary Force	JCS	Joint Chiefs of Staff
AFF	Army Field Forces	JHU	The Johns Hopkins University
AGF	Army Ground Forces	MIT	The Massachusetts Institute of Technology
AORD	Advanced Operations Research Department	MOMAR	Modern Mobile Army
ASF	Army Service Forces	NACA	National Advisory Committee for Aeronautics
ATFA	Atomic Field Army	NATO	North Atlantic Treaty Organization
AWC	Army War College	NDRC	National Defense Research Committee
CDC	Combat Development Command	OA	Operations Analysis
CDD	Combat Development Division	OAS	Operations Analysis Section
CDEC	Combat Development Experimentation Command	OCAFF	Office, Chief Army Field Forces
CDG	Combat Development Group	OEG	Operations Evaluation Group
CDS	Combat Develop System	OFS	Office of Field Services
CGSC	Command and General Staff College	ORO	Operations Research Office
CJCS	Chairman of the Joint Chiefs of Staff	ORSA	Operations Research Society of America
CONARC	Continental Army Command	OSRD	Office of Scientific Research and Development
CORG	Combat Operations Research Group	R&D	Research and Development
ETO	European Theater of Operations	RAF	Royal Air Force
EUCOM	European Command	RDB	Research and Development Board
EUSAK	Eighth US Army Korea	SORO	Special Operations Research Office
FEC	Far East Command	T/O&E	Table/Organization and Equipment
FSR	Field Service Regulation	UMT	Universal Military Training
G-1	General Staff - Personnel	UN	United Nations
G-2	General Staff - Intelligence	USAREUR	U.S. Army Europe
G-3	General Staff - Operations	WDGS	War Department General Staff
G-4	General Staff - Logistics	WPD	War Plans Division
GHQ	General Headquarters	WSEG	Weapons Systems Evaluation Group
GRO	General Research Office	WUDO	Western Union Defence Organization

Introduction and Literature Review

During the period 1945-1960, the United States Army created an institutional capacity to innovate.[1] Such an institutional capacity did not exist prior to the Second World War. While there were examples of innovation within the army during the prewar era, these were generally narrow applications of new technologies. Moreover, they were often developed in spite of, not as the product of, the organizations and even processes in which they occurred. In the post-war period, three loosely connected lines of effort emerged that resulted in new organizations and processes whose collective purpose was to prepare the army for the 'next war'. The three major elements of innovation described in this dissertation are:

- Operations Research. Though widely used by the US Navy and Army Air Forces during the Second World War, operations research came to be seen by the Army as a legitimate source of professional knowledge about land force operations only after the War.

- Combat Developments. The creation of a combat developments process provided the Army a means of 'tinkering' with the future.

- Professional Military Education and Doctrine Development. A shift in both the pedagogical and doctrinal contribution of the Command and General Staff College (CGSC) drew a sharper line between studying the lessons of the last war and contemplating the nature and needs of the next one.

Between 1945 and 1960, the army changed the way it 'evaluate[d] the future character of war, and how [it] effect[ed] change in the senior officer corps'.[2] The standards of readiness and measure of professional knowledge came to include an uncertain future, one beyond the near-term horizons of mobilization plans, published doctrine, existing

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[1] There are innumerable definitions of the term innovation. For simplicity this dissertation defines military innovation as the deliberate adoption of 'new military technologies, tactics, strategies, and structures. According to Farrell and Teriff, innovation is one of three ways a military can change, the other two being adaptation and emulation. Theo Farrel, Terry Terriff, ' The Sources of Military Change', in *The Sources of Military Change: Culture, Politics, Technology*, ed. by Theo Farrel and Terry Terriff (Boulder: Lynne Rienner Publications Inc., 2002) (p. 6.).

[2] This phrase is part of Steven P. Rosen's definition of peacetime innovation. Steven Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991), p. 52.

organizations, and even existing weapons. Taken together, these institutional changes represent a significant and overlooked example of peacetime innovation.

The army's capacity for innovation did not result from a deliberate set of plans, the forceful action of a single maverick, or the specific support or pressure of an external political force. Instead it emerged out of the gradual, evolutionary acceptance by the army of a set of assumptions about the character of future war, which challenged traditional notions about preparing for the next war. When parsing the complex and interactive behavior of a bureaucracy, one should not discount broad factors shaping assumptions. Assessments of the Soviet Union's conventional strength as well as a continuous parade of new, if occasionally overhyped, weapons technologies animated the army's views in this period. Internal threats to its self-image, its waning influence over the direction of national security policy, and the associated loss of resources also helped shape its views. However, while these factors and others may explain the rush to the ill-fated Pentomic solution of the late 1950s, none fully accounts for the creation of a solution-independent capacity to innovate that endured well beyond the early Cold War.[3]

By the late 1940s despite strongly held convictions about the enduring nature of land warfare, key army leaders accepted the notion that success in future war requires continuous doctrinal, organizational, and materiel innovation. This shift gave energy and permanence to the institutional changes described in this dissertation. To many of the iconic army leaders of the Second World War, the antiquated notion that the exclusive role of the professional officer in peacetime was to 'preserve the habits and usages of war', was clearly out of date.[4] It would take, however, until 1960 for the army to have the physical capacity to move beyond a mere ad hoc alternative to 'preservation' and toward something capable of near continuous, if not always successful, development.

The next section describes this dissertation's contribution to scholarship of military innovation. This is followed by a review of the literature on the army in the context of the early Cold War and related literature on the development of tactical atomic weapons. The

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[3] Capacity building is a term adopted by the US Department of Defense to describe the creation of institutions and processes, usually within a partner nation, designed to adapt existing defense capabilities to anticipated or unknown future security requirements. The Pentomic army was a radical top-down redesign of existing army tactical. organization and doctrine to create a flexible, nuclear capable, high technology force. Introduced in 1956, the Pentomic concept was openly derided by 1959 and abandoned by early 1961.

[4] William T. Sherman, *Memoirs of General W. T. Sherman* (New York: Charles L. Webster & Co., 1891), p. 406.

final three sections of the introduction examine the literature and sources of the major chapters of this dissertation; operations research, combat developments, and the CGSC.

On Innovation

Much of the literature on military innovation starts with a dissection of a successful case, for example the development of Germany's so-called 'blitzkrieg' capability in the interwar period, in order to identify its nature. Successful cases of innovation are relatively easy to trace because they often leave a trail of decisions, actions, and physical change that prove useful to a historian attempting to understand the attributes of success. Negative cases, where innovation failed or, more often than not did not occur at all, are obviously less interesting because they are the story of inaction and lost opportunity. Over the past thirty years scholars who study military innovation, like Williamson Murray, Alan Millett, Barry R. Posen, and Stephen P. Rosen, have established a set of general concepts to explain why innovation occurs and some of the major factors in success.[5] A full recitation of the similarities and differences between these scholars or the range of literature on military innovation is not the purpose here except to show where this dissertation fills a gap in the existing scholarship.

The reasons why a specific military innovation occurs show a great degree of variability. Explanations range from a natural, evolutionary process to ones where the driver (or inhibitor) is an internal or external actor. Woven throughout, and the subject of more recent scholarship, is a question about the extent to which bureaucratic role or institutional

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[5] The major works by these scholars on this topic are; *Military Innovation in the Interwar Period*, ed. by Williamson Murray and Allan R. Millett (New York: Cambridge University Press, 1996); Barry R. Posen, *The Sources of Military Doctrine* (Ithaca: Cornell University Press, 1984); Rosen, *Winning the Next War: Innovation and the Modern Military*. There is a large body of work in this field to include a more recent subspecialty of so-called military revolutions. The work is generally split between historians and political scientists but most have a decidedly utilitarian purpose in supporting, explaining, or challenging aspects of recent examples of military innovation or the desire for what policy makers refer to as 'transformation'. Other useful, but more specific, works which highlight the creation or support of institutional capabilities for innovation include Michael H. Armacost, *The Politics of Weapons Innovation: The Thor-Jupiter Controversy* (New York: Columbia University Press, 1969); Mathew Evangelista, *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies* (Ithaca: Cornell University Press, 1988); I.B. Holley Jr., *Ideas and Weapons: Exploitation of the Aerial Weapon by the United States During World War I*, Reprinted from 1953 (Washington DC: Office of Air Force History, 1983); David E. Johnson, *Fast Tanks and Heavy Bombers: Innovation in the U.S. Army, 1917-1945* (Ithaca: Cornell University Press, 1998); John T. Kuehn, *Agents of Innovation: The General Board and the Design of the Fleet That Defeated the Japanese Navy* (Annapolis: Naval Institute Press, 2008); Thomas G. Mahnken, *Technology and the American Way of War since 1945* (New York: Columbia University Press, 2008); Norman Friedman Thomas C. Hone, and Mark D. Mandeles, *American & British Aircraft Carrier Development 1919-1941* (Annapolis: Naval Institute Press, 1999).

cultures play in innovation.[6] Despite the focus on identifying the major causal factors of innovation, most of these works touch only lightly on the question of a military's 'capacity to innovate' as either a precondition or essential quality to moving beyond just innovative ideas. Where historians address capacity they normally describe it as a positive (or negative) aspect of the underlying culture, not as a physical or organizational attribute. For example, Murray notes that '[r]igidity is undoubtedly a fact of life in many military organizations — one which has exercised a baleful influence over institutional capacity to innovate[7]. These kinds of general statements, while useful as a descriptive, do not illuminate the more specific question of capacity. What is the impact on army culture or its ability to successfully innovate if it had a coherent set of institutional processes whose purpose is facilitating change? The question here is not one of simply judging a process successful because of the later success of its output. This is clearly a desired but never guaranteed outcome of any innovation. The question is about the efficacy of establishing within a military bureaucracy an ongoing process dedicated to change. Is such activity, in and of itself, evidence of or an essential ingredient for innovation? In the positive example cited earlier, the German military established organizations and processes to study, experiment, test, assess, and adapt new ideas to actual conditions.[8] In this example, the resulting tactical innovations were a success, but clearly insufficient for victory. However, this has not diminished the allure of the German case to students of peacetime military innovation. How then should one assess the impact of similar organizations and processes, created by the army in the early Cold War, whose near term and, some would argue, long-term outputs were tactical failures?

Another area of innovation literature this dissertation informs is the fundamental question of the activity itself: innovate for what? Understanding how institutions answer this question is important to replicating success, but it often remains well hidden in a milieu of human judgments, prejudices, fears, and preferences. For example, consider the major schools of thought on this question. Military innovation, according to Posen, occurs through changes in a nation's grand strategy and broad doctrinal preferences for offense, defense, and

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[6] Dima Adamsky, *The Culture of Military Innovation: The Impact of Culural Factors on the Revolution in Military Affairs in Russia, the US, and Israel* (Stanford: Stanford University Press, 2010). In the category of ascribing to a military culture the primary factor in the army's 'failure to innovate', prior to Vietnam, I would also include John A. Nagl, *Learning to Eat Soup with a Knife: Counterinsurgency Lessons from Malaya and Vietnam* (Chicago: The University of Chicago Press, 2005).

[7] Williamson Murray, 'Innovation Past and Future', in *Military Innovation in the Interwar Period*, ed. by Williamson Murray and Allan R. Millett (New York: Cambridge University Press, 1996) (p. 322).

[8] For a detailed description of the German interwar capacity for innovation see James S. Corum, *The Roots of Blitzkrieg: Hans Von Seeckt and German Military Reform* (Lawrence: University of Kansas Press, 1992).

deterrence.[9] On the other hand, Rosen argues that it is actually the result of a complex analysis of the anticipated security environment including economic, technological, and political factors.[10] Millett argues that a more operational set of factors like 'the anticipated enemy, anticipated theaters of operations, the immediacy in distance and time from the possible outbreak of war, the balance between deterring war or simply preparing to fight it, the likely length of a potential conflict, the role of allies, [and] the lessons of the last war', in combination account for innovation.[11] Finally, Murray argues that studies of military innovations show that regardless of the larger context, a focus on a 'specific military problem' was a key to a coherent process and ultimately success. He adds that this attribute of 'specificity' applies to more than just the problem statement, but the proposed solution as well. In a successful innovation, Murray tells us, 'there must be clear institutional conceptions and interest in developing a new form of war'.[12] In most of the cases examined by the above scholars, the question of how a military institution answers the 'for what' question, is a mix of personality, circumstance, and serendipity. Depending on the level of one's analysis, all of these explanations are useful but, again, incomplete. This dissertation aims to extend understanding of how nations or armies answer the question 'innovate for what' by examining the role-played by organizations and processes dedicated to exploring that question. Where a deliberate set of institutional processes and organizations are created to propose answers to these questions systematically, and on a continuing basis – is that a form of innovation?

Finally, this dissertation offers a challenge to the view that the legacy of the army's early Cold War experience with innovation was negative. Certainly to judge by the short-lived concept for a high technology, dual-capable (atomic and non-atomic) force, known as the Pentomic Army, the early Cold War was not a high point in terms of increasing the army's effectiveness. The army chief of staff immediately after the Pentomic division's demise noted that it 'would have had a difficult time fighting its way out of a wet paper bag'.[13] One finds a similarly negative legacy in personality and cultural explanations for the army's later

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[9] Posen, *The Sources of Military Doctrine*, pp. 13-15.

[10] Rosen, *Winning the Next War: Innovation and the Modern Military*, p. 254.

[11] Millett described these factors as 'strategic calculations.' Allan R. Millett, 'Patterns of Miltary Innovation in the Interwar Period', in *Military Innovation in the Interwar Period*, ed. by Williamson Murray and Allan R. Millett (New York Cambridge University Press, 1996) (p. 322).

[12] Murray, 'Innovation Past and Future' (pp. 311-312).

[13] Lieutenant General Harold K. Johnson, 'Speech to Canadian National Defense College, 10 January 1964,' (10 January 1964), p. 4; Harold K. Johnson Papers MHI - Series II - Official Papers Box 136. Harold K. Johnson Papers, Series II - Official Papers, Box 136: DCSOPS, Trips and Visits 1962-1964. MHI

performance in the Vietnam War. John A. Nagl, in *Learning to Eat Soup with a Knife: Counterinsurgency Lessons from Malaya and Vietnam,* explains the army's later failures by arguing it posessed a constrained, conservative, and learning impaired culture fundamentally incapable of recognizing the character of the next war. In addition to downplaying the context of the larger Cold War, Nagl concluded that '[t]o understand how and why an organization will change, it is essential to examine its past successes and failures – and those of the individuals who control the institution'.[14]

In a similar vein, Andrew J. Krepinevich, Jr., in his highly regarded analysis, *The Army and Vietnam,* described the army in this period as an institution blind to any innovation that did not fit a well defined and highly successful Second World War-based 'army concept' of 'how wars ought to be fought'.[15] While it is difficult to argue with the general proposition that Vietnam was not the war the army prepared for, using a Vietnam War-centric lens to examine the innovative qualities of the period that went before distorts what actually happened. Despite their glaring near-term failures, the organizations and processes discussed in this dissertation were in part responsible for two dramatic changes in doctrine and organization within a span of less than five years.[16] Whatever one can say about their near-term utility, it is hard to argue that the three areas explored in this dissertation did not spur a significant amount of innovation or that they were not oriented at the problem they set out to address — namely the defense of Europe against the possibility of a Soviet-led conventional onslaught.

Context – The Army in the Early Cold War

A significant part of the army's institutional history in the early postwar era was characterized by a struggle to retain relevance. It was an unexpected and disorienting fall from the high point of victory over Germany and Japan. The period was one of change in which a fundamental shift in strategic requirements challenged long held assumptions about the army's role in national defense. The rapid development of new technologies, especially atomic weapons and their associated delivery systems, caused many inside and outside the

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[14] Nagl, *Learning to Eat Soup with a Knife*, p. 216.

[15] Andrew F. Krepinevich Jr., *The Army and Vietnam* (Baltimore: The Johns Hopkins University Press, 1986), pp. 4-5.

[16] From the introduction of the first Pentomic units in 1956 to the approval of the Reorganization Objective Army Division (ROAD) in early 1961.

army to question its doctrinal foundations. Finally, dramatic shifts in long-standing defense policies fueled a climate of fierce bureaucratic competition for resources between the armed services and even among arms within army.

One can break the literature of the early Cold War, more specifically the army's role, into three major time periods. In the first, 1945–1950, the dominant issues for the army concerned demobilization, readiness, and the creation of the Department of Defense. The best of the general histories, such as Russell F. Weigley's *History of the United States Army,* provide a clear description of the strategic and political issues that buffeted and significantly impacted the postwar army.[17] The most useful specific works on developments within the army during this time are in official histories such as Kenneth W. Condit's *The Joint Chiefs of Staff and National Policy, 1947-1949* and Steven Rearden's contribution to the history of the Office of the Secretary of Defense, *The Formative Years 1947-1950.*[18] In terms of institutional histories, the most important is James E. Hewes, Jr. *From Root to McNamara: Army Organization and Administration 1900-1963.*[19] Despite the scope of his work, Hewes covers the transition from the War Department General Staff (WDGS) to the Department of the Army and subsequent changes to the army staff organizations throughout this entire period with great clarity. The U.S. Army Center of Military History archives contain a useful set of army ground forces historical monographs from this period, which document some of the internal changes resulting from broader institutional chaos.[20] Only a few works specifically address the impact on combat readiness of the institutional chaos of the later 1940s. Thomas E. Hanson's work, 'America's First Cold War Army: Combat Readiness in

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[17] Russell F. Weigley, *History of the United States Army* (New York: Macmillan Publishing Co., Inc., 1967). Other works which provide useful context into the army of this period include Stephen E. Ambrose, 'The Armed Services and American Strategy, 1945-1953', in *Against All Enemies - Interpretations of American Military History from Colonial Times to the Present*, ed. by Kenneth J. Hagan and William R. Roberts (New York: Greenwood Press, 1986), pp. 305-320; Joseph C. Bernardo, Eugene H. Bacon, *American Miitary Policy - Its Development since 1775*, 2nd (Harrisburg: Stackpole Company, 1961); Allan R. Millett, Peter Maslowski, *For the Common Defense - A Military History of the United States of America* (New York: The Free Press, 1984).

[18] Kenneth W. Condit, *The Joint Chiefs of Staff and National Policy, 1947-1949*, History of the Joint Chiefs of Staff, II (Washington DC: Office of Joint History, 1996); Steven L. Rearden, *The Formative Years 1947-1950*, History of the Office of the Secretary of Defense, I (Washington DC: Historical Office, Office of the Secretary of Defense, 1984).

[19] James E. Hewes Jr., *From Root to McNamara: Army Organization and Administration* (Washington DC: United States Army, Center for Military History, 1975). Another useful reference, although more general in nature, on the changes in defense is Paul Y. Hammond, *Organizing for Defense: The American Military Establishment in the Twentieth Century* (Princeton: Princeton University Press, 1961).

[20] Examples include Keith Sherman and Albert N. Garland, *Studies in the History of Army Ground Forces During the Demilitarization Period* (Washington DC: U.S. Army Center of Military History, 1948); *Planning Activities of Army Ground Forces, 1945-1948 Study No. XIV* (Washington DC: U.S. Army Center of Military History, 1949).

the Eight Army, 1949-1950' is useful in describing the actual condition of the pre-Korean War army.[21]

The second period of the Cold War is generally bounded by the start of the Korean War in 1950 and the truce agreement in 1953. As Weigley described it, the 'army of 1950 was very much a postwar army, shaped less by military doctrine looking to a future war, to which this army too often seemed irrelevant, than by the past, by the last war, of whose massive armies it was the remnant'.[22] The standard histories by T.R. Fehrenback and Clay Blair suffice to provide the context of war itself, but do not delve much into the army reaction to the war.[23] Somewhat surprisingly, while the Korean War had a major impact on the operational army of the day, it played only an indirect role in the army's creation of a capacity to innovate. Events on the Korean peninsula informed decisions concerning operations research, combat developments, and CGSC, but in large measure did not drive them. The most significant impact of the Korean War on innovation in the army was to accelerate the drive to prepare for a future war in Europe. Lawrence S. Kaplan's official history, *A Community of Interest - NATO and the Military Assistance Program 1948-1951* details in the logic and policies which resulted in the increased emphasis on solving the challenges of a ground defense in NATO.[24]

The final period covers the two terms of President Dwight D. Eisenhower. In terms of impact, the tension between the most respected retired soldier of his day and the army that he once led was second only to atomic weapons in terms of influencing how the army prepared for future war. Eisenhower's emphasis on strategic weapons not only accelerated a process that had begun in the late 1940s, but also established the budgetary context within which the army's leadership made decisions. The literature on the Eisenhower era is extensive. Again, in terms of correlating the broader strategic events to the institutional decisions of the army, the official histories of the Office of the Secretary of Defense and the Joint Chiefs of Staff are

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[21] Thomas E. Hanson, 'America's First Cold War Army: Combat Readiness in the Eighth U.S. Army, 1949-1950' (unpublished PhD thesis, Ohio State University, 2006).

[22] Weigley, *History of the United States Army*, p. 502.

[23] Clay Blair, *The Forgotten War: America in Korea, 1950-1953* (New York: Crown, 1987); T.R. Fehrenback, *This Kind of War* (New York: Macmillan Co, 1963).

[24] Lawrence S. Kaplan, *A Community of Interest - NATO and the Military Assistance Program 1948-1951* (Washington DC: Office of the Secretary of Defense Historical Office, 1980). Kaplan expands on this study in Lawrence S. Kaplan, *The United States and NATO: The Formative Years* (Lexington: The University Press of Kentucky, 1984).

essential references.[25] The best work on the specific contours of the relationship between Eisenhower's strategy preferences and the army's are Saki Dockrill's *Eisenhower's New-Look National Security Policy, 1953-1961,* Gerard Clarfield's *Security with Solvency - Dwight D. Eisenhower and the Shaping of the American Military Establishment,* and David Fautua's 'An Army for the "American Century": The Origins of the Cold War United States Army, 1949—1959'.[26] While Eisenhower's own two-volume memoir of the period tend to downplay the conflict with the army, the records of the National Security Council illuminate the sometimes-open hostility between the president and the army.[27] Where Eisenhower's public memoirs downplay the tension, the chiefs of staff who served during his administration were not so forgiving.[28]

The army's side of the debate exists in memoirs of former chiefs of staff Generals Mathew B. Ridgway and Maxwell D. Taylor. While autobiographies covering General Omar N. Bradley and Lawton J. Collin's tenures as the army's chiefs of staff have some useful insights, both are too general on the inner working of the army or singularly focused on the postwar unification battles and the Korean War to inform the subject at hand significantly. Ridgway's public criticism of Eisenhower's strategy of massive retaliation was well known long before he published *Soldier: A Memoir of Matthew B. Ridgway* in late 1956. Ridgway's memoir, when supported by the official record, helps establish the army's fundamental

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[25] See Doris M. Condit, *The Test of War 1950-1953,* History of the Office of the Secretary of Defense, II (Washington DC: Historical Office, Office of the Secretary of Defense, 1988); Richard M. Leighton, *Strategy, Money, and the New Look, 1953-1956,* History of the Office of the Secretary of Defense, III (Washington DC: Historical Office, Office of the Secretary of Defense, 2001); Robert J. Watson, *Into the Missile Age 1956-1960,* History of the Office of the Secreary of Defense, IV (Washington DC: Historical Office, Office of the Secretary of Defense, 1997). On the JCS see Kenneth W. Condit, *The Joint Chiefs of Staff and National Policy, 1955-1956,* History of the Joint Chiefs of Staff, VI (Washington DC: Historical Office, Joint Staff, 1992); Byron R. Fairchild and Walter S. Poole, *The Joint Chiefs of Staff and National Policy, 1957-1960,* History of the Joint Chiefs of Staff, VII (Washington DC: Office of Joint History, Office of the Chairman of the Joint Chiefs of Staff, 2000); Walter S. Poole, *The Joint Chiefs of Staff and National Policy 1950-1952,* History of the Joint Chiefs of Staff, IV (Washington DC: Office of Joint History, 1998).

[26] Gerard Clarfield, *Security with Solvency - Dwight D. Eisenhower and the Shaping of the American Military Establishment* (Wesport: Praeger, 1999); Saki Dockrill, *Eisenhower's New Look National Security Policy, 1953-1961* (New York: St. Martin's Press, Inc., 1996); David T. Fautua, 'An Army for the 'American Century': The Origins of the Cold War United States Army, 1949--1959' (unpublished PhD thesis, University of North Carolina, 2006). A more accessible version of Fautua's thesis is found in David T. Fautua, 'The "Long Pull" Army: NSC 68, the Korean War, and the Creation of the Cold War Army', *The Journal of Military History,* 61 (1997), 93-120.

[27] See especially, *National Security Policy 1955-1957,* ed. by William Klingaman, David S. Patterson, Ilana Stern, XIX (Washington DC: Government Printing Office, 1990); *National Security Affairs 1952-1954,* ed. by Lisle A. Rose and Neal H. Peterson, II (2 Parts) (Washington DC: Government Printign Office, 1984).

[28] Dwight D. Eisenhower, *Mandate for Change, 1953-1956: The White House Years* (Garden City: Doubleday, 1963); Dwight D. Eisenhower, *Waging Peace, 1956-1961: The White House Years* (Garden City: Doubleday, 1965).

argument for a flexible force, which would continue for the remainder of the decade. His influence on the debate, however, remained limited by his shortened tenure as chief of staff and publication of his decidedly 'frank and angry account' of his time in office.[29] The tone of Ridgway's account, and the proximate source of Eisenhower subsequent anger toward him and the army's senior leaders, was his accusation that the administration's 'military budget was not based so much on military requirements, or on what the economy of the country could stand, as on political considerations'.[30]

General Taylor's *The Uncertain Trumpet* is, unlike his predecessor's book, less a memoir than a polemical essay on the failings of the Eisenhower strategy and a prescription of how to correct it. Taylor's book does not address the specific army machinations in reaction to the strategy of massive retaliation. Rather it describes the philosophic position that framed army decisions within the context of deliberations within the Joint Chiefs of Staff (JCS). The work is notable for two insights. First, Taylor explains, in great detail, the development of his strategic concept of flexible response and its emphasis on the non-nuclear capabilities of a dual-use force. Second, the book is almost completely silent on the army's transformation, which by the time of its drafting was already coming under withering criticism from within the army itself. Both of these positions perhaps give the strongest evidence to some observers, such as Andrew J. Bacevich, who argue that the Pentomic experiment was always a political pacifier to the administration and not a serious effort at innovation.[31]

The final senior officer memoir of the period, which reflects on the subject of this dissertation, is that of Lieutenant General James A. Gavin. Gavin's book *War and Peace in the Missile Age* is a combination memoir and wide-ranging discussion of the interface between national strategy, technology and politics.[32] If there were ever a 'Maverick-like' personality during this period it was Gavin. One of the youngest generals in the army, Gavin was an early military member of defense establishment's Weapons Systems Evaluation

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[29] Ridgway's initial thoughts were published in a series of long articles in the 'Saturday Evening Post' beginning in January 1956. These were later expanded and published in Matthew B. Ridgway, *Soldier: The Memoir of Matthew B. Ridgway* (New York: Harper and Brothers, 1956).

[30] Ridgway, *Soldier: The Memoir of Matthew B. Ridgway*, p. 272.

[31] A.J. Bacevich, *The Pentomic Army: The U.S. Army between Korea and Vietnam* (Washington DC: National Defense University Press, 1986).

[32] James M. Gavin, *War and Peace in the Space Age* (New York: Harper & Brothers, 1958). Another work which offers some valuable insights into internal bureaucratic politics of the army's technical services and competition with the air force over missiles is found in Maj. General John B. Medaris, *Countdown for Decision* (New York: G.P. Putnam's Sons, 1960).

Group (WSEG) and the director of army research and development during the critical debates over how the army would respond to the 'New Look' strategy. Gavin remained committed to the rapid development of new technologies, convinced of the inevitability of the use of tactical atomic weapons, and frustrated by what he called 'the deception and duplicity' of the defense department.[33] He represented a segment of the army that was convinced of its inability to deal adequately with limited wars (including those requiring use of atomic weapons). As Gavin argued, a gap between rhetoric and reality at the strategic level exacerbated this situation. A so-called 'missile lag' threatened 'limited defeats that we would rationalize at the time but that would ultimately lead to a general defeat, or a general war.'[34] Gavin simultaneously advocated a more aggressive strategic policy, moving the 'high-ground' to space, while simultaneously supporting the move to the Pentomic army. Despite his enthusiasm, however, Gavin warned that the necessary equipment, specifically 'missile fire power' and 'sky cavalry' were 'seriously lacking' and the army was in danger of creating its own rhetoric and reality gap.[35]

The other major theme that cuts across this period and one that this dissertation identifies as animating force within the army was the advent and development of atomic weapons.[36] The standard work on the army's move toward integrating atomic weapons is Andrew J. Bacevich's *The Pentomic Army: The Army Between Korea and Vietnam*. Bacevich presents a searching treatment of the army's decision to pursue a dramatic transformation centered on tactical atomic weapons that turned out to be 'striking for its impermanence.'[37] He concludes that the Pentomic experiment was born of political maneuvering and a 'compulsive commitment to nuclear technology' without considering the alternatives.[38] While Bacevich presents a tight history of the various pressures shaping the army's decisions, he is dismissive of the sincerity of the effort to develop actual capabilities toward the objective promoted in the Pentomic concept. Part of this was the actual frailty of the effort and its apparent irrelevance to the demands of the decade that followed. A significant new addition to the literature is Ingo Trauschweizer's *The Cold War U.S. Army: Building Deterrence for*

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[33] Gavin, *War and Peace in the Space Age*, p. 155.

[34] Gavin, *War and Peace in the Space Age*, pp. 12-13.

[35] Gavin, *War and Peace in the Space Age*, pp. 270-272.

[36] Unless otherwise specified, this dissertation will use the phrase 'atomic' when referring to nuclear weapons and associated equipment. Although beginning in the late-1950's the more accurate term 'nuclear,' which was considered inclusive of fission and fusion weapons came into common use.

[37] Bacevich, *The Pentomic Army*, p. 142.

[38] Bacevich, *The Pentomic Army*, p. 151.

Limited War. Trauschweizer places the army's development and innovation decisions in this period clearly within the larger Cold War context and demonstrates that the army's concept for limited war was driven by the search for an adequate force and warfighting doctrine for a war in Europe against the USSR.[39] As this dissertation demonstrates, the effort to create future capabilities within the Cold War context Trauschweizer describes was in response to the challenges presented by a new war in Europe and not merely political window dressing.

On the more specific topic of how the army addressed atomic weapons during this period, there is a wide range of general histories on atomic weapons development. Nevertheless, few address the institutional processes and organizations at work. There are two standard works, however, which specifically address the army's development of atomic-related doctrine and organizations. The single best volume on the army's attempts to rationalize atomic weapons and land warfare as it existed in the early Cold War is John J. Midgley's *Deadly Illusions: Army Policy for the Nuclear Battlefield.*[40] The strength of Midgley's effort is that he shows how the outputs of the three processes described in this dissertation interacted on the army staff. Midgley clearly demonstrates that despite the questions concerning conceptual, technical, and practical viability of many of the components of the Pentomic army, decisions to proceed were based on a desire to acquire an atomic capability and less on how the army would actually fight with it. John P. Rose's *The Evolution of U.S. Army Nuclear Doctrine 1945–1980* is a less scholarly work than Midgley's and handicapped at times by the author's advocacy for updating the army's doctrine at the time it was written.[41] Notwithstanding these limitations, Rose presents a useful discussion and analysis of atomic warfare, as it appeared in the army's professional journals and within the curriculum of CGSC.

A recent addition to the standard works on this question is Paul C. Jussel's, 'Intimidating the World: The United States Atomic Army, 1956–1960.'[42] Jussel's work updates earlier scholarship on the origins of the actual concepts underpinning the Pentomic army. The significance of this work is that he deemphasizes the role of bureaucratic politics in Taylor's decision to field the Pentomic division and instead notes the steady development

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[39] Ingo Trauschweizer, *The Cold War U.S. Army: Building Deterrence for Limited War* (Lawrence, University Press of Kansas, 2008).

[40] John J. Midgley Jr., *Deadly Illusions: Army Policy for the Nuclear Battlefield* (Boulder: Westview Press, 1986).

[41] John P. Rose, *The Evolution of U.S. Nuclear Doctrine: 1945-1980* (Boulder: Westview Press, 1980).

[42] Paul C. Jussel, 'Intimidating the World: The United States Atomic Army, 1956-1960' (unpublished PhD thesis, Ohio State University, 2004).

of concepts intended to address both atomic weapons and war in Europe. Jussel demonstrates that the conceptual ideas associated with Pentomic — mobility, firepower, and communications — were the result of a thoughtful, if informal, conceptual development process. This dissertation expands his thesis by showing that in some cases, the parallel development of formal organizations and processes were both the result of, and in some cases the source of, these early concepts.

The next three sections of this introduction will briefly describe the main chapters of this dissertation and review the primary literature and sources associated with each. While the subject of each section stands alone in terms of development and purpose, the broad nature of changing the way the army approached future war is the common thread moving between them. Readers will note that while some individuals, like Lieutenant General James Gavin, play a role across all three, and some subjects, like the impact of atomic weapons, animate the activities, no single driver of this innovation is identified.

Expanding the Boundaries of Professional Knowledge

One of the major changes that occurred in the army after the Second World War was an expansion of what could be considered its traditional sources of professional knowledge. Samuel Huntington defined the professional characteristics of the modern officer corps as expertise, responsibility, and corporateness. The responsibility and corporateness of the army would expand during in the early Cold War but for the most part would not be challenged. However, the idea of the army officer as possessing a unique and unassailable body of knowledge in the 'management of violence' was an unexpected casualty of the Second World War. [43] The large-scale introduction of science, civilian scientists, and a requirement to manage scientific developments forever changed what an officer, and perhaps more importantly, the society he served, considered the basis of professional knowledge. The army, unlike the air force or the navy, was not a technologically centric service. The army's relationship to science was always more about pragmatism than knowledge. Science was useful to the extent is produced new technologies for battlefield use. More importantly, the army want to know how new weapons might impact basic tactics and organization and in turn how new tactics might drive requirements for new weapons. The answer to these kinds of questions would be found in the newly created discipline of operations research.

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[43] Samuel P. Huntington, *The Soldier and the State: The Theory and Politics of Civil Military Relations* (New York: Vintage Books, 1957), pp. pp. 11-18.

Definitions for operations research vary. For simplicity, this dissertation will use the U.S. Department of Defense's definition:

> Operations Research: The analytical study of military problems undertaken to provide responsible commanders and staff agencies with a scientific basis for decision or action to improve military operations. Also called operational research; operations analysis.[44]

Some form of operations research has probably existed since the earliest days of organized armies and the introduction of technologies dedicated to the conduct of war. The early development of operations research began during the First World War and continued, in an unrecognized form, in small pockets across the fields of science, engineering, and industry over the next twenty years.[45] Operations research, in its fully developed form, began in Britain during the development of an air defense system in the late 1930s. These innovations spread to the United States during early military and scientific exchanges, but remained for most of the Second World War within the confines of the AAF and navy.[46] Most of the major works on the development of operations research in the army focus on the work of Office of Science Research and Development (OSRD). The administrative and organizational side of the OSRD story is well covered by a wartime participant, Steward Irvin, in his *Organizing Scientific Research for War: The Administrative History of the Office of Scientific Research and Development.* [47] The most significant aspect of OSRD's work from the perspective of long-term army interest in operations research, however, was the creation of the Office of Field Services (OFS) in 1943. Although the OFS had a mixed record of performance, it established precedent for scientists working with and directly for commanders engaged in

[44] Joint Staff, *Joint Publication 1-02, Department of Defense Dictionary of Military and Associated Terms* (Washington DC: Office of the Chairman, Joint Chiefs of Staff, 2010), p. 272.

[45] For a succinct summary of the early history see Joseph F. McCloskey, 'The Beginnings of Operations Research: 1934-1941', *Operations Research*, 35 (1987), 143-152.

[46] For examples of early air force, navy, and technical services operations research activity in the Second World War, see George Raynor George R. Thompson, and Dixie R. Harris, *The Signal Corps: The Outcome (Mid-1943 through 1945)* (Washington DC: Office of the Cheif of Military History, 1966); Charles W. McArthur, *Operations Analysis in the U.S. Eighth Air Force in World War II*, History of Mathematics, 4 (Providence: American Mathematical Society, 1990); Keith R. Tidman, *The Operations Evaluation Group: A History of Naval Operations Analysis* (Annapolis: Naval Institute Press, 1984).

[47] Irvin Stewart, *Organizing Scientific Research for War: The Administrative History of the Office of Scientific Research and Development* (Boston: Little, Brown, 1948). A broader and very insightful look at the relationship between science and WWII is A. Hunter Dupree, 'The Great Insaturation of 1940: The Organization of Scientific Reserach for War', in *The Twentieth-Century Sciences: Studies in the Biograpahy of Ideas*, ed. by Gerald Holton (New York: W.W. Norton & Company, Inc., 1972).

combat. Erik P. Rau's research, 'Combat Scientists: The Emergence of Operations Research in the United States During World War II,' offers perhaps the best explanation for how this new form of knowledge gradually found acceptance within the American military.[48]

The historiography of operations research in the early Cold War is a sub-set of a much larger body of scholarship on the growth of what Edward Teller called the era of 'big science'.[49] The great debates over the role of science in society; the proper relationship between the military and academia, and the implications, good and bad, of defense-oriented research funding all emerged during this period and remain a productive field of scholarship.[50] The most relevant part of this work is that which centers on the creation of specific internal and external organizations founded upon or dedicated to the use of operations research. The most iconic of these postwar organizations was the RAND Corporation.[51] In many ways much of the army's early emphasis on operations research in the late 1940s was a reaction to the almost ubiquitous influence of RAND's work in support of the newly independent air force.

On the specific topic of army operations research in the early Cold War, the best and most comprehensive work is *History of Operations Research in the United States Army, 1942-1962* by Charles R. Shrader.[52] Shrader's work is especially valuable because it traces the development of operations research as a discipline within the institutional context of the army. This is an important distinction since the majority of scholarship, as noted in the RAND case, focuses on either the personalities involved or the relative impact of the work itself. By the early 1950s, and in large measure as a result of military or military sponsored work, operations research had grown from a niche activity to a highly visible and increasingly influential force in national security. In the early 1950s practitioners of

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[48] Eric Peter Rau, 'Combat Scientists: The Emergence of Operations Research in the United States During World War II' (unpublished PhD thesis, University of Pennsylvania, 1999). Rau expounds on the early resistance to the work of the OFS in Erik P. Rau, 'The Adoption of Operations Reserach in the United States During World War II', in *Systems, Experts, and Computers - the Systems Approach in Management and Egnineering in World War II and After*, ed. by Thomas P. Hughes and Agatha C. Hughes (Cambridge: The Massachusetts Institute of Technology Press, 2000) (pp. 57-92).

[49] Edward Teller, 'The Era of Big Science', *Bulletin of Atomic Scientists*, 27 (1971), 34-36 (p. 34).

[50] See for example; Paul Dickson, *Think Tanks* (New York: Atheneum, 1971); Gregg Herken, *Counsels of War* (New York: Alfred A. Knopf, 1985); Fred Kaplan, *The Wizards of Armageddon* (New York: Simon & Schuster, Inc., 1983); Don K. Price, *The Scientific Estate* (Cambridge: Harvard University Press, 1965).

[51] RAND is short for Research And Development. For RAND's role and influence, see Alex Abella, *Soldiers of Reason: The RAND Corporation and the Rise of the American Corporate Empire* (Orlando: First Mariner Books, 2009); David Hounshell, 'The Cold War, RAND, and the Generation of Knowledge, 1946-1962', *Historical Studies in the Physical and Biological Sciences*, 27 (1998), 237-267.

[52] Charles R. Shrader, 'History of Operations Research in the United States Army: 1942-1962', I (Washington DC: United States Army, 2006).

operations research established a professional society and began publishing a highly regarded journal, *Operations Research*. This journal is a tremendous resource for insights into both the developments the field and the new discipline's history.

This dissertation traces the influence of operations research on the army and the creation of a capacity to conduct operations research related work through two organizations. The first was not actually an army organization. However, the Weapons Systems Evaluation Group (WSEG) played an important role in how the army began to accept a new source of professional knowledge. Secretary of Defense James V. Forrestal agreed to the creation of the Weapons Systems Evaluation Group in December 1948 in order 'to provide rigorous, unprejudiced, and independent analysis and evaluations of present and future weapons systems under probable future combat conditions'.[53] Harkening back to some of the unique attributes of the Second World War's OSRD, the WSEG consisted of of civilian scientific and academic experts paired with a small group of uniformed service representatives. The only general history of the WSEG is a comprehensive study by John Ponturo entitled, *Analytical Support for the Joint Chiefs of Staff: The WSEG Experience, 1948-1976*.[54] The WSEG is important to understanding the army's experience because of its role in several major studies of atomic weapons in the defense of Europe, and the influence it had on key individuals who in turn influenced the direction of the army's approach to future war. In addition to discussions of the politics and influence of WSEG in various memoirs, an important perspective is found in the oral histories of Gavin's replacement as the WSEG's senior army representative, Major General Garrison H. Davidson.[55] Davidson would go on to command CGSC and would credit his education at the WSEG for the development of the college's doctrine and development missions.

The genesis of the army's own postwar operations research organization is found in Eisenhower's 30 April 1946 memorandum directing the army to develop a means to 'have civilians assist in military planning as well as for the production of weapons'. Eisenhower's memorandum, which one can only view ironically as a call for the same military-industrial-complex he would later warn against, argued the army had a duty;

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[53] Reproduced as Annex C in John Ponturo, 'Analytical Support for the Joint Chiefs of Staff: The WSEG Experience, 1948-1976' (Arlington: Institute for Defense Analyses, 1979), pp. C-1.

[54] Ponturo, 'Analytical Support for the Joint Chiefs of Staff'.

[55] William C. Baldwin, 'Engineer Memoirs: Lieutenant General Garrison H. Davidson, USA Retired (Oral History)', (Oakland: Office of History, Office of the Chief of Engineers, 1986); Dr. John T. Greenwood, 'Interview with Lt. General Garrison H. Davidson' (Oakland: U.S. Department of the Army, Corps of Engineers, 1980). Other useful memoirs include Philip M. Morse, *In at the Beginnings: A Physicist's Life* (Cambridge: The MIT Press, 1977).

to take the initiative in promoting closer relations[s] between civilian and military interests. It must establish definitive policies and administrative leadership that will make possible even greater contributions from science, technology, and management than during the last war.[56]

The development of the army's own semi-independent operations research capability would come to fruition in 1948 under a unique collaborative contract with the Johns Hopkins University. The army and Johns Hopkins administrators quickly assembled a group of talented scientists under the leadership of a veteran of the navy's operations research program, Dr. Ellis Johnson. Johnson would be the first and only director, remaining with the program through its transition outside army control in 1961. One author noted that '[t]he history of [ORO] is inseparable from the history of Ellis A. Johnson'.[57] Johnson's correspondence, available in the archival records of the ORO at Johns Hopkins, is useful in tracing the growth, frictions, and demise of the organization he created.[58] The organizational history of the ORO is documented primarily through its formal studies and reports, many of which have been declassified and are accessible at both the archives at the U.S. Army Heritage & Education Center and on-line through the Defense Technical Information Center.

Although ORO was the first and largest operations research activity in the army, it was not the only one created during the early years. As discussed in the next section, operations research became a part of the combat developments activities on the army staff, Army Field Forces (AFF) and its successor, Continental Army Command (CONARC). A significant number of the early ORO projects included some aspect of social science research such as troop morale, training, and personnel performance. Still other efforts delved into issues of psychological warfare, country studies, and anthropological research in support of counterinsurgency planning. The growth and acceptance of operations research approaches to a wide range of issues eventually led to the creation of the Human Resources Research Office (HumRRO) at George Washington University and the Special Operations Research Office (SORO) at American University. More than any technical research conducted by ORO over

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[56] Memorandum from Eisenhower to Directors and Chiefs of War Department, subj: Scientific and Technical Resources as Military Assets, 30 April 1946, CCS 020 (10-4-44), Sec 1, Document 883, Part 4 Chapter 8, in *The Papers of Dwight D. Eisenhower, the Chief of Staff*, ed. by Louis Galambos, VII (Baltimore: The Johns Hopkins University Press, 1978), pp. 1045-1049. Eisenhower's papers from his time as chief of staff are useful in understanding the army's early relationship with science in general and OR in particular.

[57] Eugene P. Visco, 'The Operations Research Office', *Army History* 3(1996), 24-33.

[58] The Johns Hopkins University Archives, Baltimore Maryland. See Records of the Office of the President, Series I, Boxes 33, 34 and

the course of this era, it would be the application of operations research to the social sciences that would see a fundamental change in the way the army leveraged this discipline. A general survey of these organizations is found in Shrader's, *History of Operations Research in the United States Army* and an official history, *A History of the Department of Defense Federally Funded Research and Development Centers.*[59] As with ORO reports, a significant number of declassified HumRRO and SORO studies are in available in both national and military archives and on-line through the Defense Technical Information Center.[60]

The Birth of Combat Developments

For most of its history, until the early Cold War, the army's approach to the development of new concepts, doctrine, and technology remained at best ad hoc. The founding fathers designed deliberate separation into the army at its birth in the late eighteenth century aimed at keeping its warfighting arms and the administrative and logistics organizations separate. Congress created an eclectic mix of organizations such as the Quartermaster General, Commissary General of Stores and Provisions, Commissary General of Musters, Commissary of Artillery Stores, Adjutant General, Clothier General, Paymaster General, Chief of Engineers, Wagonmaster, and a Medical Department to manage the materiel of war. One historian has described it as an 'unsystematic, ill-managed administrative system that divided responsibility for maintaining the army among congressional committees, state authorities, military commanders, staff officers, and civilians'.[61] The mix of bureaucracies would change over the next century, and the basic processes would mature, but the "unsystematic and ill-managed" description remained applicable.[62]

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[59] Office of Technology Assersment US Congress, *A History of the Department of Defense Federally Funded Research and Development Centers*, OTA-BP-ISS-157 (Washington DC: U.S. Government Printing Office, 1995).

[60] Examples include: Peter A. Bordes, John L. Finan, Joseph R. Hochstim, Howard H. McFann, Shepard G. Schwartz, 'HumRRO Tr-1, Desert Rock I: A Psychological Study of Troop Reactions to an Atomic Explosion' (Washington DC: George Washington University - Human Resources Research Office, 1952); Meredith P. Crawford, 'Research Bulletin 1: What Is HumRRO Doing?', 1 (The George Washington University - Human Resources Research Office, 1954).

[61] E. Wayne Carp, *To Starve the Army at Pleasure: Continental Army Administration and American Political Culture, 1775-1783,* (University of North Carolina Press: 1990), p.19. See also Lucille E. Horgan, *Forged in War: The Continental Congress and the Origin of Military Supply and Acquisition Policy* (Greenwood Press: 2002).

[62] A useful survey of the army in this period is James A. Huston, *The Sinews of War: Army Logisitics 1775-1953*, Army Historical Series (Washington DC: Center of Military History, 1997).

One of the best studies of the ineffective and purposely incoherent process is David A. Armstrong's, *Bullets and Bureaucrats: The Machine Gun and the United States Army 1861-1916*.[63] Slowly, beginning with the 1902 Root Reforms and accelerating with the military and civilian mobilization of the First World War, bottom-up initiatives of creative officers and an occasional maverick began to drive small pockets of what one can best describe as 'local coherence', but there was still no coherent process.[64]

In the period between the world wars, most of the effort toward establishing a process for developing combat capabilities remained tied directly to mobilization for war and production of proven equipment designs. Developing new capabilities was never an easy task given the confusion over who controlled the process. Moreover, even where it showed glimmers of coherence, development in this period was a nearly fruitless task considering the lack of resources. On the mobilization and the development, in the interwar years, two official histories place development well within the context of near-term mobilization; *The Ordnance Department: Planning Munitions for War* and *History of Military Mobilization in the United States Army 1775-1945*.[65] On the specific issue of doctrine development in this period, the best overall study is William O. Odom's *After the Trenches: The Transformation of U.S. Army Doctrine, 1918-1939*. Odom argues that the irrelevance of the army's 1939 capstone doctrine manual to the challenges of the approaching war was proof of 'the lack of a doctrine development system; at worst, it suggested the stagnation of intellectual activity within the army.'[66]

During the first two years of the Second World War, introducing new technologies represented a second priority to the rapid tactical training and equipping of newly formed divisions. There were a few exceptions to this rule that would provide a preview of an integrated development process. The development of the army's tank destroyer force is

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[63] David A. Armstrong, *Bullets and Bureaucrats: The Machine Gun and the United States Army 1861-1916* (Westport: Greenwood Press, 1982).

[64] See George F. Hoffman, 'Army Doctrine and the Christie Tank: Failing to Exploit the Operational Level of War', in *Camp Colt to Desert Storm: The History of U.S. Armored Forces*, ed. by George F. Hoffman and Donn A. Starry (Lexington: The University Press of Kentucky, 1999), pp. 92-143. William Mitchell, *Our Air Force: The Keystone of National Defense* (New York: E.P. Dutton and Company, 1921).

[65] Contance McLaughlin Green, Harry C. Thomson, Peter C. Roots, *The Ordnance Department: Planning Munitions for War* United States Army in World War II, the Technical Services (Washington DC: Office of the Chief of Military History, 1955); Marvin A. Kreidberg, Merton G, Henry, *History of Military Mobilization in the United States Army 1775-1945*, DA Pamphlet No. 20-212 (Washington DC: Department of the Army, 1955).

[66] William O. Odom, *After the Trenches: The Transformation of U.S. Army Doctrine, 1918-1939* (College Station: Texas A&M University Press, 2008), p. 241.

informative. This nascent process took a concept through equipment development into the co-development of organization and doctrine and foreshadowed a process that would not reach maturity until the late 1950s. It is equally instructive that advocacy of an influential officer, in this case Lieutenant General Leslie J. McNair, championed the idea beyond what both the technology and initial combat feedback warranted. Christopher R. Gabel's *Seek, Strike, and Destroy: U.S. Army Tank Doctrine in World War II* provides a succinct description of the rise and fall of this wartime adaptation.[67]

New developments during the war, generally emerged through a bottom-up system that existed during the interwar years, but with two major modifications. First, the process was now well-funded. The challenge was no longer a lack of money, but one of rapid design, testing, and production. The second major change was the 1942 War Department general Staff (WDGS) reorganization and the creation of the ASF and the Army Ground Forces (AGF). For the first time there were higher headquarters with responsibility and some degree of central control over developments within the various arms and services. This marked the beginnings of an all-arms development approach. Organizational demands, user feedback from actual combat, gave rise, to the army's first holistic process. The Green Book series of official histories, specifically *The Organization of Ground Combat Troops, The Organization and Role of Army Service Forces* and *The Ordnance Department: Procurement and Supply* remain the best single sources for understanding this short-lived process.[68]

The army's first attempt to address the post-war combat development process came in the form of the 1946 *Report of War Department Equipment Board* or the Stilwell Board after its president General Joseph W. Stilwell. Despite its progressive nature, the Stilwell Board's near-term utility suffered because its analysis was unconstrained by resources. As if to emphasize that point, the reports release coincided with the acceleration of what would become a chaotic demobilization process. Despite this failing the report offered a clear description of the kind of development program the army required to keep up with the anticipated pace of technological change. The board argued that the army required 'vigorous research and development of new or anticipated types of equipment an continued

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[67] Christopher R. Gabel, *Seek Strike and Destroy: U. S. Army Tank Destroyer Doctrine in World War II* (Fort Leavenworth Combat Studies Institute, 1985).

[68] Kent Roberts Greenfield, Robert R. Palmer, Bell I. Wiley, *The Army Ground Forces: The Organization of Ground Combat Troops* United States Army in World War II (Washington DC: Center of Military History, 1987); John D. Millett, *The Organization and Role of the Army Service Forces*, United States Army in World War II (Washington DC: Center of Military History, 1954); Harry C. Thomson, Lida Mayo, *The Ordnance Department: Procurement and Supply*, United States Army in World War II (Washington DC: Center of Military History, 1960).

improvement of existing equipment as an interim measure [...and must] supervise continuously research and development merging or terminating projects at the feasible, economical moment and assur[ed] a step-by-step change-over from the discarded material to the new'.[69]

As described in Hewes' *Root to McNamara,* the late 1940s became an organizational battle between the army's diffuse combat development past and an increasingly consolidated future. An internal institutional power struggle began between the technical services, re-empowered after the postwar dissolution of the ASF, and the combat arms, represented by the AFF (successor to the wartime AGF) over the fate of research and development. During the late 1940s, this internal bureaucratic turf battles for control played out just under the surface as the larger unification and reorganization debate took place above. Inertia and the weight of history may have won the day for the status quo had it not been for the emergence of tactical atomic weapons. The need to conceptualize a future war animated in large measure by weapons which did not yet exist, shifted the internal debate toward the development of a system much more in line with that advocated by the Stilwell Board.

Beginning with the recommendations of an independent study of tactical nuclear weapons in the defense of Europe, Project VISTA, and continuing through several important organizational studies throughout the decade, the army gradually consolidated it development activities. [70] The creation of a 'Combat Development Group' within the new Continental Army Command (CONARC), which replaced the AFF in 1955, provided the nucleus around which combat developments would eventually grow. The history of organizational change in this period is documented primarily in Hewes' *Root to McNamara* study, as well as several official histories and monographs, such as the *United States Army Combat Development Command: Origins and Formation* and the *Combat Development System.* [71] Several official histories of the changes in army doctrine and organization during this period provide some

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[69] 'Report of War Department Equipment Board (Stilwell Board)' (Washington DC: War Department, Office of the Chief of Staff, 1946), p. 2.

[70] The multi-volume Project Vista report is available at the MHI archives. Additional information on the project is available in the California Institute of technology Archives, Project Vista Collection. For a useful analysis of the process and major recommendations see David C. Elliott, 'Project Vista and Nuclear Weapons in Europe', *International Security,* 11 (1986), 163-183; W. Patrick McCray, 'Project Vista, Caltech, and the Dilemmas of Lee Dubridge', *Historical Studies in the Physical and Biological Sciences,* 34 (2004), 339-370. The most influential reorganization study of the period was Paul L. Davies, 'Report of the Advisory Committee on Army Organization (the Davies Report)' (Washington DC: Department of the Army, 1953) <http://www.whs.mil/library/Dig/Rpt.%209-18-53.pdf> [accessed 1 March 2011].

[71] 'U.S. Army Combat Development System' (Fort Monroe: Headquarters, United States Army Continential Army Command, 1960); Jean E. Keith, Howard K. Butler, 'United States Army Combat Development Command: Origins and Formation' (Fort Monroe: US Army Combat Developments Command, 1972).

indication of both the pace of change and the limitations of the processes as they then existed. The first is Robert A. Doughty's *The Evolution of US Army Tactical Doctrine, 1946-1976*. Doughty, who was an army officer at Fort Leavenworth in the mid-1970s, was involved in another period of dramatic change, noted that the lesson of the Pentomic era was 'the dangers of a strategic concept dictating tactical doctrine without consideration of the technical and intellectual capability to follow'.[72] Another useful work oriented on the organizational machinations of the period is John B. Wilson's, *Maneuver and Firepower: The Evolution of Divisions and Separate Brigades*. Wilson argues that despite the failings of the army's post-war combat developments process, 'the effort resulted in a set of "fertile ideas" with regard to new equipment and organizational concepts which would 'see further development in the next two decades'.[73] To that list, this dissertation would add coherent, if still immature, combat developments.

The final chapter in the dissertation examines the role of the army's education and doctrine development process. The CGSC was an important near-term integrator of many of the ideas emerging out of operations research and combat developments. Just as importantly, it shifted the army's conceptual framework of the next war from one that exclusively starts with current capabilities to one that includes the possibility of wholly new solutions to future challenges.

Learning to Keep Pace with the Future

From its founding in the late nineteenth century through the period of this dissertation, the army school at Fort Leavenworth Kansas played an important role in shaping the army's future. First, the CGSC is the army's most influential officer training and education institution. The other mission of the CGSC was as the army's primary developer and integrator of combined arms doctrine. This dissertation examines the development of both of these missions over the course of the early Cold War as well as CGSC's influence on the army's approach to future war. Changes in how the army thought about the future

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[72] Major Robert A. Doughty, *The Evolution of US Army Tactical Doctrine, 1946-76* (Fort Leavenworth: Combat Studies Institute, 1979), p. 19. Another useful survey of the broader changes in doctrine over the entire century see Jonathan M. House, *Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organziation*, Research Survey No. 2 (Fort Leavenworth: Combat Studies Institute Press, 1984).

[73] John B. Wilson, *Maneuver and Firepower: The Evolution of Divisions and Separate Brigades*, Army Lineage Series CMH Pub 60-14 (Washington DC: Center of Military History, United States Army, 1998), p. 286.

emerged through debates over curriculum and the appropriate methods of reviewing and creating army doctrine. As this dissertation demonstrates, changes at the CGSC during this period impacted the army's near term efforts to integrate atomic weapons into land warfare and at the same time lifted the institution's horizon for thinking about future war.

One advantage of researching an educational institution is the professional habit of its staff and supporting library system to document both administrative and curricular activity. Records on the various Leavenworth schools dating to its founding in the early 1880s is available in the Combined Arms Research Library (CARL) archives and special collections. The collection includes locally produced histories of the college and its activities, annual reports from the commandants, and an extensive collection of student papers and reports. Significant for this dissertation's purpose, the collection covering the early Cold War includes an almost complete set of the annual reports of curriculum development, the internal and external review boards, correspondence of the commandants, as well as the special studies on doctrine and doctrine development procedures.

The other significant source of information on the college, its organization, and the topics *de jour* is the college's journal *Military Review*. Published monthly beginning in 1922, *Military Review* provides a window into what should be considered a 'semi-official' institutional perspective on major issues. Given the pressure, especially in the early Cold War, for instructors to write for the journal and a lack of an independent peer review process, one cannot consider *Military Review* an accurate gage of what the officer corps was actually thinking, but rather an indicator of what the institution wanted them to think.

In order to establish the degree of change that occurred after the Second World War, this chapter briefly describes the creation and development of CGSC. The early history of the CGSC is well documented in the secondary literature. The best chronicle of the college's early developmental years is available in Timothy K. Ninninger's *The Leavenworth Schools and the Old Army: Education, Professionalism, and the Officer Corps of the United States Army, 1881-1918.* [74] The two best studies of the school in the interwar period are Peter J. Schifferele's *America's School for War: Fort Leavenworth, Officer Education, and Victory in*

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[74] Timothy K. Nenninger, *The Leavenworth Schools and the Old Army: Education, Professionalism, and the Officer Corps of the United States Army, 1881-1918* (Westport: Greenwood Press, 1978). The best works on the intellectual development underway in the army at this time are T. R. Brereton, *Educating the U.S. Army: Arthur L. Wagner and Reform, 1875-1905* (Lincoln: University of Nebraska Press, 2000); Carol A. Reardon, *Soldiers and Scholars: The U.S. Army and the Uses of Military History* (Lawrence: University Press of Kansas, 1990).

World War II and a long journal article by Nenninger entitled 'Leavenworth and Its Critics: The U.S. Army Command and General Staff College, 1920-1940.'[75]

The early Cold War, as noted above, is well documented in official records but somewhat less so in the secondary literature. In terms of placing CGSC in the broader context of officer education the standard work in this period is John W. Masland and Laurence I. Radway's *Soldiers and Scholars: Military Education and National Policy.* [76] This highly regarded work is a scholarly treatment of the relationship between military education and the changing needs of national security. The authors provide a readable survey of both the general history of military education and the contemporary organization and curriculum.

Two other works provide a general overview of CGSC in the Cold War. The first is a report prepared for the college by Robert A. Doughty in 1976 entitled 'The Command and General Staff College in Transition, 1946–1976'. In this thoughtful study, Doughty usefully categorizes the changes at CGSC according to 'education versus training, generalist versus specialist, and scope of instruction'.[77] A more recent effort to examine CGSC in the Cold War is Michael David Stewart's 'Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College 1946–1986.' Stewart's work is a useful survey of the complete CGSC mission during this period, including material not considered here. Such as the courses offered to reserve forces and allies. While Stewart's work adds much to the scholarship in this period, he argues that much of the blame for the college's hesitancy to move toward a more progressive approach to its mission lay with the faculty's 'hesitancy to adopt new methods or to attempt to predict some part of the future.' What this dissertation makes clear is that the evidence does not support that position.[78]

In addition to anecdotal information found in memoirs of former commandants, staff officers, and students at CGSC, no study of this institution would be complete without

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[75] Timothy K. Nenninger, 'Leavenworth and Its Critics: The U.S. Army Command and General Staff School, 1920-1940', *The Journal of Military History*, 58 (1994), 199-231; Peter J. Schifferle, *America's School for War: Fort Leavenworth, Officer Education and Victory in World War II* (Lawrence: University of Kansas Press, 2010).

[76] John W. Masland, Laurence I. Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton: Princeton University Press, 1957).

[77] Robert A. Doughty, 'The Command and General Staff College in Transition, 1946-1976' (Fort Leavenworth: Command and General Staff College, 1976), p. 3, in Defense Technical Information Center (DTIC) <<http://handle.dtic.mil/100.2/ADA030436>> [accessed 1 December 2010].

[78] Michael David Stewart, 'Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College 1946-1986' (unpublished PhD thesis, University of Kansas, 2010), p. 99.

consideration of the oral history of Dr. Ivan J. Birrer.[79] Birrer became one of the college's first full-time civilian staff members in 1948. A year later, he became the senior education advisor to the commandant — a position he held for thirty years. In addition to his oral history, the recollections of Davidson, Brigadier General William F. Train, and Major John H. Cushman provide critical background material that establishes a missing context to many of the changes instituted by the final CGSC commandant during the period of this dissertation.[80]

Major General Lionel C. McGarr served as the commandant of CGSC from 1956 through 1960. During that time he instituted major changes to the curriculum, the college's organization, and the relationship of the college to the army's doctrine and combat development processes. Many of McGarr's initiatives in terms of curriculum and organization would continue to shape CGSC and the army officer corps for decades after his departure. McGarr's aggressive championing of the Pentomic concept and his rejection of the Davidson design for an integrated concept-doctrine-combat development process provided the negative evidence necessary for the army to eventually adopt the Davidson design. McGarr's tenure at CGSC is well documented in the CARL archives; see especially his end-of-tour report and the special report he wrote to explain the dramatic changes he instituted during his first year.[81] Given the self-promotional tone of some of this material, it seems that McGarr was more determined to impress upon his superiors the enthusiastic degree to which he was making changes rather than the intellectual basis for doing so.

The above introduction and literature review provide the thesis and necessary background material for the three substantive chapters that follow. Although all three major themes in this work are connected, and in many areas overlap one another, they each represent a distinct and necessary part of a military institution's ability to innovate. The fundamental argument of this dissertation is that in the period between the end of the Second World War and 1960, the army moved from a limited and largely ad hoc ability to prepare for

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[79] Robert A. Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College, Fort Leavenworth, Kansas, 20 January 1948 to 30 June 1978' (unpublished thesis, Command and General Staff College, 1978).

[80] Baldwin, 'Davidson - Oral History'; John H. Cushman, 'Fort Leavenworth - A Memoir, Vol. I,' U.S. Army War College Library, UB 200.C87 2001 V1;; Greenwood, 'Interview with Lt. General Garrison H. Davidson'; Reginald G. Moore, 'Oral History - William F. Train, Lieutenant General, USA Retired', II (Carlisle Barracks: US Army Military History Institute, 1983). Cushman would eventually command CGSC and retire as a Lieutenant General.

[81] Lionel C. McGarr, 'End of Tour Report of the Commanding General Fort Leavenworth and Commandant United States Army Command and General Staff College ' (Fort Leavenworth: Command and General Staff College, 1960); Lionel C. McGarr, 'Special Report of the Commandant' (Fort Leavenworth: Command and General Staff College, 1959).

future war to an institution with a coherent capacity to innovate. The distinction is important because while peacetime innovations, some successful and some not, have always occurred, estimates of the pace of change and the risk of failure in the early Cold War demanded more than genius and passion. Over the course of fifteen years the army created the capacity to change as the result of a three distinct processes. As stated at the outset, innovation in and of itself, whether the result of an ad hoc or institutional process, does not guarantee success. However, as one scholar of military change has observed, having an institutional capacity gives one 'a reasonable chance of beginning the next war adequately configured to make the always necessary adjustments'.[82]

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[82] Harold R. Winton, 'Introduction - On Military Change', in *The Challenge of Change: Military Instituions and New Realities, 1918-1941*, ed. by Harold R. Winton (Lincoln: University of Nebraska Press, 2000) (p. xii).

Chapter One - The Army and Operations Research

In the early Cold War, the United States Army's adoption of operations research as a legitimate, if sometimes problematic, source of professional knowledge changed the way it approached war. This chapter charts the background, development, and ultimately the demise of the Operations Research Office (ORO), the army's first organization dedicated to operations research. The army's early relationship with the field began slowly and ran in two parallel tracks. The first was the use of operations research to fill significant institutional gaps in knowledge ranging from the use of tactical atomic weapons to psychological operations. The second was the use of operations research as an institutional tool for strategic analysis, co-equal to professional military judgment. The ORO's demise after a thirteen-year existence might have spelled the end of operations research in the army had not been so successful in addressing a diverse set of challenges. The rise and fall of the ORO is one of those rare cases where the utility and inherent flexibility of the tool proved far more valuable than the skill of the mechanic.

Amid the profound changes shaping the army after the Second World War, the rapid development of technology and the fundamental shift in the strategic posture of the United States had the most far-reaching impact.[1] The rapid introduction, diversity of purpose, and inherent complexity of new weapons were changing the character of war at a pace the army had never experienced. It was no longer enough for a young officer to carry his technical and tactical mastery of a particular weapon through to the end of his career, assuming a long career, of course. As the recent war had demonstrated, weapons, or more specifically systems, might retain a degree of stability by general type, such as tanks, mines, or radios, but the potential now existed for generational changes in the specific hardware in a matter of a few years. Moreover, such changes increasingly required a degree of scientific and technological literacy on the part of officers in an institution still predisposed to notions of 'heroic' knowledge.[2]

America's new strategic posture was the other major change that affected the army in the early Cold War. The army was no longer a small force that mobilized for a national emergency and then just as quickly demobilized. The rapidly evolving concept of deterrence, while focused in the early years exclusively on atomic weapons, soon expanded to include forward deployed 'trip-wire'. The army, while slow to move away from concepts like universal military training and an updated version of the 1939 mobilization plan, had to adapt to the demands of a standing force. The reality of a relatively large standing force, ostensibly maintained in a high state of readiness, placed new demands on the officer corps for management skills on a scale unknown outside of managing large organizations in wartime. Six years of building, fighting, sustaining, and demobilizing the largest army in American history taught the institution many lessons. Nevertheless, as any runner can attest, sprinting does not prepare one for a marathon.

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[1] On the changes in this period and their impact on military professionalism see Samuel P. Huntington, 'Power, Expertise, and the Military Profession', *Daedalus*, 92 (1963), 785-807 (p. 785).

[2] Heroic knowledge here refers to what Brian McAllister Linn called a tradition that emphasized 'the human element, and defined warfare by personal intangibles such as military genius, experience, courage, morale, and discipline.' Brian McAllister Linn, *The Echo of Battle - the Army's Way of War* (Cambridge: Harvard University Press, 2007), p. 1.

The combined weight of these changes created a requirement for a new source of professional military knowledge. Prior to the end of the Second World War, an army officer was considered professionally well qualified if, in addition to the mastery of his particular arm, he was a student of history and had demonstrated his martial skills on a battlefield. An understanding of history, especially as developed through the applicatory method of study as it came into practice in the staff college before the First World War, was the ultimate source of knowledge in the American view of the profession of arms. Given the pace of change for most of the army's history, events within an officer's lifetime were a reliable source of up-to-date knowledge on how the army should operate once mobilized. The second source, personal experience, was by definition an idiosyncratic, but nonetheless powerful source of professional knowledge. It is not an accident that when soldiers, in professional or personal correspondence or memoirs, referr to a colleague, especially an admired one, they note that soldier's battlefield resumé. Experience was also the source of Basil Liddell Hart's observation that 'the only thing harder than getting a new idea into the military mind is to get an old one out'.[3]

Over the period covered by this dissertation, operations research became a third and influential source of professional military knowledge. This is not to say army officers gave up on the traditional sources or became scientists themselves. The story of operations research is how civilian scientists, by providing a novel approach to solving increasingly complex challenges, bridged the gap between two divergent trends.

The first trend was an increasing move toward specialization. Technology was in part responsible but, in general, specialization was a trend in all professions. For the military profession, however, this was problematic. Army officers began their professional lives as specialists. Training and initial assignments rested on a narrow skill set such as artillery, cavalry or infantry. Over the course of a career, officers became increasingly generalized as they gained experience and worked in larger and more integrated organizations. This is the opposite of most other professions. Most doctors, for example, graduate as general practitioners and then move to increasingly specialized fields such as cardiology or orthopedics. For senior army officers in the

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[3] Basil Liddell Hart, *Thoughts on War* (London: Faber and Faber, 1944), p. 115.

early Cold War, this trend toward specialization and the rapid pace of development increasingly chipped away at the near-term value of both their experience and knowledge of history, even recent history.

The second trend ran in the opposite direction. The Cold War required much more of the army as an institution than either its leadership or civilian masters could have anticipated. Large-scale overseas occupation, forward-deployed formations maintained at a high state of readiness, the political and strategic responsibilities of sustaining alliances, and the responsibilities and challenges of a unified Department of Defense, all greatly expanded the scope of general knowledge expected of senior officers. Walter Millis described the invasion of 'once pure sanctuaries of the general staffs' with such issues as '"psychological warfare," propaganda, policy aims, infiltrative methods, espionage, terror, threat, "economic warfare," and the industrial base by which one nation might affect the fortunes and policies of another beside the simple detonation of high explosives.'[4] So while demands of the Cold War remained in keeping with the generalist role of senior officers, there was little in their backgrounds to prepare them beyond the sphere of the narrowly military. While it is true that there is little on the list that did not occur at some point in the history of the United States prior to the Cold War, the difference was one of scale, volume, and duration.

A small group of scientitis working in a still developing field, served to bridge the gap that developed between these trends. In so doing, civilian scientific advice moved from being the musings of 'longhaired nuts' to a valued and integral factor in decision making. A number of scholars have charted the rise of the civilian defence intellectuals and Cold War strategists.[5] Sometimes derisively referred to them as slide-rule strategists or paper-prophets, individuals like Bernard Brodie, Herman Kahn, Henry Kissinger, Robert Osgood, and Albert Wohlstetter had a significant impact at the highest level on national security decision-making. In many ways, these new strategists were an antidote for an American tendency to 'seek refuge in technology

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[4] Walter Millis, *Arms and Men: A Study in American Military History* (New York: G.P. Putnam's Sons, 1956), p. 305.

[5] See Colin S. Gray, 'What RAND Hath Wrought', *Foreign Policy* (1971), 111-129; Gregg Herken, *Counsels of War* (New York: Alfred A. Knopf, 1985); Fred Kaplan, *The Wizards of Armageddon* (New York: Simon & Schuster, Inc., 1983).

from hard problems of strategy and policy'.[6] Just below the strategists was second tier of civilian defence intellectuals, mostly in the field of operations research, who occupied the seam between strategy and technology. This group worked closely with the services even as they both tried to maintain their independence. The operations researchers associated with the army in the early Cold War found themselves involved in every major issue the institution confronted, helped to shape the way it adapted its organizations, and changed the way senior army leaders thought about the future. By 1960, this chapter argues, operations research as a source of professional knowledge was of significant, if not equal, value to an army officer as was his personal experience and understanding of history.

Operations Research: The Science of Better

The U.S. military currently defines operations research as 'the analytical study of military problems undertaken to provide responsible commanders and staff agencies with a scientific basis for decision on action to improve military operations'.[7] One of the first books on operations research defined it as 'a scientific method of providing executive departments with a quantitative basis for decisions regarding the operations under their control'.[8] In practice these definitions have not moved far from the more descriptive statement of purpose first articulated in 1941 by the man considered the father of operations research:

> The object of having scientists in close touch with operations is to enable operational staffs to obtain scientific advice on those matters, which are not handled by the service technical establishments.
>
> Operational staffs provide the scientists with the operational outlook and data. The scientists apply scientific methods of analysis to these data, and are thus able to give useful advice.[9]

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[6] Russell F. Weigley, *The American Way of War* (New York: Macmillan Publishing Co., Inc., 1973), p. 416.

[7] Joint Staff, *Joint Publication 1-02, Department of Defense Dictionary of Military and Associated Terms* (Washington DC: Office of the Chairman, Joint Chiefs of Staff, 2010), p. 272.

[8] Philip M. Morse, George E. Kimball, *Methds of Operations Research*, Revised (New York: The Technology Press of Massachusets Institute of Technology and John Wiley & Sons, Inc., 1951), p. 1.

[9] P.M.S. Blacklett, 'Scientists at the Operational Level' (1941) reproduced in P.M.S. Blackett, *Studies of War: Nuclear and Conventional* (New York: Hill and Wang, 1962), p. 171.

Like military decision-making, operations research is not a purely philosophic pursuit; it is about solving specific problems. The emphasis on a 'systematic method of learning by experience' in support of decision making, makes operations research a unique branch of science. It is a science 'with a severely practical goal'.[10] Operations research is an applied science defined by its approach to problem solving.[11] By its nature it is eclectic. It has no fixed methodology or narrow philosophic core. Practitioners of operations research can and do come from across the academic spectrum and include physicists, chemists, mathematicians, biologists, sociologists, political scientists, doctors, historians, and lawyers. What holds the discipline together as a science, and in fact what made it so valuable to the army, is its methods, concepts, and techniques applicable to a range of complex problems.

One of the pioneers of the field, E. C. Williams, described what he called the 'four main streams' of operations research work:

- Work concerned equipment or weapon evaluation and redesign for better performance with its human operators;

- Analysis of specific operations to improve the tactics, and tactical experiments;

- Prediction of the outcome of future operations whether in the tactical or strategic field with the object of influencing policy;

- Study of the efficiency of organizations, which wielded the equipment and weapons in battle.[12]

In the service of military decision makers or field commanders, operations research seeks to answer the perennial question – is there an alternative or better combination of means to accomplish a desired end? The question is hardly new or original. Commanders across military history have entertained some variation of this

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[10] Blackett, *Studies of War*, p. 199; Committee on Operations Research, 'Operations Research with Special Reference to Non-Military Applications' (Washington DC: National Research Council, 1951), p. 3. One industrialist termed operations research, 'quantitative commonsense.'

[11] There have always been debates over the question – is operations research a science? Blackett himself questioned whether 'operational research,' as he termed it, should be a field of its own. Others have called it a part of management science, or engineering. This dissertation accepts the assertion by the majority of operations research practitioners at the time that it is a distinct science.

[12] E.C. Williams, 'The Origin of the Term "Operational Research" and the Early Development of the Military Work', *OR*, 19 (1968), 111-113 (p. 113).

most fundamental of questions. Prior to the industrial age, the science of war more often than not simply deferred to the art of war. The proliferation of means and the scale of war ushered in by the industrial revolution shifted, or at least indicated a need to shift, the balance between art and science. Consideration of the science of war and management of its means became an essential if still unsolvable equation. Carl Von Clausewitz mused on a classic operations research problem in *On War*:

> If one could compare the cost of raising and maintaining the various arms with the service each performs in time of war, one would end up with a definite figure that would express the optimum equation in abstract terms.

Clausewitz, in his standard fashion, dashed any hope that, given the nature of war, the search for a 'definitive figure' was anything more than a 'guessing game'. The great number of variables including the 'monetary factor,' the 'value of human life,' and 'the fact that each arm really depends on a different sector of the national economy' conspired, he argued, to confound any human calculus. As any modern defence analyst can attest, the nature of these 'outside determinant(s),' as Clausewitz called them, gave purely monetary factors an outsized weight in any discussion of means. He noted that the problem only got worse when one tried to measure and compare the effectiveness of the various arms. Clausewitz concluded that '[i]n theory [...] there is an optimum proportion between the arms, which in practice remains the unknown X, a mere figment of the imagination'.[13]

Almost 150 years after *On War*, practitioners of operations research would generally agree with the great military theorist – the optimum still remains the 'unknown X.' Charles Hitch, a RAND Corporation economist and significant contributor to the development of operations research in the early Cold War, asked:

> So what does the poor operations researcher do? Here he is, faced by his fundamental difficulty. The future is uncertain. Nature is unpredictable, and enemies and allies even more so...how can he find the optimal course of action to recommend to his decision maker?[14]

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[13] Carl Von Clausewitz, *On War*. trans. by Michael Howard and Peter Paret, ed. by Michael Howard and Perter Paret (New York: Alfred A. Knof, 1993), p. 340.

[14] Charles Hitch, 'Uncertainties in Operations Research', *Operations Research,* 8 (1960), 437-445 (pp. 443-445).

In answering his own question, Hitch recognized both the limitations as emphasized by Clausewitz and the demonstrated reality that one can reduce uncertainty but only through a combination of scientific analyses coupled to realistic decision-making.

> The simple answer is that he probably cannot [...] It is our job and opportunity to find, invent, within constraints, some better pattern of adjusting to an uncertain world than our betters would find if we weren't here, or some better way, taking costs and pay-offs into account, to buy information to reduce the uncertainly.[15]

The Birth of Operations Research

The fact that operations research draws on a multitude of disciplines and attracts scientists from across the philosophical spectrum makes it easy to identify 'elements' of operations research in any number of historical cases. Historians often cite Archimedes as one of the earliest examples of an individual applying mathematical principles and a scientific approach to the challenges of war. Throughout history, creative geniuses have applied the leading-edge science of the day to the problems of technology and weapon designs. What these early examples share was not a common scientific methodology or set of well established principles but scientists 'prepared to research into any question even though it was quite outside [their] previous specialized knowledge'.[16]

Examples of precursors to operations research abound.[17] Efforts by scientists and engineers throughout the nineteenth and early twentieth centuries added to the body of knowledge and toolbox of methodologies still used by operations researchers. Work by Frederick Winslow Taylor, the engineer and father of scientific management in the decade prior to the First World War is a good example. Taylor's efforts sought to replace 'rule-of-thumb' management techniques with the so-called scientific

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[15] Hitch, 'Uncertainties in Operations Research', (p. 445).

[16] Harold Larnder, 'The Origin of Operational Research', Operations Research, 32 (1984), 465-475 (p. 467).

[17] A listing of scientists whose work constituted the 'precursors' of operations research from 1564 through 1935 is found in Saul I. Glass and Arang A. Assad, Annotated Timeline of Operations Research: An Informal History (Boston: Springer Science + Business Media, Inc., 2005), pp. 1-44.

approach that would take into account the entire system.[18] His work was influential in that it explicitly combined the observational and analytical attributes of science with the value added decision-making purpose of management. But it was engineering rather than research. A pioneer of operations research would later argue that 'Taylor's ideas were the essence of our profession, but the fire was not kindled by the spark'.[19]

Another example, closer to the military but no less an example of scientists crossing the boundaries of their discipline, was the work of Frederick W. Lanchester. Lanchester, a British engineer and restless inventor, postulated a set of linear and square mathematical 'laws' to explain the tactical interaction between forces in his 1915 work *Aircraft in Warfare: the Dawn of the Fourth Force*.[20] Developed as a part of his research and advocacy for the field of aeronautics, the so-called 'Lanchester equations' provided a mathematical tool useful in modelling and estimating complex combat interactions. Lanchester's foundational work was important to the development of operations research and remains useful for simple attrition modelling.[21]

One of the interesting, but little noticed, aspects of *Aircraft in Warfare* was its preface. Written by Major General David Henderson, then Britain's director general of aeronautics, it provides a preview of the tension, and eventual grudging respect that would develop between scientists and the military during the early years of operations research. In his preface Henderson, the future commander of the Royal Flying Corps and a driving force behind the creation of the Royal Air Force (RAF), complained of the knowledge gap between new technology and reliable information about its potential use. He argued that this situation left the public, and the military, vulnerable

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[18] Frederick Winslow Taylor, *The Principles of Scentific Managment* (New York: Harper & Brothers Publishers, 1913).

[19] Ellis A. Johnson, 'The Long Range Future of Operational Research', *Operations Research,* 8 (1960), 1-23 (p. 3).

[20] F. W. Lanchester, *Aircraft in Warfare: The Dawn of the Fourth Arm* (London: Constable and Company, Ltd., 1916). On Lanchester's lasting impact on the field see Joseph F. McCloskey, 'Of Horseless Carriages, Flying Machines, and Operatons Research', *Operations Research,* 4 (1956), 141-147.

[21] On the continuing relevance of these early equations see Paul K. Davis, 'Aggregation, Disaggregation and the 3:1 Rule in Ground Combat' (Santa Monica: Project Air Force, Arroyo Center, National Defense Research Institute, 1995); Morse, *Methds of Operations Research*, pp. 63-80.

to 'any plausible rogue, gifted with sufficient assurance, and aided by a ready pen or supple tongue' posing as an 'aeronautical expert'.[22]

Henderson's lament was an acknowledgment that existing sources of expertise and professional knowledge were increasingly inadequate. For three years he and Lanchester debated many of the issues addressed in *Aircraft in Warfare*. The civilian, 'well protected by his profound knowledge of physical science [...] and engineering,' and the soldier, 'strongly entrenched behind a barricade of military prejudice with some dim recollections of early scientific training as reserves for counterattack' did not, in the end, agree on all the issues. However, Henderson heartily endorsed and encouraged Lanchester's work because, he argued, scientists were among the few students of this new field, who 'by reasons of their receptive minds, and their wide and varied experience, have mastered so many of the fundamental problems that they are well qualified to review the general position, and to put forward a reasoned statement of their views'.[23] A tribute to Lanchester, written a decade after his death in 1946, credited him with 'recognizing the power of scientific insight and mathematical tools in the solution of operational problems long before "operations research" was coined'.[24] Notwithstanding advances by men like Lanchester and Taylor, the military would have to wait until the run-up to the Second World War before the emergence of the key concept of operations research — teams of scientists working at the operational level of military commands — came into practice with an eclectic group of British scientists helping to prepare the air and then naval defence of their island.

In 1934, Albert Percival Rowe, a meteorologist working for the Director of Scientific Research in the Air Ministry, successfully agitated for a scientific study of the nation's air defences, arguing that current efforts were essentially worthless. The Committee for the Scientific Study of Defence was formed to 'consider how far advances in technical knowledge could be used to strengthen the present methods of defence against hostile aircraft'.[25] Henry Tizard, a former First World War test pilot,

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[22] Lanchester, *Aircraft in Warfare*, pp. v-xi.

[23] Lanchester, *Aircraft in Warfare*, pp. v-xi.

[24] McCloskey, 'Of Horseless Carriages', (p. 141). Other contributors include American inventor Thomas A. Edison. His use of statistics and invention of a tactical board game to help convoys evade submarine attack anticipated work by naval operations researchers in the Second World War. Edison's efforts, however, remained isolated from military decision makers and had little effect on events. William F. Whitmore, 'Edision and Operations Research', *Operations Research*, 1 (1953), 83-85.

[25] P. M. S. Blackett, 'Tizard and the Science of War', *Nature,* 185 (1960), 647-653 (p. 647).

noted chemist, and rector of the Imperial College of Science and Technology, agreed to lead the investigation. Other members of the committee included Archibald Vivian Hill, a Nobel Prize winning physiologist who led an anti-aircraft experimental research team in the Great War; P.M.S. Blackett, a physicist, veteran of the First World War navy, and future Nobel laureate; as well as Rowe and his boss H.E. Wimperis. From the beginning the Tizard Committee embodied several characteristics that would define operations research – a specific military operational problem in need of solution, and a diverse pool of civilian scientific talent to consider the options.

Another attribute of operations research, a willingness to explore seemingly odd ideas, was immediately evident in the Tizard committee's preparation for its first meeting. They asked Robert Watson-Watt, the superintendent of the National Physical Laboratory's Radio Research Department, if it were possible to use radio waves as a kind of 'death-ray' to stop incoming bombers. Watson-Watt reported back that the idea of using radio as a weapon was not feasible. However, he informed them, one might use radio waves to detect aircraft at long range. The concept of radar (then called radio direction finding) was born. Within a month, field experiments were underway.

The development of radar proceeded quickly and within two years, radar stations were under construction along Britain's eastern and southern coasts. Tizard and his scientists understood that detection was only part of the ultimate solution. To be effective, radar would have to be integrated with the RAF Fighter Command, air defence artillery, and other elements of an early warning system. A series of experiments integrated the various streams of information and tried to maximize the impact of any one part of the whole system. As these experiments, exercises, and attempts to do 'the best you can with what you have' continued, they gave rise to the term 'operational research.'[26] Operational research grew rapidly. Fighter Command took advantage of the radar scientists to improve its operations procedures and coordination. For example, early in the Battle for France, Air Marshal Hugh Dowding

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[26] Joseph F. McCloskey, 'The Begining of Operations Research: 1934-1941', *Operations Research*, 35 (1987), 143-152 (p. 146). See also Williams, 'The Origin of the Term "Operational Reseach"'.

relied on calculations from the operational researchers to guide his advice to Churchill on how many squadrons Britain could afford to keep in France.[27]

The reputation and utility of these scientific teams spread to other parts of the British military. In late 1940, Blackett created the Antiaircraft Command Research Group, soon dubbed 'Blackett's Circus'. After six months of applying what had been learned in radar development and Fighter Command to improve both the coordination and efficiency of air defence, Blackett moved to Coastal Command. During a nine-month period, Blackett and his team made significant contributions to anti-submarine efforts. Blackett's role as an organizational integrator and articulate advocate of a scientific approach to military problems finally landed him the job as Scientific Advisor and Director of Naval Operations Research, a position he would hold for the remainder of the war. In December 1941, he wrote a short memorandum entitled 'Scientists at the Operational Level,' which he described as 'hurriedly and somewhat flippantly written,' on basic principles and lessons of operations research.[28] This document, and a more technical treatment of the subject written in 1943, formed the foundation of what became operations research.

The British experience produced four principles of successful science at the operational level. These principles were, the outline for operations research in the United States Army after 1948. First, there must be a specific problem. In this case it was radar, where the actual solutions took precedence over developing the theory behind the solution. The second was the need to bring senior military officers together with senor scientists to create a common understanding of major issues. Third, below the level of senior people, one needed to create an environment where serving officers and university scientists could work on 'brilliantly creative and sometimes obstreperous teams'. Finally, one had to create in the minds of the military the recognition that scientifically trained personnel could contribute to more than just the design and testing of weapons but 'also in the actual study of operations.'[29]

By the late 1930s the basic ideas behind operations research were slowly making their way across the Atlantic, but still lacked an advocate. On 27 June 1940,

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[27] Maurice W. Kirby, *Operational Research in War and Peace: The British Exprience from the 1930s to 1970s* (London: Imperial College Press, 2003), p. 79.

[28] Both documents are reprinted in Blackett, *Studies of War*, pp. 171-198. For a recitation of the problems studied during Blackett's various postings during the war, see p. 205-234.

[29] Blackett, 'Tizard and the Science of War', (p. 647).

President Franklin Roosevelt approved the creation of the National Defense Research Committee (NDRC) and selected Vannevar Bush, the energetic president of the Carnegie Institution, as its leader.[30] The president designed the NDRC to 'support scientific research on the mechanisms and devices of warfare'. Imbued with a sense of urgency, the NRDC organized itself into divisions and sections oriented on major categories of weapons research, secured the services of some of the country's best scientific talent, and let contracts for research with universities and laboratories.[31]

One of the early functions of the NRDC was to establish scientific liaison with Allied powers. The first of these came at the initiative of the British.[32] In August 1940, at the height of the Battle of Britain, Tizard led a British mission to Washington to initiate what was essentially a unilateral transfer of classified technology to their still uncertain ally. For the British, this was part of a larger campaign to bring the United States along as an ally and potentially tap its manufacturing capacity.[33] For the Americans, the visit was a windfall of scientific data and technology, including such areas as asdic (sonar), atomic energy, the influence (VT or variable time) fuze, the sonabouy, and anti-aircraft gun laying. The most important single item of technology was the cavity magnetron. This device was the heart of advanced radar and almost overnight changed the direction of American research. The exchange was a successful one for both nations. The United States received a two-year jump-start in many areas and was 'getting infinitely more than [it] could give'. For his part, Tizard reported to Prime Minister Winston Churchill that 'broadly speaking the Americans are far

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[30] Vannevar Bush (1980-1974) was described as a Twentieth Century American without peer in terms of influence in the growth of science and technology. Trained as an engineer at MIT, Bush worked on submarine detection technology during the First World War, taught and became the dean of the Engineering Department of MIT, was a member of the National Academy of Science, and the National Research Council. During the Second World War he led the NRDC, the Office of Scientific Research and Development (OSRD), the Joint New Weapons Committee of the Joint Chiefs of Staff, and the Military Policy Committee of the Manhattan Project. Following the war, Bush continued to coordinate and advocate for research in support of national defense by leading the Joint Research and Development Board and it successor until 1948. See Jerome B. Wiesner, 'Vannevar Bush 1890-1974 - Biographical Memoir' (Washington DC: National Academy of Sciences, 1979).

[31] Rexmond C. Cochrane, *The National Academy of Sciences: The First Hundred Years 1863-1963* (Washington DC: National Academy of Sciences, 1978), pp. 382-399.

[32] Numerous, primarily informal contacts between military staffs occurred throughout this period. In the run-up to the Tizard visit, A.V. Hill made what can only be described as a scientific intelligence tour of the United States between February and June 1940. He returned to London convinced of the mutual value of an open technical collaboration.

[33] The Tizard mission met without expectation of a *quid pro quo*.

behind' and that the rewards of a long-term scientific relationship would be great, but only if the contacts were to continue though the formal exchange of scientific missions and were carefully managed. [34]

What was less clear at the time was the degree to which the basic idea of operations research was part of this scientific exchange. Many of those who participated in the Tizard mission or were selected for liaison duty over the next year were veterans of operations research work in the United Kingdom. American missions and liaison teams began flowing the other direction as well. Most of the development of operations research in the United States during the war occurred in three areas: the navy, the army air forces, and the Office of Scientific Research and Development (OSRD).

There is little evidence of any significant interest in operations research on the part of the army's non-aviation combat arms or the technical services. Elements of operations research occurred in other areas, but generally on a small scale or in a limited fashion. The best example is perhaps the Signal Corps. In the immediate aftermath or the disaster of Pearl Harbor, the U.S. military mission in London asked Watson-Watt to conduct a survey of American air defences. At the time, American air defences were divided among the interceptors and barrage balloon units of the GHQ Army Air Corps, air defence regiments of the active army and National Guard, and a nascent aircraft warning service of the Signal Corps. [35] Watson-Watt's report was highly critical of the pace and relevance of the Signal Corps' technical efforts. The main problem, the blunt Scotsman noted, beside the 'absurd attitudes' displayed by some in the U.S. military toward radar, was the 'insufficient organization applied to technically inadequate equipment used in exceptionally difficult conditions'. [36] In response, the Signal Corps established the Technical Research Group on Radar. After

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[34] Alfred Loomis as quoted in Secretary of War Henry L. Stimson diary, 2 October 1940. Cited in David Zimmerman, *Top Secret Exchange: The Tizard Mission and the Scientific War* (Montreal: McGill-Queen's University Press, 1996), p. 138 and 172.

[35] Stetson Conn, Rose C. Engelamn, Byron Fairchild, *The Western Hemisphere: Guarding the United States and Its Outposts*, United States Army in World War II (Washington DC: Office of the Chief of Military History, 1964), pp. 54-64.

[36] Quoted in *Plans and Early Operations, January 1939 to August 1942* ed. by Wesley Frank Craven and James Lee Cate, New Imprint, I (Washington DC: Office of Air Force History, 1983), pp. 291-292.

the initial flurry of activity, however, this effort gradually became a technical and engineering research and test programme.[37]

Somewhat surprisingly, the navy's development of operations research during the war had more impact on the army's later efforts than did the activities of its own air arm. Like the army's later experience, early encounters between the navy and the scientists were not promising. Philip M. Morse, a pioneer in American operations research, recalled that the sea service was always 'apprehensive about trusting its secrets to civilians, and Admiral Ernest J. King, the new [...] Chief of Naval Operations was particularly strict'.[38] Things changed after the Japanese attack on Pearl Harbor and U-Boat attacks against shipping along the East Coast. A naval officer who saw at first hand the work of Blackett's Circus, Captain Wilder Baker, began advocating a programme based on the tenets of spelled out in 'Scientists at the Operational Level'. The formula was simple '[military] staff provide the scientists with the operational outlook and data' and in return 'the scientists apply scientific methods of analysis to the data...to give useful advice'. Blackett's approach allowed scientists, to do more than just tinker with 'new gadgets'. They could 'encourage numerical thinking on operational matters, and so can help to avoid running the war by gusts of emotion'.[39] Once again, it was informal relationships with the British that convinced the navy's leadership to break the stoic tradition of the naval officer as 'absolute master'.[40]

The navy formed the first active operations research group, the Mine Warfare Operations Research Group (MWORG) in January 1942. The MWORG grew out of research into German magnetic mines at the navy's ordnance laboratory and was led by the future head of the army's major post-war operations research, Ellis A. Johnson. Johnson, a physicist, along with a group of scientists augmented their technical work

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[37] The army did avail itself of the work of OSRD's Statistical Research Group from 1942–1945. This group, like the efforts in the Signal Corps did not progress to the level of operations research. See W. Allen Wallis, 'The Statistical Research Group, 1942-1945', *Journal of the American Statistical Association*, 75 (1980), 320-330.

[38] Philip M. Morse, 'The Beginnings of Operations Research in the United States', *Operations Research*, 34 (1986), 10-17 (p. 11). Morse worked on naval issues through an NRDC contract with MIT.

[39] Quoted from 'Scientists at the Operational Level' reproduced in Blackett, *Studies of War*, pp. 171-176.

[40] Morse, 'The Beginings of Operations Research', (p. 12.).

with simple war-gaming as a way to improve effectiveness.[41] Informal collaboration between members of Johnson's staff and members of 'Blackett's circus' working on similar problems for the RAF Coastal Command accelerated the process of combining academic disciplines and moving the research out of the laboratory and into the operating forces.[42]

Despite initial resistance on the part of some conservative naval officers, the navy's Vice Chief of Naval Operations was impressed with both the British operations research efforts and recent reports by Johnson's team. In the early summer the navy expanded its operations research efforts by creating the Antisubmarine Warfare Operations Research Group (ASWORG). Despite its early growth, old habits died hard. Johnson and his fellow scientists found it difficult to obtain operational data. Working from laboratories in Washington and Boston, they found it easier to obtain classified technical data and operational reports from the British than from the their own navy sponsors.[43]

Several changes took place in the navy's programme over the course of the war that would provide lessons to Johnson in his later position developing the army's operations research. First, operations research did not begin to add value and build trust with naval personnel until the organization moved from the supervision of the bureau of ordnance to an office under the Chief of Naval Operations in October 1942 and later to commanders of the fleets.[44] As one history noted, 'the very purpose of operations research is neutralized if the results cannot be handed to a central authority endowed with the power to change procedures'.[45] The second lesson was a subset of the first; Johnson could not influence events unless he was in the same physical place

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[41] Among the scientists recruited for the Johnson's efforts was Dr. William B. Shockley, who would go on to invent the transistor and win the Nobel Prize for physics.

[42] Charles R. Shrader, 'History of Operations Research in the United States Army: 1942-1962', I (Washington DC: United States Army, 2006), pp. 18-19. Johnson was at Pearl Harbor on 7 December 1941 as part of a navy wargame effort on countermining. Johnson and his team assisted in the wake of the attack with planning the clearance of the harbor against the possibility of Japanese mining. The value of fusing scientific approaches to ongoing military requirements could not have been clearer.

[43] Joseph F. McCloskey, 'U.S. Operations Research in World War II', *Operations Research*, 35 (1987), 910-925 (p. 11); Philip M. Morse, *In at the Beginnings: A Physicist's Life* (Cambridge: The MIT Press, 1977), pp. 185-188; George Shortley, 'Operations Research in Wartime Naval Mining', *Operations Research*, 15 (1967), 1-10 (p. 5).

[44] Shrader, 'History of Operations Research in the United States Army', p. 20

[45] Keith R. Tidman, *The Operations Evaluation Group: A History of Naval Operations Analysis* (Annapolis: Naval Institute Press, 1984), p. 57.

as the operational commander he served and was working with the actual data on which the commander made decisions.[46] Accordingly, in early 1943 Johnson accepted a naval reserve commission and deployed to the Pacific to work on mining issues for the Pacific Fleet. The final lesson was that earning the trust and respect of the military in an operational setting required patience and a willingness to compromise. After some initial setbacks, Johnson slowly became a trusted member of Admiral Chester Nimitz's staff. This trust, in turn, created the freedom of action he needed for his work.

By summer 1944, Johnson and his team were directing aerial mining operations for the entire Pacific. However, a lack of aircraft and the slow pace of surface mining limited the operational value of their work. In spring 1945, with support from Nimitz, Johnson convinced General Henry 'Hap' Arnold to divert a small portion of his B-29 fleet, then dedicated to bombing Japan, to aerial mining efforts aimed at the Shimonoseki Straits. Using analysis of sea-lanes, available shipping, ports, and supply, the operations research team determined that halting traffic through aerial mining would effectively cut Japan off from its last remaining sources of outside supply. The appropriately named Operation STARVATION, which ran through the end of the war, eventually cut off some 140 Japanese ports. One participant called it 'the most complete example of the successful application of military operations-research techniques during the war'.[47]

The lessons from the efforts of the Army Air Forces (AAF) are less direct. Operations analysis (OA) as operations research was called in the AAF, had two nearly simultaneous starting points. One was a discussion between Secretary of War Henry Stimson and the commander responsible for the defence of the Canal Zone in Panama in early 1942. No doubt influenced by the recent Watson-Watt inspection tour, the local commander requested 'a group of analytically minded civilians, some scientific and some technical [...to assist in] solving the usual and insistent problems of planning and tactics involved in the defense of the Canal'.[48] The second start point came in the form of a request from the commander of the newly deployed Eighth Air

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[46] Tidman, *The Operations Evaluation Group*, pp. 41-46.

[47] Shortley, 'Operations Reserach in Wartime Naval Mining', (p. 5).

[48] Conversation between Major General Andrews and Secretary of War Stimson, spring 1942, cited in Charles W. McArthur, *Operations Analysis in the U.S. Eighth Air Force in World War II*, History of Mathematics, 4 (Providence: American Mathematical Society, 1990), p. 3.

Force Lieutenant General Ira Eaker asked Arnold to create operations research elements on the model of the RAF.

Over the summer 1942, a small team under the direction of a Harvard law professor and major in the army reserves, W. B. Leach, studied the existing operations research work in both Britain and the United States. The study's primary recommendation was to create operational research activities in all major AAF units following the British model. On 24 October and based on Leach's study, Arnold directed air force commands to include in their staff 'highly qualified civilians, having unusual scientific or analytical attainments [...] for the purpose of improving tactics, equipment, methods of training and methods of supply'.[49]

With the assistance of the NRDC, Leach began assembling and deploying civilians to England to create and propagate Operations Analysis Sections (OAS) throughout Eighth Air Force. The institutional backing provided by Arnold assured that OASs would quickly open in almost every air force and subordinate commands across the globe. The fundamental question posed to the first OA group by the commander in Britain was 'how can I put twice as many bombs on my targets?' As one analyst noted after the war, this represented the perfect question for a group of civilian scientists: it was 'of major importance, of broad scope, and stated in quite vague terms, by scientific standards.' In other words the scientists could use the 'whole bomber command as their laboratory'.[50] OAS scientists, working closely with the bomber crews, isolated seven factors that explained why only fifteen percent of bombs hit within 1000 feet of their desired aim point. By methodically working though each category and making detailed statistical analyses, supported by direct observations of the benefits of modifying one factor over the other, the OAS recommended a set of changes to reduce the error over time. Bombing accuracy rose to better than sixty percent.[51]

In a post-war history of the AAF's OA efforts, General Carl Spaatz, Eighth Air Force commander, wrote that his OASs 'were essentially field units [...] devoted [...] to the problems of the particular command which they served--to the mission it had to

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[49] McArthur, *Operations Analysis in the U.S. Eighth Air Force*, p. 4.

[50] Leroy A. Brothers, 'Operations Analysis in the United States Air Force', *Journal of the Operations Reseach Society of America*, 2 (1954), 1-16 (pp. 1-2).

[51] Brothers, 'Operations Analysis', (p. 8).

accomplish'. The semi-autonomous nature of the AAF model meant that the analysts became specialized in solving the local command's problems and 'acquiring the confidence of the officers by whose side they worked'.[52]

The final wartime influence on the army's postwar operations research efforts was the OSRD's Office of Field Services (OFS). In June 1941, Roosevelt created the OSRD to fix the deficiencies of the NDRC. The NDRC suffered from a weak bureaucratic position because, among other things, it was not a federal agency and so was left to react to requests for research by the various elements of the War Department. Moreover, even when the NDRC was productive, there was a gap 'between the completion of research and the initiation of a procurement program [...] which the armed services were slow to fill'.[53] The OSRD, on the other hand, had direct access to the president, a broad mandate to mobilize the scientific talent and facilities of the nation, and an independent budget. After the war Bush, the OSRD's only leader, recalled the difference between the two organizations: 'orders could be given to OSRD only by the President of the United States, and he never gave any'.[54] This created the inevitable frictions with the services, most famously with Admiral King, but was considered by Bush as the price for maintaining his organization's independence and maximizing its overall impact on the war effort.[55]

As the fruits of the OSRD and NDRC began to arrive in the field, there were increasing calls from both the military and the scientists for technical support. The scientists, laboratories, and contractors did not want 'military dissatisfaction with performance' caused by improper use or lack of technical knowledge to 'delay an entire program of research'. Similarly, the military commands were increasingly asking for technicians to train people in how to use new equipment, maintain it, and

[52] Leroy A. Brothers, 'Operations Analysis in World War II' (Washington DC: United States Army Air Forces, 1946), p. forward.

[53] Irvin Stewart, *Organizing Scientific Research for War: The Administrative History of the Office of Scientific Research and Development* (Boston: Little, Brown, 1948), p. 35. Stewart served as the Deputy Director of the OSRD and Executive Secretary of its Administrative Office during its existence. The OSRD essentially absorbed the NDRC, which continued to operate research committees under James B. Conant.

[54] Vannevar Bush, *Pieces of the Action* (New York: William Morrow and Company, Inc., 1970), p. 82.

[55] On the relationship with King, see G. Pascal Zachary, *Endless Frontier: Vannevar Bush, Engineer of the American Century* (New York: Free Press, 1997), pp. 161-171.

'aid in the broader problem of finding out how [the new equipment] could best be employed in actual military or naval operations'.[56]

Despite his role in the development of the capabilities that drove the military to ask for operations research advice along with the technologies being delivered to the battlefield, Bush did not support this expansion of his mandate. It was not that he did not have the authority or expertise, although a growing shortage of experienced scientists was becoming a concern; rather, it was his philosophical view of the need to keep a barrier between science and its sponsors. Bush feared that his scientists would be co-opted by the military. This was a mirror image of the fear of some military that scientists would co-opt decision-making processes that were inherently military. Bush preferred a narrower concept, more along the lines of the AAF OA program. By encouraging the use of general analysts, including lawyers and statisticians, as the AAF had, he hoped to preserve scientific intelligence for research and development work, free from direct military control. It was a losing battle, both in terms of the rate at which operations research activities were proliferating within the navy and AAF and because significant numbers of his own OSRD and NDRC staffs disagreed. [57]

Rather than continue the ad hoc arrangements already underway, Bush created the OFS on 15 October 1943. He placed one of the most experienced members of the NDRC, Kart T. Compton, a strong proponent of the scientist-in-the-field concept, in the lead. Within eighteen months, the OFS staff had grown to more than 500 scientists, a third of whom were physicists, over 40 percent with doctorates, by tapping into universities like Massachusetts Institute of Technology (MIT), Yale, and Princeton.[58]

It did not take long for the deployed scientists to move beyond the task of simply assisting with the employment of new weapons. They quickly began to ask probing questions about the underlying concepts of employment. Finally, this logical sequence opened the door to the question – what alternative might exist to current weapons and approaches? The OFS provided a wartime model of how the army might move from its conservative method of determining future requirements, where

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[56] Stewart, *Organizing Scientific Research for War*, p. 128.

[57] Eric Peter Rau, 'Combat Scientists: The Emergence of Operations Research in the United States During World War II' (unpublished PhD thesis, University of Pennsylvania, 1999), pp. 127-146.

[58] Stewart, *Organizing Scientific Research for War*, pp. 128-129 and 144.

existing capabilities predominated, to one that would begin with probing the nature of the problem.

By the end of the war attitudes on both sides of the professional divide softened. Bush later described the value of a close working relationship with the military not in utilitarian terms, like the weapons created, but in organizational terms, the kind of relationships established. Recalling his work on the Joint New Weapons Committee with the Joint Chiefs of Staff (JCS), Bush wrote that it 'did not accomplish much'. However it 'did form a link between [the] civilian effort and top echelons of the services'. He added 'the relationship between civilian and military personnel went through an evolution during the war'.[59] One commentator pointed out that in the end it was not the technology that emerged from the OSRD that created the relationship with the military but, in fact, the relatively small operations research activities.

> Operations research practice formed the venue and its quantitative
> methods the medium, in which these two social groups forged a bond
> of trust; it allowed researchers and officers to appreciate the
> complexity and usefulness of the other's contributions, and it permitted
> them to see one another as collaborators in a common purpose.[60]

In terms of actual operations research, the OFS was more successful in Europe than in the Pacific. Its most important contribution was validating the concept that outside operations research teams could successfully partner with the military to work on so-called 'action-problems'.[61] This was a lesson the army largely missed but one thoroughly grasped by the scientific veterans who formed its future operations research workforce.

Post-War Operations Research – Setting the Conditions

Research in the army during the first years of the Cold War fell victim to the same demobilization fever afflicting the rest of the force. There was no shortage of interest in developing either better versions of the equipment on hand, as

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[59] Bush, *Pieces of the Action*, pp. 52-53.

[60] Rau, 'Combat Scientists', p. 335.

[61] The OFS experience in the Pacific occurred late in the war and was plagued by personality and coordination issues. See Roy MacLeod, '"Combat Scientists": The Office of Scientific Research and Development and Field Service in the Pacific', *War & Society*, 11 (1993), 117-134.

recommended by many post-war boards, or pushing into new areas of research, such as missiles. However, as demobilization deepened, so did competition for scarce resources between research and development and operations and maintenance. Operations research organized on a scale approaching what the navy or even the AAF had done during the war was not possible. As one historian noted 'the ground [a]rmy, which had not developed a comprehensive [operations research] capability during the war, abandoned what few [operations research] organizations it had'.[62]

Operations research did, however, continue in the newly independent air force and navy. Each service approached the problem of continuing its operations research programmes in distinct ways. The AAF's operations analysis efforts during the war were large and increasingly relied upon to conduct analyses to grow and justify the air force programme.[63] As demobilization cut deeply into the scientific organizations and staffs created during the war, Arnold became concerned that 'we have not yet established the balance necessary to insure the continuance of teamwork among the military, other government agencies, industry, and the universities'.[64] Assisted by MIT researcher Edward Bowles and his close friend Donald Douglas, president of the Douglas Aircraft Company, Arnold created a contract for a division of Douglas Aircraft to support the air staff's research and development office with a 'continuing programme of scientific study and research' and 'independent objective analysis'.[65] By 1948, concerns about potential conflicts of interest between the thinking and aircraft manufacture business led to the creation of the freestanding, private, non-profit research organization known as the RAND Corporation. The air force would retain an in-house operations analysis capability on its staff, but increasingly turned to RAND for the broader subjects inherent in operations research.

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[62] Shrader, 'History of Operations Research in the United States Army', p. 54.

[63] In the Eighth Air Force alone the programme grew from its single location with 16 analysts in 1942 to 17 sections with more than 400 civilians, officers, and enlisted. Brothers, 'Operations Analysis in World War II', p. 1. The overall size of the AAF civilian effort was 275 researchers assigned to 26 different activities around the globe. Shrader, 'History of Operations Research in the United States Army', p. 58.

[64] David Hounshell, 'The Cold War, RAND, and the Generation of Knowledge, 1946-1962' (Santa Monica: RAND, 1998), p. 241.

[65] RAND charter cited in Alex Abella, *Soldiers of Reason: The RAND Corporation and the Rise of the American Corporate Empire* (Orlando: First Mariner Books, 2009), p. 14. For more on the early years see Martin J. Collins, *Cold War Laboratory - RAND, the Air Force, and the American State, 1945-1950* (Washington DC: Smithsonian Institution, 2002).

The navy believed in the value of operations research and had no doubts about continuing its programme in peacetime. At the end of the war, King was 'unequivocal in his desire to see the navy continue to harness this analytical resource' and secured the backing of the secretary of the navy.[66] Two of the scientists who had led the navy's wartime operations research efforts, Dr. Philip M. Morse and George Kimball, pressed their institution, MIT, to accept a contract to continue the navy's post-war operations research efforts.[67] King and his advisors believed that an operations research group's 'value to the navy stemmed from its ability to provide original scientific thought, free from bias and with an academic orientation [...] The group, therefore, should be attached to an academic institution to preserve the integrity of its work and the independence of its members'.[68] In November 1945, the Operations Evaluation Group (OEG) was born. Significantly, the OEG reported to the Deputy Chief of Naval Operations (fleet operations and readiness) and not to the office of Naval Research or the Naval Ordnance Bureau (NOB).[69]

Since the army did not benefit directly from operations research during the war, in the immediate aftermath, there was no effort to follow either the navy or air force lead. However, by the late 1940s, the army increasingly felt increasing pressure from being the proverbial 'odd-man-out' when it came to justifying its strategic position, its research and development priorities, and increasingly, its proposed budgets. The final push toward creating an army operations research capability came during deliberations over the creation of the Weapons Systems Evaluation Group (WSEG).

Chartered in December 1948 by the Secretary of Defense, the WSEG was designed to fill a widening gap between the JCS, his advisory body on strategy, and

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[66] Tidman, *The Operations Evaluation Group*, p. 95. Admiral King was effusive in his praise for not only the scientific advances during the war but also the close collaboration with the scientists. Fleet Admiral Ernest J. King, 'Third Official Report to the Secretary of the Navy', in *The War Reports of General George C. Marshall, General H. H. Arnold, Admiral Ernest J. King* (Washington DC: J. B. Lippincott Company, 1945), pp. 651-778 (pp. 715-722).

[67] Morse and Kimball spent the last few months of the war recording the methods used by the various naval operations research activities. Their multi-volume study was classified by the navy and only declassified in 1950. Republished as Methods of Operations Research, this work became the first real textbook of the new discipline. Morse, *Methds of Operations Research*.

[68] Tidman, *The Operations Evaluation Group*, p. 96.

[69] The OEG was significantly smaller than its wartime predecessor. At its height, ASWORG included ninety scientists and a budget of $800,000. The new OEG had a staff of twenty-five scientists and a budget of $300,000. Shrader, 'History of Operations Research in the United States Army', p. 57.

the Research and Development Board (RDB), tasked with coordinating military research and development activities.[70] The RDB and the JCS were to work in close collaboration, constantly reviewing the impact of strategy on research and research on strategy and adjusting both as the situation dictated. However, in practice, as a history of the WSEG generously noted, 'communication [between the two] was imperfect and collaboration infrequent'.[71]

Service debates over roles and missions, strategy, and budget share conspired to make it all but impossible for the Secretary of Defense to achieve a consensus on anything.[72] The service debates of this period are well developed in other histories. Of note, however, is the fact this organizational dysfunction was the reason Forrestal authorized the creation of an independent organization to 'provide rigorous, unprejudiced and independent analysis and evaluations of present and future'.[73]

The WSEG was co-managed by the JCS and the RDB, led by a rotational three-star officer and managed by a civilian research director. The staff was composed of civilian scientists — a mix of full-time staff, consultants, and personnel borrowed from service laboratories and operations research activities. Each service provided a general officer, who was supported by a small number of senior officers (colonels for the most part). The first director was Lieutenant General John E. Hull, an officer with extensive experience in strategic planning. To fill the research director's position, Hull

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[70] Between the unification of the armed forces under the National Security Act of 1947 and the modifying legislation of 1949, the Secretary of Defense coordinated the actions of the services loosely through four groups: the War Council (policy), the Joint Chiefs of Staff (military strategy), the Munitions Board (production and procurement), and the Research and Development Board. Each was composed of service representatives, which created a poor atmosphere for executive decision-making.

[71] John Ponturo, 'Analytical Support for the Joint Chiefs of Staff: The WSEG Experience, 1948-1976' (Arlington: Institute for Defense Analyses, 1979), p. 10.

[72] See Kenneth W. Condit, *The Joint Chiefs of Staff and National Policy, 1947-1949*, History of the Joint Chiefs of Staff, II (Washington DC: Office of Joint History, 1996), pp. 87-98; Steven L. Rearden, *The Formative Years 1947-1950*, History of the Office of the Secretary of Defense, I (Washington DC: Historical Office, Office of the Secretary of Defense, 1984), pp. 29-55 and 385-422; James F. Schnabel, *The Joint Chiefs of Staff and National Policy 1945-1947*, History of the Joint Chiefs of Staff, 1 (Washington DC: Office of Joint History, Office of the Chairman of the Joint Chiefs of Staff, 1996), pp. 91-113.

[73] Directive establishing the WSEG (11 December 1948) reproduced in Appendix C, Ponturo, 'Analytical Support for the Joint Chiefs of Staff', pp. C-1. The idea for the WSEG was fist proposed to Forrestal by Bush.

recruited physicist and OSRD veteran Morse. Morse accepted the position despite his concerns that such a group would find it difficult to deliver independent judgments.[74]

In terms of influence over the nearly simultaneous development of the army's operational research organization, the WSEG played two roles. First, establishing a secretary of defense level organization to study issues with a direct impact on the army's budget, as well as its place in national security strategy, created a strong incentive for development of its own operations research capability.[75] The second influence generated by the WSEG related to the first. Since the army could not control the group's study agenda, it had an incentive to send capable officers to serve either as director or senior army representative. An unintended effect was that these same high quality officers would in-turn influence the army's views on operations research.

The first senior army officer assigned was Major General James M. Gavin, the Second World War commander of the 82nd Airborne Division. Gavin wrote of his initial efforts after arriving in March 1949, 'I devoted the entire summer of 1949 to reading everything on the subject I could get my hands on and visiting our laboratories and talking to our scientists [...] nuclear weapons became more understandable to me'.[76] Gavin's enthusiasm for attacking the army's problems through the use of leading-edge science made him an early and consistent supporter of operations research. In fall 1950, as part of his WSEG research, Gavin led a small group of prominent scientists to Korea to examine tactical air support in the hopes that 'drawing on their unexcelled knowledge of scientific technology', they could generate some new ideas.[77] The tour offered little immediate assistance to the forces in the field. However, it did lead to creation of an influential study on how science might provide new solutions to the problems of land combat.

Gavin's trip and research already underway by the WSEG motivated a small group of scientits to convince the army to partner with the air force on a study of air-

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[74] Morse described the officers on the WSEG as 'new to systems analysis, but interested and hopeful about its possibilities.' Morse, *In at the Beginnings: A Physicist's Life*, p. 245.

[75] The first study agenda, approved on 1 September 1949, included studies of strategic air offensives, antisubmarine weapons, weapons for airborne operations, carrier task force operations, air defense weapons, and projected ground force weapons. Ponturo, 'Analytical Support for the Joint Chiefs of Staff', pp. 56-57.

[76] James M. Gavin, *War and Peace in the Space Age* (New York: Harper & Brothers, 1958), p. 114. Gavin summarized his understanding of the utility of tactical atomic weapons in Major General James M. Gavin, 'The Tactical Use of the Atomic Bomb', *Combat Forces Journal*, 1 (1950), 9-11.

[77] Gavin, *War and Peace in the Space Age*, p. 129.

ground tactical operations. Project VISTA, as the study became known, was designed, in the words of one participant, to generate some 'technological developments, which will be of concrete help to the heretofore scientifically neglected doughboy'.[78] Conducted in collaboration with California Institute of Technology during summer 1951, the project's eight-volume final report made recommendations on a wide range of tactics and weapons, to include a strong endorsement for development of tactical atomic weapons, and associated doctrines to defend Western Europe. The study also included a recommendation for how to 'forge and develop the tactics and techniques of this new kind of warfare'. It recommended the army create a combat development system that would include 'a permanent staff including scientists' and work closely with the army's new operations research organization.[79]

Gavin's replacement was an officer whose experiences at the WSEG would influence both the army's attitudes toward operations research and how the army approached the problem of thinking abouth future war. Major General Garrison Davidson joined WSEG in 1951 and served until he departed to become commandant of the Command and General Staff College (CGSC) in 1954. Davidson learned as much about the process of research and development while in the WSEG as he did the scientific process. When asked many years later about his experience, Davidson described it as interesting but tough work. He praised the teamwork and the civilian scientists with whom he was paired, but added 'the work that I did didn't amount to a damn thing because the die was already cast [...] so it [had] no purpose [...] I was very disappointed'.[80]

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[78] Dr. William Fowler, scientific director of Project VISTA, quoted in W. Patrick McCray, 'Project Vista, Caltech, and the Dilemmas of Lee Dubridge', *Historical Studies in the Physical and Biological Sciences,* 34 (2004), 339-370 (p. 356). For more on the impact of the Project VISTA efforts, see David C. Elliot, 'Project Vista and Nuclear Weapons in Europe', *International Security* 11 (1986), 163-183. On the involvement of prominent scientists see Judith R. Goodstein, 'A Conversation with Lee Alvin Dubridge - Part II', *Physics in Perspective,* 5 (2003), 281-309; Charles H. Holbrow, 'In Appreciation - Charles C. Lauritsen: A Reasonable Man in an Unreasonable World', *Physics in Perspective,* 5 (2003), 419-472.

[79] 'Project VISTA Final Report, Chapter 3, Appendix III: Ground Force Operations,' Project VISTA: A Study of Ground and Air Tactical Warfare with Especial Reference to the Defense of Western Europe (Pasadena: California Institute of Technology, 1952), p. 25.; Military History Institute, Carlisle PA (Hereafter MHI) UA646.P76 1952. (See Appendix 4)

[80] Dr. John T. Greenwood, 'Interview with Lt. General Garrison H. Davidson' (Oakland: U.S. Department of the Army, Corps of Engineers, 1980), pp. 472-473.

Davidson's assessment was echoed by his protégé Colonel William F. Train. Train joined the WSEG staff in 1952 and subsequently followed Davidson to CGSC in 1955. He recalled the difficulty they had trying to isolate the variables in ground combat in the same way one would with aircraft or ships. Train bemoaned the fact that two years of work which resulted in a multi-volume study on ground warfare was destined to occupy, unread, shelves in the archives.[81] Neither Davidson's nor Train's assessments, however accurate they were of the WSEG's value, prevented them from carrying away from the experience the basic principles of operations research. As will be discussed in a later chapter, Davidson and Train based much of their redesign for the army's doctrinal development as well as the CGSC's role in combat developments around the processes they had learned while serving on the WSEG.

The Birth of Army Operations Research – The Operations Research Office

The army began the Cold War with no effective operations research organization. The creation of the independent air force effectively stripped the last remaining operations research function from its upper echelons. Operations research techniques and methods continued to be employed in the technical services laboratories, especially the Ordnance Corps, and occasionally by the equipment boards of the AFF. However, much as in the years leading up to the Second World War, the army's research activities generally returned to small-scale efforts oriented on specific weapons. One source describes the army's postwar attitude toward operations research as stemming from the limited contact most officers had with actual practitioners during the war and 'the continued assumption that the problems of land warfare were less amenable to [operations research] techniques and [...] ignorance of how [operations research] methods might be applied to ground combat'.[82]

The creation of the army's postwar operations research capability began with Eisenhower's 30 April 1946 memorandum, 'Scientific and Technological Resources as Military Assets'. After praising the fact that in the recent war 'scientists and

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[81] Reginald G. Moore, 'Oral History - William F. Train, Lieutenant General, USA Retired', II (Carlisle Barracks: US Army Military History Institute, 1983), pp. 378-384.

[82] Shrader, 'History of Operations Research in the United States Army', p. 63.

business men contributed techniques and weapons which enabled us to outwit and overwhelm the enemy', Eisenhower argued that 'this pattern of integration must be translated into a peacetime counterpart'. Among the attributes of this peacetime arrangement, he advocated:

- Civilians be involved in military planning and not just weapons production

- Scientist and industrialist were more likely to make 'new and unsuspected contributions' if detailed direction was held to a minimum.

- Some 'of our industrial and technological resources' should be made 'organic' parts of the military structure in time of war.

- The army must keep research and development separate from 'the functions of procurement, purchase, storage, and distribution.

- Army officers, through formal education and inducements, must become 'fully aware of the advantages which the army can derive from the close integration of civilian talent.' [83]

The immediate, but impermanent, effect of the memorandum was the elevation of research and development within the war department. As Eisenhower noted, a senior director for research and development, supported by one or more civilians, would ensure 'confidence of both the military and the civilian in this undertaking'. The second desired impact was one that Eisenhower knew would take time. 'The association of military and civilians in educational institutions and industry,' Eisenhower wrote, 'will level barriers, engender mutual understanding, and lead to the cultivation of friendships invaluable to future cooperation.' He concluded that 'the realization of our objectives places upon us, the military, the challenge to make our professional officers the equals in knowledge and training of civilians in similar fields and make our professional environment as inviting as those outside'.[84] This was nothing less than a call for a new source of professional knowledge and a roadmap for how to access it.

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[83] Memorandum from DDE to Directors and Chiefs of War Department, General and Special Staff Divisions and Bureaus and the Commanding Generals of the Major Commands, subj: Scientific and Technological Resources as Military Assets, 30 April 1946. CCS 020 (10-4-44) Sec 1, doc 883 in *The Papers of Dwight D. Eisenhower, the Chief of Staff*, ed. by Louis Galambos, VII (Baltimore: The Johns Hopkins University Press, 1978), pp. 1045-1049. (See Appendix 1).

[84] *The Papers of Dwight D. Eisenhower, the Chief of Staff*, ed. by Galambos, p. 1046.

By 1948 it was clear that, in the competition for resources within the new national defense establishment, the arguments for the army's share of the budget would have to rely on more than just memories of the last war. The navy and especially the air force were quickly mastering the ability to quantify their arguments with quantitative data, backed by scientific analyses. One of the roles of the RDB was to serve as a scientific judge among various service proposals for research. To serve this purpose, it needed each service to have a robust and credible operations research capability. An RDB report from 1947 noted that while both the air force and the navy had such a capability, 'the army and the Joint Chiefs of Staff have no analytical groups of a similar nature within their organizational structure'. The report continued that 'the application of scientific analysis techniques to military problems offers a useful adjunct to military thought [...] we suggest therefore that our armed forces expand the facilities and the scope of their operational analysis units'.[85]

Major General Anthony C. McAuliffe, the defender of Bastogne and the army's Deputy Director for Research and Development, initiated a study to determine how his service could move into the operations research business. After considering the air force's approach, where independent research was obtained through a contract with Project RAND, and the navy's solution, which was a contract with a major university, McAuliffe chose to use the navy model. With the encouragement of the chairman of the RDB, Vannevar Bush, the army would establish its first university-based, independent, nonprofit research organization.

McAuliffe's search quickly settled on The Johns Hopkins University in Baltimore as the most logical choice. The reasons were simple: the location of Johns Hopkins main campus in Baltimore was convenient to the Pentagon; the university possessed the academic experience necessary for a wide-ranging program; and the university had recently established the Institute for Cooperative Research (ICR), designed to administer externally sponsored research activities such as the university's Applied Physics Laboratory.[86] The concept negotiated between Johns

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[85] RDB study quoted in Memorandum Major General A.C. McAuliffe Deputy Director for Research and Development Logistics Division, 'General Research Program,' (May); The Johns Hopkins University Archives Office of the President 47.2/RG2/Box33/May-Dec 48. (See Appendix 2)

[86] The JHU's APL was responsible for the research, development and early production of the proximity fuze, one of the technological wonders of the Second World War. After the war its technological research would expand to include ballistic missiles and space vehicles.

Hopkins and the army envisioned a staff of 130 to 140 personnel with a small administrative office in Baltimore, a primary activity in Washington, and provisions for field observers and agents.

In early summer 1948, McAuliffe outlined the basic research programme for what he called the General Research Office (GRO). The work plan for the army's proposed operations research organization was ambitious. He described an organization that would 'research on problems or phases of problems which are unique to the Department of the Army' in the following general areas:

- Combat and strategic intelligence techniques;
- Combat psychology and morale;
- Analysis of weapons and weapons systems;
- Comparative over-all economic cost of various methods of waging ground warfare;
- Psychological warfare and "Cold War" techniques;
- Logistics;
- Analysis of general progress in psychology as it pertains to Army application and other related broad fields of non-materiel research.[87]

The lead negotiator for Johns Hopkins, Dr. Arthur E. Ruark, a physicist and veteran of the OSRD, strongly supported McAuliffe's basic proposal, but noted that 'the army is behind the game in operations analysis [...] clearly the pressure to establish a hard-hitting activity, promptly, comes from very high quarters'.[88] It was for these reasons that he recommended the university's president establish a firm understanding of the army's intent with its most senior leadership. Ruark warned that despite pressure on the army to acquire an operations research capability in a hurry, recruiting the necessary talent would take time. Even under wartime personnel rules it had taken the OSRD eighteen months to staff the OFS. The army should understand

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[87] McAuliffe - 'General Research Program'. The term 'Cold War' in this context referred not to the overall strategic standoff between the U.S. and USSR but to less confrontational means of competition such as various forms of psychological, political, and economic 'warfare.'

[88] Memorandum from Arthur E. Ruark Assist. Dir. JHU to Mr. Bowman and Mr. MacCauly, 'Subject: Check Sheet for Discussion 6 May, Operational Studies for Army and for Navy,' (5 May 1948); JHUA, Office of the President 47.2/RG 2/Box 33 (Jan - Dec 1948). Ruark was relating an undated conversation with Lawrence R. Hafstad, Executive Secretary of the RBD,

that Johns Hopkins had no 'Aladdin's Lamp' and needed the latitude to 'permit steady, conservative progress rather than hurried construction of a jerry-built crew and an ineffective subcontract structure, which, indeed, would defeat the goals which we are all interested [in]'.[89]

Acting on Raurk's advice, the university's president, Dr. Isaiah Bowman, wrote a carefully worded letter to McAuliffe to establish an understanding that was 'not conveniently incorporated into the contract'. Specifically, Bowman wanted to ensure that 'it was the intent of all parties concerned that the army wished to have the right to prescribe "what" was to be done under the contract but that the university should be at liberty to determine "how" such work should be performed'.[90] Bowman's point may have seemed obvious given the army's stated intent to secure the services of an 'independent' research organization. However, experience taught many in the scientific community that collaboration even when born out of a sense of crisis, would not easily overcome the army's reputation for resistance to outside experts. McAuliffe's reply was positive, but included a hint of reservation: 'I am in accord with the concept as to the general intent and mode of carrying out the work as outlined in your letter.'[91] The definition of the term 'general intent' would be tested early and often as the army institutionalized outside knowledge in a substantive way for the first time since its founding.

Building Ellis A. Johnson's 'Thinking Machine"

The first, and as it would turn out only, director of the ORO, was Dr. Ellis A. Johnson.[92] Johnson was a well-known name in the growing operations research community. A history of army operations research described Johnson as possessing a

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[89] Ruark - 'Subject: Check Sheet for Discussion 6 May', p. 9.

[90] Letter from Isaiah Bowman Pres. JHU to Maj Gen A.C. McAuliffe, 'Subject: Understanding Concerning Contract No. W44-109-Qm-2073 between Johns Hopkins University and the Department of the Army,' (21 July 1948); JHUA, Office of the President 47.2/RG 2/Box 33 (Jan - Dec 1948).

[91] President JHU Letter from Maj Gen A.C. McAuliffe to Dr. Bowman, ' Concurrence,' (2 August 1948); JHUA, Office of the President 47.2/RG2/Box 33 (Jan-Dec 1948).

[92] One of Johnson's earliest actions was to request an organizational name change. The GRO was renamed the Operations Research Office (ORO) in December 1948. Dr. Maccauly Letter from Ellis A. Johnson to JHU Acting President, 'Request for Name Change,' (27 Dec 1948); JHUA Office of the President 47.2/ RG 2/Box 33 (Jan-Dec 1948). Maccauly approved the request on 29 December.

'forceful, enigmatic, and sometimes quarrelsome personality'.[93] As is often the case, the personality traits that made Johnson successful in introducing the army to operations research also contained the seeds of his undoing thirteen years later. However, in 1948 it was clear the army had secured the services of one of the most qualified operations research scientist in the country. In 1934 Johnson had earned a doctorate in physics from MIT and worked briefly in the college's famed electrical engineering department. An academic interest in magnetism soon led him to work in Washington for a government survey organization and then at the Carnegie Institution, where he established a lifelong and professionally beneficial friendship with its director, Vannevar Bush. Soon after arriving in Washington, Johnson began consulting part-time with the Naval Ordnance Laboratory (NOL) where he initially worked on mines and de-mining technology. It turned out to be his niche and he soon became the laboratory's full-time associate director.

Johnson's technical and operational accomplishments point to several attributes that made him an inspired choice for the new army position.[94] First, like the early pioneers of British radar and operations research, he developed his understanding of the field in a technical specialty and expanded his understanding by working outward from a laboratory setting. Johnson 'felt that for good effect, the work of the technical people had to be very closely meshed with the knowledge, thought, and practices of the operating people [...] the research had to include operations research'.[95] The fact that he had learned that sometimes he had to make compromises in the context of his work, such as taking a reserve commission in the navy to overcome prejudice against civilians and earn the trust of Nimitz's staff, would serve Johnson well in later years.

When the war ended, like many of his peers, Johnson was anxious to return to non-military pursuits. Despite his significant contribution to ending the war, he 'got out of the service as fast as he could'. His wartime service left him with 'the feeling

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[93] Shrader, 'History of Operations Research in the United States Army', p. 73.

[94] In 1946, Johnson and a colleague prepared a detailed treatment of their wartime experiences and the operations research techniques created during the war. The manuscript was not declassified until after his death in 1973. Ellis A. Johnson, David A. Katcher, *Mines against Japan* (Washington DC: US Naval Ordnance Laboratory, 1974).

[95] Thornton Page, George S. Pettee, William A. Wallace, 'Ellis A. Johnson, 1906-1973', *Operations Research*, 22 (1974), 1141-1155 (p. 1143). All three authors were members of the ORO staff during the 1950s.

that his hands were bloody,' as he believed his role had involved 'starving enemy civilians' and 'sending airmen on perilous tasks from which some had not returned'. Enticed back into military work a few years later in an advisory capacity by Bush, Johnson recalled that he became alarmed at learning of the country's relative military weakness compared to the Soviet Union. In the course of these advisory meetings, Johnson met McAuliffe, who gauged Johnson's interest in starting an operations research activity by reportedly telling him that 'we've got a tough job in the army too'.[96] His former colleagues and subordinates said it was his 'intense interest in the possibility of [operations research] helping the armed forces with the complex and fast-changing problems of warfare' that caused him to accept the position as director of ORO.[97] It was also his enthusiasm and dedication to the field of operations research that largely explains how he overcame his 'revulsion for war'. As he told a journalist, 'I've always thought a scientist could do more for his country before a war.'[98]

In addition to his scientific qualifications and operational experience, Johnson also demonstrated an ability to select and cultivate scientific talent. Whatever value operations research brought to the army in the early Cold War was the direct result of scientists who learned their trade in the navy and OFS. Johnson brought to ORO several of his colleagues from the navy including George H. Shortley, Lynn H. Rumbaugh, William L. Watson, and Robert J. Best.[99] Despite their qualifications, the first group of scientists was not sufficient to cover the specific issues and diverse operational environments in which the army operated. Johnson's first priority in August 1948, was to hire the rest of his scientific and support staff. In that first year two particular hires underline Johnson's eye toward navigating new territory. Among his recruits was Dr. George S. Pettee, the first of many researchers from the social sciences, who within a year would become the deputy director. Another early hire was Dorothy K. Clark, the first of many historians to work in ORO.[100] To provide the day-to-day management, Johnson hired Lester D. Flory, a retired army brigadier general

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[96] Herbert Yahraes, 'The Mysterious Mission of ORO', *The Saturday Evening Post*, 23 February 1952, pp. 36-82 (p. 77).

[97] Page, 'Ellis A. Johnson, 1906-1973', (p. 1148).

[98] Yahraes, 'The Mysterious Mission of ORO', (p. 77).

[99] Page, 'Ellis A. Johnson, 1906-1973', (p. 1148).

[100] Other notable historians who worked for ORO over the years include S. L. A. Marshall, Forrest C. Pogue Jr., and Hugh M. Cole.

with a master's degree in electrical engineering from MIT, to serve as executive director.[101] There is little doubt that Flory, a West Point graduate (Class of 1919), successful regimental commander in the Second World War, and former military governor of Austria, was hired for his army relationships as much as for his management skills.

The remainder of the hirings reflects both the character of the early tasks and the philosophy of ORO's director. Johnson understood that the problems of ground warfare were 'not likely to be as simple and manageable as were some of those dealt with by operations research for the navy and air force [...ground operations] took place on much more complicated terrain [...] Many more critical factors could affect ground combat'.[102] Despite early dominance by the physical sciences, operations research in general had always been understood by its practitioners as 'nearer, in general, to many problems, say, of biology or of economics, than to most problems of physics, where usually a great deal of numerical data is ascertainable about relatively simple phenomena'.[103] In keeping with this reality, Johnson sought to create a diverse work force.

Physical Sciences	Engineers	Social Sciences
3 Physicists	2 Electrical	5 Sociologists
1 Chemist	1 Mechanical	8 Economists
3 Biophysicists	1 Production	3 Historians
1 Meteorologist	4 Transportation	
1 Geographer		
2 Biologists		
1 Physiologist		
3 Medical Researchers		

Table 1 **ORO Personnel by Profession (January 1949)**[104]

Operations research was new and the talent pool small. Only a portion of the self-taught operations researchers from the war remained in the field. In 1948,

[101] Shrader, 'History of Operations Research in the United States Army', p. 67.

[102] Charles A.H. Thomson, *The Reseach Analysis Corporation: A History of a Federal Contract Research Center* (McLean: The Research Analysis Corporation, 1975), p. 9.

[103] P.M.S. Blackett, 'A Note on Certain Aspects of the Methodology of Operational Research, (1943) reproduced in Blackett, *Studies of War*, p. 177.

[104] Letter from Ellis A. Johnson to President JHU Dr. Isaiah Bowman, 'Subject: Discussion with Respect to Your Advisory Group,' (17 Janurary 1949); JHUA, Office of the President 47.2/RG2/Box33/(Jan-Dec 1949).

universities were only just beginning to recognize operations research as a field, and they would not award the first PhD until 1954.[105] A flexible contract with the army allowed Johnson to engage research universities and private firms in sub-contracts as well as to hire consultants from across a variety of communities. Within the first year ORO had consulting agreements with staff from seventeen major universities and several private research firms.[106] A decade after starting, ORO conducted a survey of its staff and asked them to list the qualities of an analyst. The results reflect the kind of people Johnson hired and also suggest the research environment he fostered.

- Be fairly mature, with five or more years of professional experience in his or her field;
- have a genuine interest in operations research;
- be able to get to the heart of a problem;
- have better than average mathematical skills and the ability to show results in quantitative form;
- be able to get along with the client's representatives;
- be resourceful and able to get by with a minimum of support;
- be willing to go anywhere, at any time, and do anything ethical, and;
- have a strong sense of loyalty to country, employer, and client.[107]

Organizationally, the ORO did not have much of an internal structure for most of its existence. In 1949, two different models were proposed but apparently neither was put in place. As Johnson noted in March 1949, 'the organization involved is not a rigid one, and the nature of our work actually prevents this'.[108] The ORO's external organization ran through two independent reporting chains. The first was through Johns Hopkins' ICR in Baltimore. The ICR provided primarily administrative and fiscal support for the personnel and contracts initiated by ORO. The relationship with

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[105] Ellis Johnson, 'A Survey of Operations Research in the U.S.A.', *OR*, 5 (1954), 43-48 (p. 47).

[106] President JHU Letter from Ellis A. Johnson to Dr. Detlev W. Bronk, 'General Status of ORO,' (11 November 1949); JHUA, Office of the President 47.2/ RG 2/Box 33 (Jan-Dec 1949). (See Appendix 3).

[107] Operations Research Office, 'Fields of Knowledge and Operations Research' (Bethesda Operations Research Office, 1960), p. 5; Shrader, 'History of Operations Research in the United States Army', p. 96.

[108] Memorandum from Ellis A. Johnson to Director Institute for Cooperative Research, 'Subj: Proposed Organization for the Operations Research Office,' (4 March 1949); JHUA, Office of the President 47.2/ RG 2/Box 33 (Jan-Dec 1949). This proposal was a functional design with major divisions being studies, analysis, and administration. The alternative design in June was project category-centric, organized into strategic, technological, and human resources.

the army initially ran on a year-to-year contract. In one of the early lessons of managing outside research, the army had to be convinced that the uncertainty of annual funding was detrimental to the continuity of research and the hiring of quality staff. The contract cycle changed to a three-year term after 1952. Finally, ORO's initial budget was modest. The initial contract for ORO was $1,000,000. Nevertheless, funding would grow steadily as ORO expanded and added staff and functions.[109]

The second reporting chain ran from Johnson to the deputy director for research and development within the army staff's logistics division. Despite the fact that ORO was administratively assigned to one directorate, the intent was for it to examine a full array of army problems. The implementing directive stated '[o]perations research and/or analysis on problems that are not unique to any one agency [and entail] basic research of a nonmateriel nature for which primary cognizance has not been assigned to a specific army agency'.[110] To ensure ORO was available to assist across the staff directorates, the army established an advisory committee consisting of one officer from each staff division, each technical service, Army Field Forces (AFF), and the army's comptroller. The ad hoc board assisted the selection of tasks and provided assistance to ORO in obtaining necessary access and data to support its research.[111]

Developing A Mutual Understandings

Johnson understood that the success of ORO, as well as the success of operations research in the army, depended on developing mutual understanding between scientists and the officers. He would later remark 'it takes an effort to remember how relatively unwelcome military operational research was in the United States in the early years to the executives whom it was to serve'.[112] For most army

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[109] Shrader, 'History of Operations Research in the United States Army', p. 65. By way of comparison, in 1950, ORO's budget was $1,500,000. The air force budget for RAND in 1950 was $4,000,000 while the navy budgeted only $400,000 for OEG.

[110] Department of the Army Memorandum No. 3-50-2, 20 September 1948 cited in Shrader, 'History of Operations Research in the United States Army', p. 65.

[111] Shrader, 'History of Operations Research in the United States Army', p. 65.

[112] Johnson, 'The Long Range Future', (p. 1).

officers, the presence of civilian scientists represented an uncomfortable novelty. An early military advisor to ORO, Colonel Seymour I. Gilman, noted that when it came to the relationship between the military and civilian scientists 'the degree of success achieved [...] depend[ed] largely on the degree of mutual understanding, consultation, and cooperation attained'. This was never easy because of their 'wide differences in background, training, and experience'.[113] Much as Henderson had complained in 1915, the military was still confronted 'salesmen,' who presented operations research as 'some kind of magic cure-all'. When it came to educating the ORO's sponsor on operations research, the emphasis was on 'the fact that [operations research] is research, that it takes time, and that, while the payoff cannot be guaranteed, it is well worth the risks involved'.[114] The issue of time and timeliness of research is one that throughout ORO's history would remain an unresolved point of friction.

Many of the new researchers did not have field experience, and those who did were likely to have been veterans of the navy or army air force organizations. Much like his experiences in the Pacific, Johnson knew his researchers would have to establish an understanding of the army context. Moreover, operations research was not a static discipline and Johnson was determined to lead an organization that made fundamental contributions to the field. To that end, he made the continuing education of ORO's researchers a priority. The ORO staff employed two methods of education. The first was the use of internal seminars, which covered 'the concepts and methodologies of statistics, psychology, economics [...] as well as basic courses in mathematics'. The point was not to cross-train the existing disciplines, but instead 'to ease the communication problem and acquaint the staff with the capabilities and limitations of the tools and methods'.[115] Johnson also encouraged his staff to reach outside the army and stay informed of the development of operations research developments within the business world.

The second part of the education process involved learning about the army. It was important, and in peacetime difficult, to establish in the minds of scientists the

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[113] Seymour I. Gilman, 'Operations Research in the Army', *Military Review,* 36 (1956), 54-64 (p. 57). Gilman served as a senior military advisor to the ORO from 1950-1953. Prior to his ORO assignment, Gilman worked in the developments section of AFF.

[114] Joseph F. McCloskey, 'Training for Operations Research', *Journal of the Operations Research Society of America,* 2 (1954), 386-392. McCloskey was one of the original members of the ORO staff.

[115] McCloskey, 'Training', (pp. 386-387).

context within which the problems they were researching existed. Johnson pushed his researchers to 'live with the customer' on maneuvers as well as to attend military courses.[116] Taking advantage of ORO's initial location, Johnson had his research staff attend lectures and participate in the academic life of the National War College and the Industrial College of the Armed Forces. In addition, researchers attended a wide number of army courses. Between 1949–1952, more than sixty ORO researchers attended courses ranging from the staff officers' orientation course at the Pentagon to the atomic weapons' staff course at Sandia Base, New Mexico. Despite disruptions in workflow and pressures to deliver tasks early, Johnson believed this investment was a 'means of deepening the appreciation of the army's problems within ORO'.[117]

The army too had much to learn in managing an independent research activity. The biggest challenge resulted from a clash of cultures. As one historian noted:

> When the scientist enters the world of command, he finds the decision-maker dominated by problems thrust upon him, not those that happen to interest him. Where the scientist's allegiance is to the truth, the decision-maker's allegiance is to the organization he serves. The decision-maker says, 'What must we do now?' not 'what can we learn here?'[118]

The clash was not between the field of operations research and the military. No two fields could have had more natural an affinity. The clash lay in the cultural backgrounds and predilections of those whose formal training predisposed them to approach issues in different ways. The army's bureaucracy aimed at gaining and maintaining control over its assigned responsibilities. This occurred regardless of whether officers were heroic leaders, military managers, or even military technologists.[119] The pressures of peacetime scarcity and a general ignorance of the nature of a scientific enterprise only exacerbated these tendencies. For the army of

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[116] McCloskey, 'Training', (p. 387).

[117] Operations Research Office, 'Report to the Trustees Committee for the Period 1 April 1952 to 30 June 1952' (Washington DC: Operations Research Office, 1952), pp. 4-5.; JHUA, Office of the President 47.2/ RG 2/Box 33 (Jan-Dec 1948).

[118] I. B. Holley Jr.,' The Evolution of Operations Research and Its Impact on the Military Establishment; the Air Force Experience', in *Science Technology, and Warfare: The Proceedings of the Third Military History Symposium*, ed. by Monte D. Wright and Lawrence J. Paszek (Colorado Springs: Office of Air Force History, 1969) (p. 103).

[119] Morris Janowitz, *The Professional Soldier* (New York: The Free Press, 1960), pp. 21-22. Janowitz notes that despite the growth of military managers and technologists in the post-Second World War period, 'the military establishment has not lost its distinct characteristics.' p. 33.

1949, the concept of managing a research program, as opposed to research itself, was still an alien one.

Despite Eisenhower's optimistic 1946 memorandum on the subject, the attitude of one senior officer toward the proper relationship between an officer and a scientist is instructive. Major General Leslie R. Groves, the head of the Manhattan Project from 1942-1945, had more interaction with scientists than any other senior army officer of his day. Although not a scientist himself, Groves oversaw the largest scientific program in to that time and had direct supervision of hundreds of the country's most talented scientists and technicians. In a 1946 speech, Groves argued that 'if we are going to continue, as we surely must, scientific research and technological development [...] then we must have more scientifically trained men in the military establishment'. By men, Groves specifically meant military officers of sufficient skill to 'direct and lead civilian scientists and industrialists; otherwise, our officers will be led by them, and they are not equipped to lead us on matters so vital to military success'.[120]

In addition to such direct frictions, ORO found itself at the mercy of internal army debates over who should manage peacetime research. As a result of the December 1947 organizational demotion of the Directorate of Research and Development, ORO was under the supervision of the Director of Logistics.[121] This was the situation Bush had warned against, politely telling a military audience in 1946 that 'industry learned [...] fairly well and some time ago, that to place research under production, or under the purchasing department, or under sales is to wreck it'.[122] The debate exposed ORO's research agenda to the ongoing bureaucratic politics between

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[120] Washington DC, National Defense University, Army Industrial College Lectures L46-3, L46-3, The Atomic Bomb. Groves is reputed to have earned the grudging respect but not the affection of the scientific personnel under him. For a critical view, see Stanley Goldberg, 'Groves Takes the Reins', *The Bulletin of the Atomic Scientists,* 48 (1992), 32-39. For a more sympathetic telling see Robert S. Norris, *Racing for the Bomb: General Leslie R. Groves, the Manhattan Project's Indispensible Man* (South Royalton: Steerforth Press, 2002).

[121] James E. Hewes Jr., *From Root to McNamara: Army Organization and Administration, 1900-1963,* Special Studies (Washington DC: Center of Military History, United States Army, 1975), p. 172. Hewes noted that the stated reason was to reduce the number of 'direct reports' to the army chief of staff but that the lack of funds for research and development argued against such a senior position dedicated to the purpose.

[122] Lecture by Vannevar Bush to Industrial College of the Armed Forces, 'Organization of Research & Deveopment for National Security,' (19 September 1946), p. 3; National Defense University Library, ICAF Lectures, L47-14.

the army staff, the field forces, and the resurgent power of the technical services. One history argues that the situation was proof that, when compared to its sister services, the army did 'not seem equally alert to the value of innovations' but instead 'seemed to be seeking ways to apply operations research to questions of logistics and supply rather than weaponry for combat'.[123]

In 1953, Johnson instituted an annual conference between of the ORO staff and senior members of the army staff, either those directly involved in ORO oversight or more broadly in research and development. Dubbed the PISGAH Conference, after the biblical mountain from which Moses saw the Promised Land, the gatherings occurred away from Washington and aimed to help leaders 'visualize army operations as they might evolve' out to some point ten-twelve years in the future. The conferees, isolated from the day-to-day and stimulated by a series of briefings and facilitated discussion, then produced a concensus set of research and development recommendations. In terms of establishing relationships across the cultural divide, these kinds of conferences were useful. Given the fact that Johnson and his team built the agenda and ran the conferences, a major secondary purpose was to shape army understanding of both the nature of operations research and the projects ORO thought important.[124]

Expanding Knowledge - Early ORO Projects

The purpose of describing the ORO projects is not to provide a comprehensive accounting of its studies but to describe the scope and influence of its work. Most of its early research focused on near-term problems. It is difficult to show significant long-term changes resulting from a specific project or report.[125] The first status report of the new organization, issued shortly after the office opened and apparently meant

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[123] Thomson, *The Reseach Analysis Corporation: A History of a Federal Contract Research Center*, p. 4.

[124] See ORO Reports to the Trustees Committee 1952-1956 and Reports to the Committee on Sponsored Research 1957-1960. (JHUA Archives, Office of the President 47.2/RG3/Box 33 and 34)

[125] There were a few exceptions to this generalization. Although the technology has been significantly upgraded, it was an ORO study recommendation that changed the way soldiers are trained in basic marksmanship. After a study of combat marksmanship, ORO recommended the army change its century old know-distance range fire for a simulated target array using 'pop-up' targets. Eugene P. Visco, 'The Operations Research Office', *Army History* 3(1996), 24-33 (p. 31).

to codify relationships between Johnson and his sponsors in the army staff, listed the specific 'policy criteria' for a developing a research agenda. According to the report, all projects would:

- Eventually involve major action by the army.
- Involve integration of military and technical courses of action especially if two or more agencies of the army are involved.
- Not involve issues of technical planning or materiel development, as they are the responsibility of the technical branches.
- Involve the army but not those of a joint nature except for specific army portions of such problems.[126]

After initial discussions between Johnson and the army, three were approved to begin before the end of 1948. The first two, Project ANALAA and Project EVANAL, were equipment oriented.[127] Project ANALAA studied the appropriate mix of missiles versus antiaircraft guns in air defence, given prospective technological changes. In Project EVANAL, the army asked for a methodology to conducting environmental tests on its field equipment. Both projects fell within the general expectations of the army sponsors. A third project was more in keeping with what Johnson had in mind. Project MAID was a wide-ranging look at the potential value of U.S. Military aid programs to foreign countries. This was a significant early project for several reasons. First, it had a near-term policy impact in helping to shape the army's position on the 1949 Mutual Defense Act.[128] Although heavily reliant on external sub-contracted research with the University of Washington, Harvard University, and firms like the Stanford Research Institute, the main report was also notable because it delved into topics much broader than the mechanics of mutual aid.

Project MAID gave Johnson significant discretion with regard to the scope of the research. Under the major problem definition relating to foreign aid, Johnson created numerous subordinate problem sets. Some, like 'Overseas Transportation Vulnerability to Communist Subversion' had an obvious link to military aid to allied

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[126] General Research Office Quarterly Report, Vol. 1, No. 1 (Washington D.C.: General Research Office, The Johns Hopkins University, 30 September 1948), pp. 20-21. Cited in F. L. Smith, 'A History of the U.S. Army in Operations Research' (unpublished MS thesis, US Army Command and General Staff College, 1967), pp. 47-48.

[127] ORO Study titles, for the most part, were not acroymns but followed in the general style.

[128] Shrader, 'History of Operations Research in the United States Army', pp. 71-72.

powers. Others, like the study of 'Atomic Warfare' seemed tangential at best.[129] However, the freedom to explore the issues and problem sets as the scientists thought relevant represented one of the tenets Johnson sought to protect. In the end, the 'Atomic Warfare' portion of Project MAID had a more influence than did the larger study of which it was a part. For example, in 1949 Project MAID's atomic work attracted the attention of the coomandat of CGSC. An informal collaboration between ORO and the college led to the creation of the army's first useful doctrinal text on tactical atomic weapons. Access to reliable scientific data, and tactically oriented scientists to help interpret the data, had a major influence on the college's direction.

Two additional studies from early 1949 are also worth noting. Project POWOW aimed to 'determine, by scientific analysis and synthesis, the maximally effective weapons, instruments, and techniques that may be employed by ground forces in the conduct of psychological warfare operations'. The study summary admitted the nature of the subject was 'of a character markedly different from operations research in other fields'. Project POWOW was notable because of its significant use of social scientists. Some of the more than twenty project reports and papers that resulted from this project, which lasted until 1953, were used to support the expansion of the army's psychological warfare capabilities and the later creation of specialized operations research organizations designed to focus on the human equation in war.[130]

Another important first-year study was Project ALCLAD. For this project, the ORO analyzed 'individual protection means from all known forms of warfare and [made] recommendations for future research on, development, and use of the optimum equipment and systems to protect the individual soldier'. Most of the recommendations focused on improvements to such things as helmets and clothing. The exception came after ORO analysis showed that despite 'a requirement to reduce [...] loads carried by the soldier and the difficulties in eliminating or reducing the weight of present equipment, no chance is offered to include body armor without

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[129] Operations Research Office, 'ORO Publications Graded Excellent 1948-1958' (Bethesda: Operations Research Office, 1958).

[130] 'Revised Summary of ORO Projects Special Studies and Field Operations to May 31 1952, Volume I' (Chevy Chase: Operations Research Office, 1952), pp. 85-94 <http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=AD0007783> [accessed 1 November 2010].. A discussion of the creation of Human Resources Research Organization (HumRRO) is found later in this chapter.

seriously decreasing battle effectiveness'. Therefore, the study recommended that '[o]ther than armor helmets, the general provision of body armor to ground combat troops is not recommended'.[131] As one historian noted, the recommendation against the development of body armor was 'an example of how logical scientific analysis might lead to conclusions that run counter to common sense or might be politically or morally unsound'.[132] It was also the kind of analysis that could force new, if uncomfortable, thinking, because it conflicted with professional military judgment. Despite this being the cause of friction in the early years, many in the army staff soon learned that even when they strongly disagreed with the recommendations of an ORO study, the results 'increased their capacity for recommending the best course of action'.[133]

The Army's Initial Assessment of ORO

From the perspective of a near-term return on investment, the army's early experience with operations research was mixed. Organizational growing pains lasted a considerable period of time. The ORO delivered dozens of reports and papers in its first year of work, but some of the feedback was less than favorable.[134] Part of the problem lay in cultural biases. Officers resented the intrusion of civilians into matters of strategy; some felt ORO researchers were 'spying on military management' and were reluctant 'to work on day-to-day problems'.[135] Others 'simply could not accept the intrusion of 'civilian longhairs' into military matters.[136] It was always a difficult issue when ORO's research extended, as it often did, into the role of decision-making and information management. This, as Johnson well understood, was the military

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[131] 'ORO Projects Special Studies and Field Operations to May 31 1952', pp. 4, 7.

[132] Shrader, 'History of Operations Research in the United States Army', p. 72.

[133] Gilman, 'Operations Research ', (p. 62).

[134] The ORO produced three basic kinds of reports. A project report was the major product that specifically addressed one of the agreed problems for research. The next was a staff paper that in most cases was a subset of some aspect of major problem and usually was related to or fed into a staff paper. Finally, there was the less formal deliverables call staff or technical memorandum. These documents may or may not be related to one of the major projects and were designed to provide updates or quick answers.

[135] Seymour I. Gilman, 'The Role of Operations Research in the Army ' (unpublished Student Individual Study thesis, U.S. Army War College, 1954), p. 1. MHI.

[136] Shrader, 'History of Operations Research in the United States Army', p. 75.

profession's 'sacred ground'. Unit commanders and branch parochialists were also sensitive to critiques or even implied by outsiders of the efficiency of a particular weapon system, especially one that had many entrenched interests. Johnson had had some experience with this problem during his aerial mining work with the navy and AAF during the war and warned his staff they 'should avoid [...] criticizing the performance of any military individuals lest [they] lose [their] welcome as a member of the team'.[137] The problem for Johnson and his team in the early years was that knowing such a line existed and knowing when one was crossing it were two different matters. The necessity of listening to non-military experts on military issues may have been recognized by the army's upper eschelon but convincing the rest of the institution would take time.

In September 1949, the army staffs conducted a study of the ORO's first year and recommend several changes. While the staff study was generally positive and supportive of continuing the relationship, it argued that ORO should place 'greater emphasis on weapons-use level' projects.[138] Moreover, the ORO studies at the strategic level should remain limited and those looking at 'matters of joint concern' should be the responsibility of the WSEG or be conducted only on request by a higher authority. In a hopeful sign, the army staff's report explicitly recognized that the friction of the first year resulted largely from the army's general ignorance of operations research. The solution, it said, was threefold. First, the army should assign additional military personnel to work with the scientists on the various studies. Second, ORO should create a field liaison office at the AFF to enhance its awareness of the work underway by the various equipment boards. Finally, 'appropriate steps should be taken to educate military personnel at the [headquarters] Department of the Army and AFF in the aims and purposes of operations research'.[139] These initiatives were, in the long run, a useful strategy for how to solve the problem of embedding the

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[137] Ellis A. Johnson quoted in Gilman, 'Operations Research ', (p. 57).

[138] Operations research questions were generally categorized as weapons-use level (technical use or effectiveness problems), tactical (doctrinal or organizational problems), and strategic (broad issues of interest to senior decision makers).

[139] Plans and Operations Division U.S. Army General Staff, 'Study on the Operations Research Office, 30 Spetember 1949' (Washington DC: Plans and Operations Division, U.S. Army General Staff, 1949), pp. 1-2.

techniques of operations research into the wider army. They did not, however, solve Johnson's near-term challenges.

The major issue in the year before the Korean War was simply an expectation gap. For those officers looking for quick answers to complex questions, some of ORO's early work, especially that with a major social science component, was not satisfying. Gilman's assessment was that '[operations research] has been very successful in the solving of discrete technical and tactical problems [...however] the more complex the problem and the greater the number of non-quantitative aspects involved, the less chance it has for success'. It is difficult to know how representative Gilman's views were of those of his fellow officers. However, his position as a military liaison to ORO in the three years prior certainly makes his an informed opinion. Gilman estimated the odds of success in any ORO study, success defined here as an 'important payoff' as 'perhaps 1 in 10 studies'.[140]

After the release of the army report, Johnson wrote a rebuttal to the president of Johns Hopkins in the form of a list of ORO's major problems with the army. The first problem was the ill-defined boundaries on the scope of ORO's work. The question, as reflected in some negative army feedback on wide ranging research like Project MAID, was 'should the scope be very wide and include a serious attempt to apply operations research methods to the strategic problems of the army?' In Johnson's opinion, officer views on this question had a 'wide and normal distribution'. On the 'extreme right' were officers who believed strategy was the exclusive domain of military officers and scientists should be 'concerned solely with consideration of the design of weapons'. On the 'extreme left' were officers who believed that only civilians, with assistance from the military, could solve strategic problems and therefore ORO should not be overly constrained. Related to this issue was the practial issue determining the degree to which operations research 'integrate the findings of social science in its solutions of action-problems'. Many officers, as well as academics, questioned the role of 'qualitative insights' in pursuit of quantitative ends.[141]

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[140] Gilman, 'Operations Research ', (p. 60).

[141] Early criticism was usually answered in the form of caveats to findings. Qualitative approaches would become an increasingly important factor on their own terms during operations research in the Korean War.

to find a compromise whereby ORO could ensure a long-range focus for a portion of the research agenda, while at the same time accommodating 'a reasonable proportion of short-range studies meeting the immediate needs of the army'. Failure to do so would create a situation where:

> The best battleships or the best tanks will be developed, only to find
> that when war actually occurs, that battleships or tanks may no longer
> be useful weapons, in proportion to their costs. A war can be lost
> because of such reasons (Germany is a case in point).[145]

Johnson's patience paid off. Through a process of slow negotiations, he was able to secure a program of 'block funding' and a negotiated study agenda. The ORO staff and the army would each build a nomination list of studies — the two lists were then reconciled in an annual conference.

Project ANALAA	Analysis of antiaircraft weapons systems.
Project EVANAL	Determining a means for evaluating performance of army equipment under various environmental conditions.
Project MAID	Analysis of military aid programs. Expansive background research included examining tactical atomic warfare.
Project ALCAD	Analysis of individual protection means from all known forms of warfare.
Project GUNFIRE /REDLEG	Determine deficiencies that contribute to inaccuracy of predicted artillery fires.
Project POWOW	Determine the effectiveness of means used by ground forces conducting psychological warfare.
Project DONKEY	Analysis of the use of surface-to-surface missiles.
Project TREMABASE	Comparative feasibility of air, sea, or land transportation options in establishing and maintaining an advanced base.
Project TEAM	Determine most effective means of controlling social behavior as a means of increasing tactical proficiency of a military unit.
Project SITE	Determine most effective methods for planning and conducting army training and educational programs.
Project ATTACK	Evaluate on a continuing basis the use of atomic weapons in support of army operations.
Project ARMOR	Determine most effective means of countering armor by use of land mines.

Table 2 **ORO Assigned or Proposed Projects (1949)**[146]

To maintain freedom of action on both sides of the ledger, the programme would only plan to use only eighty percent of the research budget. The remaining twenty percent would be split between 'projects that the army wanted to have done

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[145] Johnson 'General Status of ORO'.

[146] 'ORO Projects Special Studies and Field Operations to May 31 1952'; Shrader, 'History of Operations Research in the United States Army', pp. 71-73.

but for which the ORO could see no value, and projects that the ORO wanted to do but for which the Army could see no need'.[147] Although Johnson's vision for the kind of work ORO should undertake was increasingly accepted, the above project list in early 1950 still showed a strong a bias toward tactical rather than strategic topics.

However, 'the growing Cold War with the Soviet Union soon made it clear the army could no longer confine it OR program to matters of a purely military nature, such as the design of weapons and the development of tactical doctrine'.[148] Johnson's pragmatic solution of a three-tier project approval process satisfied, but did not completely mollify the various camps identified in his letter. The underlying tensions remained and with every change in the army's senior leadership, the issue was born again. As Major General Ward H. Maris, McAuliffe's replacement, noted a year later, he and Johnson 'had many, many discussions bordering on arguments" on the subject of research priorities. Maris, and his replacement, believed it was their duty to 'keep the military viewpoint and military requirements before his splendid group of scientists'.[149] It is clear that within two years of coming into existence, the key question was not whether operations research had something to add but where it should best be deployed. In terms of setting the research agenda above the purely technical, Johnson eventually won most of the arguments but it was battle he would have to refight every two-to-three years.

The ORO and the Korean War

During the first two years of ORO's existence, Johnson successfully established the capability to study a 'full spectrum of future problems'. Less than two years after starting, the ORO staff was engaged in studies ranging from 'nuclear weapons, ground tactics, logistics, military costing, psychological warfare, guerilla warfare, and air defense'.[150] The start of the Korean War did not change study

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[147] Visco, 'The Operations Research Officc', (p. 32).

[148] Shrader, 'History of Operations Research in the United States Army', p. 77.

[149] Operations Research Office, 'The Second Tripartite Conference on Army Operations Research, 23-27 October 1950, Vol. II' (Washington DC: Operations Research Office, 1950), p. 36. (National Archives and Records Administration, College Park MD (hereafter NARA), RG 319, Entry 82, Box 2136)

[150] Page, 'Ellis A. Johnson, 1906-1973', (p. 1150).

priorities as much as it shifted the context in which ORO analyzed the problems. In fact, many of the subjects deemed superfluous by the army staff in early 1950 took on new importance.

Beyond the specifics of the project list, Johnson understood that the focus of effort must change because, as Blackett warned a decade earlier, '[r]esearch workers must also guard against the temptation to expect the executive machine to stop while they think [...]War, manufacture, trade, government business – all must go on, whether the scientist is there or not'.[151] Johnson also subscribed to the sentiments of Field Marshal Sir William J. Slim, Chief of the Imperial General Staff, on the utility of operations research to soldiers. Slim told a conference of operations researchers in London that on two occasions during his career he had asked his commanders after an operation what they had achieved. On both occasions the answer was 'not very much, but we have gained a lot of experience'. 'It struck me at the time,' Slim continued 'that the application of a little scientific method to finding out the answers is a much more efficient and quicker way than going off and risking several thousand men'.[152]

Johnson established three organizational goals for the ORO in its support for the Korean War. First, he would quickly resolve any administrative issues necessary to 'contribute directly to the solution of problems encountered by United Nations (UN) forces in the field'. The second goal was to obtain the maximum amount of actual field data for ongoing projects. The Korean War, for all of its tragedy, was the ultimate source of data for the problem sets Johnson was pressuring the army to study. Finally, he saw the war as an excellent opportunity to demonstrate the full capabilities of operations research in a way no peacetime environment could match.[153] Operations research was, after all, a science born in the service of war. As their military counterparts with experience in the Second World War understood, no peacetime training event, or in ORO's case no model or laboratory methodology, could approach the conditions of actual combat.

Goals in hand, and permissions secured, Johnson flew to Japan in early August 1950 to make arrangements for the follow-on deployment of ORO staff. By

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[151] Blackett, *Studies of War*, p. 203.

[152] Field Marshall Sir William J. Slim, speaking to the first Tripartite Conference on Operations Research held in London May 1949. Quoted in Yahraes, 'The Mysterious Mission of ORO', (p. 37).

[153] Shrader, 'History of Operations Research in the United States Army', p. 86.

September, he and three other analysts were accompanying UN forces on the scramble north following the breakout at Pusan and the landings at Inchon. As in the Pacific only six years earlier, Johnson validated a core tenet of operations research - being there was half the battle. As he hoped, he found the army in the field an anxious and willing customer and secured an agreement to attach his analyst teams to the Office of the G-3, Headquarters, Eighth United States Army, Korea (EUSAK).[154] To overcome hesitation about sharing operational data with civilians, Johnson secured a special arrangement with the commander to allow his civilians to wear a quasi-uniform and officer equivalent ranks. Shoulder patches identified the ORO civilians as Far East Command (FEC) 'Operations Analysts'.[155]

By November 1950, ORO had some forty analysts, divided into eight teams along with military personnel assigned by the army staff, attached to commands across Korea. By summer 1953, more than one hundred and fifty ORO analysts, contractors, and consultants had served on the ground in Korea. Most of the ORO teams served long enough in the combat zone to earn the UN Service Medal.[156] The analysts, generally assigned at division and corps level, worked under all conditions and in several instances came under enemy fire. Johnson himself had to dive into a ditch to avoid being hit by North Korean small arms fire as he inspected a destroyed tank near the front lines. An ORO consultant named Sam W. Marshall was shot down behind enemy lines while collecting data for a study on air-to-ground coordination techniques. He managed to add helicopter rescues to his data collection. While Johnson did not encourage his staff to take such risks, he believed it was 'necessary for operations-research people to comprehend military problems not just intellectually but with their guts'.[157]

Some of the most important anaysis to emerg from the battlefield was on unplanned subjects. One of the best examples occurred in late 1950 near the end of Johnson's his first trip into Korea. He and his deputy William L. Whitson were in

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[154] This was in stark contrast to the ORO's primary relationship with the R&D section of the Directorate of Logistics.

[155] Page, 'Ellis A. Johnson, 1906-1973', (p. 1150); Yahraes, 'The Mysterious Mission of ORO', (p. 36).

[156] Letter from Lowell J. Reed Pres. JHU to Dr. Ellis A. Johnson, 'Subj; Award of the UN Service Medal,' (11 May 1955); JHUA Office of the President 47.2/RG2/Box33(ICR-ORO Reports, Jan-Dec 55); Shrader, 'History of Operations Research in the United States Army', p. 86.

[157] Yahraes, 'The Mysterious Mission of ORO', (p. 82).

Pyongyang following closely behind the action as it moved north. In late November a senior planner in the EUSAK G-3, Colonel William F. Train, asked them if they would help him with a short-notice, and compartmentalized planning task. As Train later recalled, 'I was directed to prepare a plan for the dropping of the atomic bombs on the Chinese.' Intelligence had increasingly pointed to Chinese intervention as U.S. forces approached the Yalu River. Train studied what limited information he could find on Chinese tactics and the terrain. His problem, as he told Johnson and Whitson, was that he did not 'know anything about atomic bombs'. He desperately needed advice on 'where you could drop them to have the most effect'.[158]

At this time, with the exception of some preliminary and still draft work underway at ORO, and CGSC, the army had no doctrine that addressed the tactical use of atomic weapons, their effects, or even their potential impact on friendly troops. Train happened to have asked for help from the two most qualified men on this question in Korea. In addition to ORO studies, Johnson had some practical knowledge of atomic weapons effects from government consulting work he had performed for Bush prior to his time at ORO. Winston, a physicist and veteran of OSRD research on bomb delivery techniques during the Second World War, was also familiar with ORO's early conceptual work on atomic weapons. As Train recounted 'working with these two scientists from ORO [...] gave me some information about effects of the atomic bombs, how many we would need, and where they should be dropped'.[159] Thankfully for all involved, Train's plan was never executed. The swift evacuation of North Korea by UN forces in the face of the Chinese onslaught forced the hurried evacuation of the city. According to Train 'when we were driven out of Pyongyang, I

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[158] Moore, 'Oral History - William F. Train', pp. 264-266. Based on his oral history, it seems Train was developing a target nomination list for tactical atomic strikes by the U.S. Air Force. This would have been one of the first such planning processes in history. The possibility of using atomic weapons had been discussed but not seriously planned for since the disasters of that summer. General Douglas MacArthur requested authority to direct atomic strikes if necessary. General Omar N. Bradley found the idea 'preposterous.' By late November, General Collins initiated preliminary planning for 'against troops and materiel concentrations.' The Air Force was against tactical targeting of any kind. On 30 November Truman, somewhat casually, hinted at the possible use of atomic weapons when he said the U.S. would employ 'every weapon we have' to end the war and that the decision would be left to the commanders on the ground. See Conrad C. Crane, 'To Avert Impending Disaster: American Military Plans to Use Atomic Weapons During the Korean War', *The Journal of Strategic Studies*, 23 (2000), 72-88 (pp. 72-78); Gregg Herken, *The Winning Weapon: The Atomic Bomb in the Cold War* (New York: Alfred A, Knopf, 1980), pp. 329-337.

[159] Moore, 'Oral History - William F. Train', pp. 354-365.

was directed to destroy all copies of that plan so there is no official record, or otherwise'.[160]

As the saying goes, 'plans are worthless, but planning is everything'.[161] It is doubtful that when Johnson set a goal to collect the 'maximum amount of actual field data for ongoing projects,' he thought that might include potential the use of atomic weapons. However, true to his purpose, by the end of December, Johnson's team quickly produced a technical memorandum and released a full report a few months later entitled, *Tactical Employment of Atomic Weapons.*[162] The contents, while they do not refer to the events in Pyongyang, were strongly influenced by the very practical problem presented by Train. These ORO reports, along with related studies, provided the army with its first practical and scientifically sound sources of information on atomic weapons.[163]

For the remainder of Korea War, the ORO rotated research teams into theater to conduct research either on a major study already under way or in direct support of a FEC sponsored study. In June 1951, the ORO established an office at the Headquarters, FEC in Tokyo to facilitate direct theatre support. During the period 1950 – 1953, ORO worked on a diverse set of studies that included: combat operations, including weapons, equipment, tactics, and doctrine; logistics and costs; social and cultural studies, including strategy, economics and politics; personnel, training, psychological warfare, and counterinsurgency; and special studies on research management and operations research methodology.[164] Even those studies not focused on the FEC's problems, such as work done in support of army forces stationed in Europe, were informed by data collected in Korea. In all, more than two hundred ORO reports, studies and technical memoranda on research conducted between 1950-1953 were delivered to the tactical commands, EUSAK, FEC, and the

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[160] Moore, 'Oral History - William F. Train', pp. 365-366.

[161] Dwight D. Eisenhower, *Remarks at the National Defene Executive Reserve Conference, 14 November, 1957*, ed. by John T. Woolley and Gerhard Peters (Washington DC: The American Presidency Project <http://www.presidency.ucsb.edu/ws/?pid=10951.> [accessed 1 December].

[162] This and many other FEC ORO studies of the period have been declassified and are available in the MHI archives.

[163] See chapter on Command and General Staff College for a discussion of the limited knowledge of atomic warfare in the army and the role that these studies played in changing that situation.

[164] Lynn H. Rumbaugh,'A Look at US Army Operations Research-Past and Present,' RAC-TP-102 (RAC, McLean: 1964), Table 2. Cited in Shrader, 'History of Operations Research in the United States Army', p. 100.

army. In addition to the atomic weapons study, a sample of the major FEC titles gives a flavor for the work accomplished.

Document Number	Title
FEC R-1, vol. I and II	The Employment of Armor in Korea
T-109	The Employment of Land Mines
T-161	The Effects of Terrain on Battlefield Visibility
T-261	The Structure of Battle – Analysis of a UN-NK Action North of Taegu, Korea, September 1950
T-264	Civil Affairs Relations in Korea
T-278	Tank-vs-Tank Combat in Korea
FEC-AFFE T-10	Organization and Activities of Psywar Personnel in the Lower Echelons of Eighth Army – 24 January -5 April 1951
T-23	A Study of Battle Casualties Among Equivalent Opposing Forces, Korea, September 1950
T-46	The Vulnerability of Army Supply to Air Interdiction
EUSAK T-3	A Proposed Joint Intelligence Center for the Selection of Targets in Air Support and Ground Action

Table 3 **Sample of ORO Korean War Field Research (1950-1953)**[165]

Some of the major ORO studies relating to Korea or which depended on Korea as a 'highly valuable laboratory for operations research' are worth noting because of their high profile and role in the expansion of operations research in the army.[166]

Project CLEAR aimed to 'determine how best to utilize Negro personnel within the Army'.[167] This early and far-reaching study was important, not only for its impact on the army and society at large, but also for its ability to demonstrate the value of applying operations research to complex questions beyond technology. On 26 July 1948, President Harry S. Truman signed Executive Order 9981. The order left implementation to the Department of Defense, which, reflecting the social climate of the times, delayed and studied the process for over a year. Among the services, the army was the most resistant to integration. In March 1949, Army Chief of Staff Omar N. General Bradley testified to a defense department committee that:

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[165] 'ORO Projects Special Studies and Field Operations to May 31 1952'; Operations Research Office, 'ORO Publications Graded Excellent 1948-1958'.

[166] Operations Research Office, 'Report to the Trustees Committee for the Period 1 December 1951 to 31 March 1952' (Washington DC: Operations Research Office, 1952), p. 4. (JHUA, Office of the President 47.1/RG2/Box33 (Jan 1951-Jun 1952)

[167] 'ORO Projects Special Studies and Field Operations to May 31 1952', p. 43.

I consider that a unit has high morale when the men have confidence in themselves, confidence in their fellow members of their unit, and confidence in their leaders. If we [were] to force integration on the army before the country is ready to accept these customs we may have difficulty attaining high morale.[168]

Institutional desegregation was a problem of finding a convincing argument that could overcome strongly held beliefs. The army's senior leaders had two related problems. One was to institute what many of them believed to be a disruptive social policy. The second problem was an acute personnel shortage, exacerbated by the very existence of segregated units.[169] The Korean War became the laboratory from which army could derive data that could provide a 'quantitative basis for decisions'.[170] There seems to be little doubt that some in the army leadership hoped to find quantitative data to support their existing qualitative jusdgements. A contemporary history noted,

Korea inadvertently served as the testing ground for the army's new policies of abolishing racial quotas and initiating integrated units… For the first time the Army could observe and compare the performances of integrated and segregated units like that of the 24th Infantry Regiment under almost identical battle conditions, which, in effect, meant appraising the relative merits of the policies of integration and segregation.[171]

The team, led by Alfred H. Hausrath, conducted 'a partly quantitative operations research study' from May-June 1951 to define the critical elements of the problem statement and make recommendations.[172] The team employed a characteristically diverse set of qualitative and quantitative methodologies to analyze the problem. In addition to a literature review and analysis of army historical data, it interviewed 450 enlisted soldiers and 150 officers, provided 3000 surveys to front-line units; performed a 'content analysis' of the written material; analyzed 'critical

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[168] Testimony of General Omar N. Bradley, Fahy Committee Hearings, 28 Mar 49, afternoon session, pp. 71-72. Cited in Jr. MacGregor, Morris J., *Integration of the Armed Forces*, Defense Studies Series (Washington DC: Center of Military History, 1985), p. 351.

[169] For a detailed explanation of the demographics of desegregation in the army see Alfred H. Hausrath, 'Utilization of Negro Manpower in the Army', *Operations Research*, 2 (1954), 17-30.

[170] 'A quatitative basis for decisions' was part of Dr. Charles Kittel's definition of operations research. Cited in Committee on Operations Research, 'Operations Research with Special Reference to Non-Military Applications', p. 2.

[171] Ronald Sher, 'Integration of Nego and White Troops in the U.S. Army, Europe - 1952-1954' (Stuttgart: Historical Division, Headquarters, United States Army, Europe, 1956), p. 7.

[172] Hausrath, 'Utilization of Negro Manpower', (p. 17).

incident' behavior to better understand squad-level behavior concerning race; and employed standard tools of statistical analyses.[173]

The ORO team found that the critical problem across all issues was quality. 'The Negro soldier' was of a poorer overall quality compared to his white counterpart because of 'limitation in the educational and economic opportunities represented in his background'. This finding seemed to support the argument that integration would be disruptive both socially and in terms of effectiveness. However, further analysis found that separating units (regardless of race) by quality had a measurably negative impact on overall readiness. After further analysis, the study team concluded that 'the Negro soldier, whose performance in all-Negro units was in general considered poor, became a good soldier in an integrated unit, and that no adverse effects on the performance of the hitherto all-white unit were detected'.[174] It found that overall performance improved in integrated units, while segregated units present 'unwarranted military risks,' and 'no racial quota is needed if personnel [were] accepted and assigned on the basis of qualification'.[175] The army accepted the findings out of necessity and began desegregating units in Korea almost immedialty. By establishing 'a clear advantage of integration over segregation on effectiveness grounds,' the ORO not only helped the army solve its immediate problem but also made it possible to pass what proved to be a major milestone in the larger civil rights movement that followed.[176]

Another series of high profile studies that emerged from the ORO's work stand out, as much for the notoriety of the researcher as for the value of the work at the time. S.L.A. Marshall was a reserve army colonel, a newspaper reporter, and a noted military historian when the Korean War began. During the Second World War, he served as a senior military historian in Europe and collected oral histories and monographs from captured German officers. In 1947 he wrote a compelling but

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[173] *Project Clear: Social Research and the Desegregation of the United States Army*, ed. by Leo Bogart, 2 (New Brunswick: Transaction Publishing, 1992), pp. 2-3. Hausrath, 'Utilization of Negro Manpower', (pp. 20-23).

[174] Hausrath, 'Utilization of Negro Manpower', (p. 26).

[175] 'ORO Projects Special Studies and Field Operations to May 31 1952', pp. 44-45.

[176] Page, 'Ellis A. Johnson, 1906-1973', (p. 1152).

highly controversial, book *Men Against Fire: The Problem of Battle Command.*[177] While highly acclaimed for its sympathetic treatment of front-line infantry, it was Marshall's claim that only fifteen to twenty-five percent of soldiers fired their weapons in combat that was, and still is, hotly debated.[178]

Despite the controversy, in September 1950 the ORO hired Marshall as a consultant to lead research on Project 5, a 'study of infantry weapons systems, logistics, mobility, and tactics to determine how the effectiveness of our ground forces can be increased'. Using the same oral history and after-action review techniques he pioneered during the Second World War, Marshall 'compiled a large amount of data on infantry operations in Korea during the winter of 1950-51'.[179] In February 1951, the ORO renewed Marshall's contract under Project DOUGHBOY. An ambitious effort to determine 'methods of increasing the effectiveness of infantry,' Project DOUGHBOY led to numerous ORO publications over several years.[180] Several of Marshall's papers, such as his distillation of Chinese infantry tactics based on interviews of the American infantry who fought them, were very much in demand in 1951. In general however, it is difficult to gage the impact of Marshall's work or his contribution the ORO mission. In Marshall's posthumous autobiography, he was somewhat derisive of his scientific colleagues 'who were supposed to measure all problems in mathematical terms'. Calling them 'too windy to do their work' Marshall thought the whole lot, with the exception of Johnson whom he called 'rock steady,' should be shipped back to Tokyo.[181]

Despite the interest in Marshall's work, the ORO was careful to draw a line between his methodology and any 'scientific' findings. The summary of Project DOUGHBOY included the caution that the numbers of variables considered by

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[177] S.L.A. Marshall, *Men against Fire: The Problem of Battle Command*, Originally Published 1947 (Norman: University of Oklahoma Press, 2000).

[178] Most critics, to one degree or another, agree with Roger J. Spiller's assessment that Marshall's general insights into soldiers in combat are correct, but they question the accuracy, even existence, of his data and, to a lesser degree, the rigor of his methodology. See John Whiteclay Chambers II, 'S. L. A. Marshall's Men against Fire: New Evidence Regarding Fire Ratios', *Parameters*, 33 (2003), 113-121 (pp. 113-121); Roger J. Spiller, 'S.L.A. Marshall and the Ratio of Fire', *Journal of the Royal United Services Institution*, 133 (1988), 63-71.

[179] 'ORO Projects Special Studies and Field Operations to May 31 1952', p. 157.

[180] ORO-T-7 (EUSAK) 'Notes on Infantry Tactics in Korea,' ORO-R-3 'Analysis of Infantry Operations and Weapons Usage in Korea during the Winter,' ORO-T-185 'Fatigue and Stress Symposium,' ORO-T-190 'Operation Punch and the Capture of Hill 440, Suwan Korea Feb 1951.'

[181] S.L.A. Marshall, *Bringing up the Rear - A Memoir* (San Rafael: Presidio Press, 1979), p. 186.

Marshall were 'complex and closely interrelated,' and that reason, '[...] actual combat or maneuver situations do not provide sufficient control to permit complete analysis of these variables'.[182] As always, the real value of Marshall's work was the battle narrative and evocative descriptions of men in combat. Based largely on his work for the ORO, Marshall continued to develop his reputation as an historian with two widely read works on the Korean War, *The River and the Gauntlet* and *Pork Chop Hill*.[183]

The final area of research that was an important legacy of the ORO's 'Korean War laboratory' was that of psychological operations. Although the army employed psychological warfare in the Second World War, it was neglected afterwards. The army's capability to execute psychological operations (psysops) had fallen so low by early 1949 that it officially considered it, along with atomic warfare, radiological defence, biological warfare, guided missiles, and subversive warfare, as a 'new development'.[184] The character of the Korean War quickly changed attitudes, and demand for rebuilding a psyops capability grew rapidly. In September 1950, one of the first ORO teams to deploy, went to Headquarters FEC G-2, where it became become part of the Special Projects Office. Once there, the ORO team, including members of the ongoing Project POWOW, worked to improve psychological operations by testing the effectiveness of various messages on the enemy.[185]

Although the ORO's efforts in psychological operations were extensive, the problem over specificity of research that had afflicted the relationship with the army in 1949 came to the surface again. This time the friction was between the ORO and the growing number of newly minted psyops practitioners flooding into Korea. While

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[182] 'ORO Projects Special Studies and Field Operations to May 31 1952', p. 53. The variables identified in this study were: Personnel selection, classification, and assignment; Training; Equipment and clothing; Physiological and psychological factors; Leadership; Communications; Organization; Weapons and weapons employment; Tactics; Supply, evacuation, and maintenance; Staff functioning; and Combat intelligence. One result of the study was the creation of a tactical laboratory at Fort Benning to both study these factors under more controlled circumstances and to improve the methods for collecting and analyzing information on infantry units.

[183] S.L.A. Marshall, *Pork Chop Hill; the American Fighting Man in Action, Korea, Spring, 1953* (New York: Morrow, 1956); S.L.A. Marshall, *The River and the Gauntlet: Defeat of the Eighth Army by the Chinese Communist Forces, November, 1950, in the Battle of the Chongchon River* (New York: Morrow, 1953).

[184] Alfred H. Paddock Jr., *US Army Special Warfare: Its Origins - Psychological and Unconventional Warfare, 1941-1952* (Washington DC: National Defense University, 1982), p. 64.

[185] Shrader, 'History of Operations Research in the United States Army', p. 87.

the operations research team tried to connect its activities to the broad requirements of what it saw as the FEC's psychological operations problem, officers in the field viewed the ORO's efforts as 'too general in concept and not suitable for use by the army's psychological operators'.[186] In part as a result of general dissatisfaction that operations research had failed to provide the detailed answers needed, and in part as a result of findings from Project POWOW, beginning in early 1952 the army shifted much of its psychological operations research to the new Human Resources Research Office (HumRRO).

The initial idea for HumRRO emerged out of an Office of the Secretary of Defense staff study reviewing the need for human factors research. The study recommended the army establish an ORO-like relationship with a major university to conduct 'research in the areas of training methodology, motivation and morale, and psychological warfare techniques'.[187] The 'and psychological warfare techniques' portion of the HumRRO was clearly a late addition, since the study's emphasis was on human factors primarily related to training. The army quickly approved the project. The HumRRO opened its doors at George Washington University in August 1951. Its first task was to investigate the psychological impact of atomic explosions among soldiers participating in the Desert Rock atomic tests. Eventually, HumRRO opened offices at major training facilities across the country with a focus on a subset of ORO's original problem space – the human.

The HumRRO's approach to research was similar to the ORO's. HumRRO provided 'a disinterested scientific approach to the gathering of facts, the controlled experimental approach with careful measuring devices and the orderly examination of data from a research perspective'.[188] Despite methodological similarities and overlapping problem definition, the HumRRO was not conducting operations research, at least not as Johnson defined it. Johnson was promoting a concept of

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[186] Paddock Jr., *US Army Special Warfare*, p. 117. One can get a sense of the nature of the ORO studies by the titles such as: Psychological Warfare: Leaflets; North Korean Propaganda to South Korea; An Evaluation of PSYWAR Influence on North Korean Troops; and An Evaluation of PSYWAR Influence on Chinese Communist Troops.

[187] Meridith P. Crawford, 'Highlights in the Develpment of the Human Resources Research Organization (HumRRO)', *American Psychologist*, 39 (1984), 1267-1271 (pp. 1267-1268); Alexandria, HumRRO.

[188] Human Resources Research Office, 'What Is HumRRO Doing? (Research Bulletin 1)' (Washington DC: Human Resources Research Office, George Washington University, 1954), p. iii.

operations research that fit well with Blackett's observation that operations research's 'relative novelty lies not so much in he material to which the scientific method is applied as in the level at which the work is done, in the comparative freedom of the investigators [...] and in the direct relation of the work to the possibilities of executive action'.[189]

The creation of the HumRRO represented a milestone in development of operations research in the army. At one level, it was indicative of the limits of operations research, when the problems became increasingly social science centric and solutions were tied to long-term trends and programmatics. However, it also marked an institutional victory for the ORO. By creating the HumRRO, the army was validating the idea that one could apply outside knowledge to operational, and in many cases purely military problems in a way that was both relevant and non-threatening to the profession of arms. The rapid expansion of the HumRRO into specific areas of psychological testing, training management, and motivation freed the ORO to seek problems more in line with Johnson's philosophy.[190]

Despite the HumRRO's explicit mandate to support psychological operations, the ORO continued to research and report on the subject, normally as a sub-set of larger strategic studies. From the ORO's founding through 1954, it produced more than sixty studies related to psychological operations. As the field matured and perceived threats from insurgencies proliferated, so did demands from the army for more specific cultural knowledge than either ORO or HumRRO could provide. In 1956, the army contracted with The American University to establish the Special Operations Research Office (SORO).[191] Much like the ORO, the SORO was a university administered, non-profit body established to conduct nonmateriel research 'on problems involved in understanding, influencing, or supporting foreign peoples

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[189] P.M.S. Blackett, 'Operational Research', *Operational Research Quarterly,* 1 (1950), 3-6 (p. 4).

[190] Early HumRRO reports include Desert Rock I: A Psychological Study of Troops Reactions to an Atomic Explosion; Desert Rock IV: Reactions of an Armored Infantry Battalion to an Atomic Bomb Maneuver; Survey of the Educational Program of the Artillery School; Effects of Four Orientation Procedures on Airborne Trainees; and Psychological Warfare Research: A Long Range Program. Human Resources Research Office, 'What Is HumRRO Doing? (Research Bulletin 1)', p. 53.

[191] The meaning of 'special operations' has changed significantly since 1956. In this context it was meant to refer to the kinds of operations that fell below the threshold of traditional military conflict.

and societies'.[192] It is beyond this dissertation's scope to recount the growth, contributions, and ultimately negative role the SORO would play in relationships among the military, universities, and perceptions of civilian scientists in the early 1960s.[193] However, at the time, and although it did not specifically conduct operations research studies, its existence, lik that of the HumRRO supported Johnson's attempts to keep the ORO focused on broader matters of strategic interest to the army.

The Maturation of the ORO and Army Operations Research

The relationship between the field of operations research and the army had solidified by the time of the uneasy truce in Korea in 1953. During that period, the ORO had gone from a small team of less than forty scientists and support staff to a staff of some 300 with an additional 140 consultants.[194] The expansion of the ORO staff was inevitable with Korea. A year after opening its Tokyo office in 1951, the ORO opened one in Heidelberg to support US Army Europe (USAREUR). Both offices remained small, usually four to ten full-time staff, working in the respective G-3 sections. General activities of the field offices included liaison with the major army units, promoting operations research with allies, and participating in field exercises. Despite their small size, they were influential and operationally focused on 'assisting in the preparations of war plans and exercises and to collect data and provide assistance'.[195]

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[192] The Special Operations Reseach Office, 'Annotated Bibliography of SORO Publications' (Washington DC: The American University Special Operations Reseach Office, 1966).

[193] On the SORO controversy and the implications for civilian research for military use see Seymour J. Deitchman, *The Best-Laid Schemes: A Tale of Social Research and Bureaucracy* (Cambridge: The MIT Press, 1976). For the two sides of the so-called 'Camelot Affair,' see George E. Lowe, 'The Camelot Affair', *Bulletin of the Aromic Scientists,* 22 (1966), 44-48; Theodore R. Vallance, 'Project Camelot: An Interim Postlude', *American Psychologist,* 21 (1966), 441-444.

[194] Operations Research Office, 'Report to the Trustees Committee for the Period 1 April 1953 to 30 June 1953' (Chevy Chase: Operations Research Office, 1953), pp. 11-12. (JHUA, Office of the President 47.2, Record Group 2, Box 33, (Reports 1952-1953).

[195] Shrader, 'History of Operations Research in the United States Army', p. 92.

As one would expect with such small staffs, the utility of the ORO to sponsoring organizations was in part dependent on the personality of the local director. For the first ORO-USAREUR office director, Johnson selected the historian Hugh M. Cole. Cole's historical work on the Second World War was well respected as history, and was held in high regard by the former division commanders now rotating though commands at corps and army level in Europe.[196] The ORO field offices had a long-range impact on the army's attitudes toward civilian research by placing senior ORO personnel in direct support of officers who were influential and in many cases still rising in the institution's leadership.

Each of the field offices, in addition to supporting the main research agenda, also generated its own research tasks. The ORO-USAREUR office was particularly busy with the development and assessment of concept plans, and procedures for the integration and use of tactical atomic weapons in theatre. One such effort was a multi-year project designated 'EUCOM Report 1 - The Tactical Employment of Atomic Weapons in the Defense of Central Europe'. The summary report was delivered to EUCOM in October 1954, but, as indicated by the list of supporting studies in Figure 4 below, it was in fact the summation of a wide-ranging multi-year effort.

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[196] Shrader, 'History of Operations Research in the United States Army', p. 92. It is not surprising that Cole eventually added historians Forrest C. Pogue, Roland Ruppenthal, and Charles B. Macdonald to his staff. Cole was as replaced as director in April 1954 by Dr. Thornton L. Page.

Title	Report Number / Date
The Physical Bases for the Selection of a Family of Tactical Atomic Missiles	R1 (App A) / Apr 53
Organization, Staff, Procedure, and Equipment for the Tactical Employment of Atomic Weapons in Support of NATO Forces Europe	R1 (App B) / Dec 52
Intelligence Requirements for Atomic Warfare	R1 (App C) / Dec 52
Capabilities of NATO and Soviet Forces in Western Europe and a Probable Course of Action in a Conventional War	R1 (App D) / Apr 53
Troop, Demolition and Interdiction Targets for Atomic Missiles in Central Europe	R1 (App E) / Aug 53
Vulnerability of the EUCOM Logistical System to Atomic Attack	R1 (App F) / Dec 52
Atomic Weapons Delivery Problems and Capabilities in Europe	R1 (App G) / Jan 53
Training and Indoctrination for Atomic Warfare	R1 (App H) / Dec 52
Medical Aspects of Atomic Warfare in Europe	R1 (App I) / Dec 52
Effects of Atomic Weapons on Forests of Western Europe	R1 (App J) / Mar 53
An Analysis of the Proper Balance of Special Weapons Forces, Central Europe	R1 (App K) / Jul 54

Table 4 **Appendices of ORO-EUCOM R-1 Study on Tactical Employment of Atomic Weapons (1952-1954)**[197]

This particular study is notable because given the relatively primitive level of army expertise in planning for the use of atomic weapons, the lack of mature tactical atomic doctrine, few warheads or delivery systems, and no trained planners, the ORO-USAREUR staff were not only the most knowledgeable part of the staff on the subject, but they were for all practical purposes the command's atomic planning staff.

One of the most important extension offices created during this period was the Combat Operations Research Group (CORG) at AFF, at Fort Monroe Virginia.[198] The idea of placing operations research personnel within what was still the AFF, emerged out of the Project VISTA study. Its final report recommended the army create a group 'to bring to an operational state the newest tactics, ideas, and inventions having application to the kind of warfare envisaged for Western Europe'. This group,

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[197] Reseach Analysis Corporation, 'RAC Publications List' (McLean: Research Analysis Corporation, 1965), pp. 2-4. RAC assumed responsibility for ORO's work and catalogue of projects on 1 September 1961.

[198] In 1955 the Office, Chief Army Field Forces became the Continental Army Command, which, in addition to becoming a major command, also absorbed many of the staff responsibilities for research and development, doctrine, and education.

according to Project VISTA, should have a permanent staff that 'includes civilian scientists [...] and access to specialists in all relevant fields; and it must work in close coordination with Operations Research Office of the Army'.[199] While the army worked out specific details for implementation, General Mark W. Clark, chief of AFF, asked Johnson if he could augment his small team of officers struggling to develop a combat development system. In December 1952, ORO established a field office at Fort Monroe to support the 'the design of field test and exercises and to conduct simulations and wargames' and assist in the implementation of the army's new combat development system.[200]

The AFF struggled throughout most of 1953 to separate its current operations mission from its combat developments mission. In August, responsibility for combat developments was taken out of the AFF G-3 and placed under a new organization, the CORG. The members of the small ORO office were then absorbed to create a new entity close to what the Project VISTA report recommended. The CORG functions were to apply scientific methods of analysis to combat development problems; to develop new methods of determining changes for doctrine, organization, and material; and to design troop tests as required by the first two functions.[201] While theirs was not specifically an operations research mission, ORO scientists provided a sound methodological basis for the army-wide combat development system that would emerge from CORG. The ORO-Fort Monroe field office operated semi-autonomously until late 1955 when a contract was in place for a private firm to provide CORG's civilian personnel.[202] Even though CORG diverted ORO personnel from their primary task, it proved to be a useful exercise in institutional influence. Over three years, the ORO staff found itself involved in the development of doctrine, capabilities requirements, and field experiments. The general acceptance of civilian scientists within the heart of what professional officers do in peacetime — preparing for the next war — was a major shift in the army's institutional ethos. CORG also served, as

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[199] 'U.S. Army Combat Development System' (Fort Monroe: Headquarters, United States Continental Army Command, 1960), p. 4. (U.S. Army Center of Military History, Fort McNair, Washington DC (Hereafter CMH) U393.A25)

[200] Shrader, 'History of Operations Research in the United States Army', p. 92.

[201] 'U.S. Army Combat Development System', p. 7.

[202] The civil service rules in effect at the time made direct hiring of scientific personnel difficult if not impossible.

WSEG had for the ORO, as a driving force behind proliferation of operations research activities in the commands, branches, and services.[203]

The increased activity and geographic scope of ORO's work had, by 1954, reached a point where a project-based organization with a small overhead staff for administration and publications would no longer suffice. Beginning in April, ORO reorganized into five main research divisions (Strategic, Tactical, Logistics, Intelligence, and Continental Defense), a committee on war gaming, a business administration division, and a field support division. The reorganization was also a reflection of where Johnson wanted to take ORO in the future. As he stated in a 1954 report, early ORO work was 'concentrated [...] upon weapons evaluation studies, and [...] learning to master army problems [...] recruiting and training personnel, and proving the possibility of success in army operations research'. As a result of a shift 'in the nature of direct demands from the army,' the ORO was now taking on more strategic and fewer tactical studies.[204]

Colleagues recalled that it was through building the army's nascent program that Johnson realized the 'opportunity to display to the full his grasp of the potential of operations research in the national service'.[205] Johnson, not unlike others who believe they are pioneers, was almost evangelical in spreading the gospel of operations research. As director of the ORO, increasing interest in operations research in general was simply good business. However, from the earliest days of ORO Johnson was a pied piper. He maintained an aggressive traveling and speaking schedule promoting the field. He viewed outreach as 'essential to our mission for the army in that many of our studies and recommendations affect army relations with industry [...] it is also essential to the future of ORO in that we must reach out to a broad cross section of the scientific community'.[206]

Johnson was an early and strong supporter of the creation of the Operations Research Society of America (ORSA), a professional association created in 1952 to

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[203] By 1962 there were nine so-called 'in-house' operations research organizations. Smith, 'A History of the U.S. Army in Operations Research', p. 72.

[204] Operations Research Office, 'Report to the Trustees Committee for the Period 1 April 1954 to 30 September 1954' (Chevy Chase: Operations Research Office, 1954), p. 1; Shrader, 'History of Operations Research in the United States Army', pp. fig 3-1, 89.

[205] Page, 'Ellis A. Johnson, 1906-1973', (p. 1148).

[206] Operations Research Office, 'Report to the Trustees Committee for the Period 1 April 1954 to 30 September 1954', p. 6.

promote operations research in public, business, and educational institutions thorough conferences and its journal. ORSA grew steadily from its founding meeting of seventy in 1952 to more than 2500 in 1960.[207] He invested in ORSA's success by providing office space for the journal's editor, who also happened to be one of the ORO's division directors, Dr. Thornton Page.[208] The ORO's close affiliation with ORSA and its journal continued throughout the 1950s. In addition to providing editorial services and managing, Johnson subtly promoted the ORO and the army's research agenda by encouraging his staff to write for the journal. Moreover, many submissions resulted from ORO sponsored monthly research seminars designed to attrack industry and academia to the field.

The long-range viability of the army's operations research depended on ensuring a steady supply of well-trained scientists and an academic system capable of solidifying and even expanding the theoretic basis of the discipline. There had always been a fundamental disagreement in the operations research community about the best way to educate individuals for the field. Johnson came down on the side of a combination of undergraduate work in science and graduate degrees in operations research as the correct approach. He advocated, with limited success, an operations research academic program at Johns Hopkins, and even started a successful summer high school student program to stimulate interest in young scholars.[209]

One area of operations research that was of personal interest to Johnson was wargaming. His connection to gaming as an analytical tool dated back to his work in the Naval Ordnance Laboratory before the Second World War. By the mid-1950s, the ORO was a major influence in the development of computer-assisted war games. In 1955 the ORO purchased one of the first large computers, the UNIVAC 1103, opened a computer laboratory on its Chevy Chase Maryland campus, and developed a series of games focused on strategic and tactical questions. Developing answers to specific

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[207] Ellis A. Johnson, 'The Long-Range Future of Operational Research', *Operations Research,* 8 (1960), 1-23 (p. 5).

[208] Johnson was an early member of the ORSA Education Committee and made educational outreach a priority mission of the society. Page, 'Ellis A. Johnson, 1906-1973', (p. 1153). Letter from Ellis A. Johnson and Members to JHU Pres Dr. Detlev Bronk, 'Subj: Report of the Academic Council,' (8 December 1951); JHUA Department of Physics, Series 1/RG 03.040/Box 4/(Dept of Physics-ORO).

[209] For a listing of the non-research related operations research promotional activities see ORO Reports to the Trustee Committees and Reports to the Committee on Sponsored Research (1952-1960) (JHUA, Office of the President, 47.2/G2/Box 33 and 34)

questions was not the main purpose of either the computer or gaming, although that may have been an expectation of some uniformed participants. Johnson used this process to bring officers and scientists together to achieve 'military insights,' which would in turn identify 'a need for more detailed operations analysis and field experiments, which leads to revision of the war games [...] the results go continuously to the army, which in turn provid[ed] continuous guidance'.[210]

As Johnson's vision of the ORO's research agenda increasingly moved toward the strategic problems facing the army, the ORO increasingly became involved in national level research efforts. One study in particular, ORO R-17 "Defense of the US Against Attack by Aircraft and Missiles,' became a centerpiece of the research behind a major examination of national defence.[211] In 1957 the White House established a prominent committee, named the Gaither Committee after its director, to study the issue of civil defence in the event of a Soviet atomic attack. The ORO study, by pointing out the large weaknesses in U.S. air defences, was a major factor in the committee's recommendations for massive increases in U.S. spending on civil defence. The implications for the ORO were two-fold. First, the ORO's work and increasingly ORO's scientists were becoming part of the national conversation on strategy — outside of the army's narrow mandate for its operations research capability.[212] The second circled back to the original assessment in 1949, that it was not focused on army issues to the extent necessary and the products failed to meet the army's desire for timely research.[213] Neither issue was particularly new. Except of course to the new rotation of senor officers now responding to strategic questions raised by an army activitiy in a public forum. Given the army's already strained

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[210] Shrader, 'History of Operations Research in the United States Army', pp. 114- 115.

[211] The examination was formally known as The Security Resources Panel of the Science Advisory Committee of the Office of Defense Mobilization. ORO R-17 was a large study with chapters covering enemy capabilities, the effects of atomic attack, and assessment of US plans, the effectiveness of specific weapons systems, defense against ballistic missiles, and planning considerations for continental air defense.

[212] The Gaither Report, following closely after the Soviet Union's launch of *Sputnik,* caused a major political crisis for the Eisenhower administration. See Lawrence Freedman, *The Evolution of Nuclear Strategy* (New York: St. Martin's Press, 1981), pp. 160-171; Kaplan, *The Wizards of Armageddon*, pp. 125-143.

[213] ORO published a study in 1960 (ORO-TP-16 Analysis of the ORO Research Program with Respect to Timeliness) which restated the original position; delays were 'inherent in any research,' caused in many cases by the need to assemble the necessary scientific talent, and army instigated 'crash studies' caused delays across the entire program. Shrader, 'History of Operations Research in the United States Army', pp. 103-104.

relationship with the White House over almost every other issue, this additional burden was not welcome.[214] In earlier years, Johnson may have been more sensitive to the complaints but he seems to have lost the energy to refight the issue of the ORO's scope and independence with the latest rotation of staff officers.

The rapid growth of the ORO in the mid-1950s led to some complaints from the army over the quality of its reports. In response, Johnson and his staff redesigned ORO's workflow, institutionalized a more rigorous peer review program, and a revamped the way it presented its work to the army. The use of so-called 'murder-boards' (panels of subject matter experts) to review the ORO's studies proved more difficult than either the army or ORO anticipated. With an unclassified publication, ORO brought-in academic experts on the subject and sought their unbiased comments. However, inherent in classified research is the problem that the pool of experts is small and limited to many of those involved in the subject under study. As the ORO report noted, 'impartial evaluation tends to be difficult because of the invidious effects of partisanship, so prevalent in classified work, because much classified work involves serious effects on the budgets of the military services'[215] There were no simple answers to this problem, and it made rebutting complaints of quality a difficult if not impossible proposition.

The End of the ORO and the Rise of Operations Research

The ORO, as constituted in a Johns Hopkins contract and under the leadership of Ellis A. Johnson, came to an end in August 1961. There are a number of reasons why this happened, some institutional, some organizational, and, as is often the case with small organization under a strong leader, personal. Institutionally, Johnson's determination to keep army operations research out of the 'trenches' remained a point of friction from the earliest discussions. High visibility studies, regardless of their long-term value to the army's legitmate role in the strategic debate, did little to satisfy

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[214] On the controversy and the White House's reaction see Morton H. Halperin, 'The Gaither Committee and the Policy Process', *World Politics,* 13 (1961), 360-384; 'Interview with Dr. Ellis A. Johnson Who Directed the 'Top-Secret' Johns Hopkins Report', *U.S. News and World Report* 1958, pp. 50-55.

[215] Operations Research Office, *The Professional Evaluation of ORO Publictions* (Chevy Chase: Operations Research Office, 1958), p. 3. (JHU Archives, Office of the President, 47.2/RG2/Box 34/Jan-Dec 1958)

staffs struggling with more immediate and generally technical questions. Speaking at a conference in 1959, Johnson reiterated the case for a broad research agenda. As he had done for ten years, Jonson argued that operations research 'must be concerned continuously with research in the broadest operational sense, rather than merely successful repetitive operational engineering application of the previous successful results of operations research [...] it must, therefore, always be concerned with pioneering'.[216]

Between 1948 and 1961, ORO produced some 1600 studies and 632 publications. The distribution of studies by topic and ORO division (Figure 5) indicates that Johnson was successful in maintain a 'balanced' study agenda.

Table 5 **Major ORO Studies by Topic (1948-1961)**[217]

Study Topic	July 1948 - June 1951	July 1951 - June 1954	July 1954 – June 1958	July 1958 – June 1961
Combat operations: weapons and equipment; intelligence; organization, tactics, and doctrine	47	41	45	39
Logistics and costs	21	17	24	29
Background Studies: social, cultural, and civil affairs environment; international strategy, economics, and politics	2	11	6	10
General studies: personnel selection, training, and performance; psychological warfare; special warfare and counterinsurgency	14	21	10	3
Special studies: R&D management; OR methodology; miscellaneous	6	10	15	19

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[216] Johnson, 'The Long Range Future', (p. 2).

[217] Lynn H. Rumbaugh, 'A Look at US Army Operations Research-Past and Present,' RAC-TP-102, April 1964. Cited in Shrader, 'History of Operations Research in the United States Army'. The shift away from general studies is attributable to the creation of HumRRO and SORO.

Lieutenant General Gavin, in his capacity as chief of army research and development, reportedly said before he retired that 'if not immediately, then within a few years after publications, most of the ORO's recommendations are adopted by the army'.[218] The army, however, adopted more than just the ORO's recommendations. At every turn, Johnson pushed this boundary, while trying to not lose sight of the obligation and practical necessity to remain responsive to the executive. 'At times,' he maintained, 'operations research, like a part of a good and creative brain, will come up with an answer to a question that has never been asked but that has become self-evident because of the continuous correlation of data.'[219] This insight was one that the institutional army gradually assimilated though the ORO, even if the rotational cadre of staff officers did not remain in place long enough to observe the phenomenon.

Other issues had less to do with the army than the evolution of Johnson's thinking. In 1960, writing to the president of Johns Hopkins, Johnson said that an anticipated cut in overall army research funding for 1961 might reduce the ORO's funding by almost twenty percent. To make up this shortfall and keep the ORO as a 'pioneering organization,' he proposed a new research organization, in collaboration with Howard University, to focus on African development. Operations research in the military was now well served. Johnson suggested that within three years, the ORO's work on military problems would no longer be of a 'pioneering nature'.[220] While the development never materialized, the letter is indicative that Johnson had, to some degree, moved on.

Organizationally, the situation within the army in terms of operations research had changed dramatically in thirteen years. By the early 1960s, eleven army agencies and commands had operations research activities.[221] The creation of a combat development system also shifted the nature of the research questions. Pioneering studies were still were useful, but the flood of new warfighting concepts created a

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[218] W.L Whitson, 'The Growth of the Operations Research Office in the U.S. Army', *Operations Research*, 8 (1960), 809-824 (p. 815).

[219] Ellis A. Johnson, 'The Application of Operations Research to Industry: A Speech Delivered at the Fifth Annual Industrial Engineering Institute, 31 Janurary 1953' (Chevy Chase: Operations Research Office, 1953), p. 8.

[220] Letter from Ellis A. Johnson to Dr. Milton S. Eisenhower Pres JHU, 'Application of Operations Research to the Development of Large Areas,' (n.d.); JHUA, Office of the President 47.2/RG2/Box34 (ICR-ORO Jan-Dec 1960).

[221] Shrader, 'History of Operations Research in the United States Army', p. 121.

serious need for reliable data and analyses. One long time ORO analyst, noted that the rate of theory development was out of balance with the rate at which new factual information was generated by 'the means [by] which the theories may be tested'.[222] A decade earlier, the army had a deficit of new concepts and no scientific method for assessing the few proposed. By 1960, a lack of concepts and methods was no longer the issue. The new problem, highlighted by the spectacular failure of the Pentomic concept, was the army's inability to reconcile what was possible against what was required or even prudent. As one historian noted, 'the technology lagged behind the doctrine, [while] strategic concepts raced ahead of tactical realities'.[223]

Johnson's 'irascible personality' also helped to accelerate the ORO's final demise. Specific personality traits aside, the natural turnover of army officers and the continuity of Johnson's position likely increased his frustration toward his sponsor and the requirement to continuously refight the battle of 1949. This frustration, combined with the tension between 'pioneering research' and tactical solutions, came to a head in 1961. A group of army officials, perhaps believing the issue was primarily personality based, approached Dr. Milton S. Eisenhower, president of Johns Hopkins, about replacing Johnson. The request, regardless of its merits, placed the university in a difficult position. The ORO staff was the responsibility of the university and the independence of the underlying relationship was now in question. As one member of the ORO staff later wrote, 'if the army wanted more control over the management and direction of an institution providing operations analysis support […] it would have to do so without the Johns Hopkins'.[224]

The story of the rise and fall of the ORO traces a major thread in the army's institutional innovation after the Second World War. The army was the last of the services to adopt operations research. Lack of enthusiasm for a field that emerged from and had its greatest wartime successes in highly technical areas was not surprising given the army's continuing focus on mobilizing and training an infantry-

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[222] Whitson, 'The Growth of the Operations Research Office', (p. 823).

[223] Major Robert A. Doughty, *The Evolution of US Army Tactical Doctrine, 1946-76* (Fort Leavenworth: Combat Studies Institute, 1979).

[224] In 1961 the army contracted with a private firm, the Research Analysis Corporation (RAC), to continue with some ongoing ORO projects. Visco, 'The Operations Research Office', (p. 32); Eugene P. Visco, Carl M. Harris, 'Operations Research Office and Research Analysis Corporation', in *Encyclopedia of Operations Research and Managment Science*, ed. by Saul I. Gass, Carl M. Harris (Boston: Kluwer Academic Publishers, 2001), pp. 595-599.

centric force. The army's initial interest in operations research first arose not out of a desire to see what it could provide on the battlefield, but instead what it could contribute in the competition for resources. The relationship between civilian scientists and the army officers with whom they worked was always a complex one. Nevertheless, the ability of the ORO, or more specifically the field of operations research, to help the army address an ever-expanding list of missions ranging from atomic weapons to psychological warfare earned it, sometime begrudgingly, a place at the table.

Operations research never developed an iconic uniformed champion. Its most visible supporter was Gavin, but his interests, while inclusive of operations research, were always much broader. However, the nature of the field, going back to Blackett's 1941 description, meant that, to be successful, operations research has to serve a specific decision maker looking to solve a specific problem. As the number and complexity of the problems exploded after the Second World War so did the number of officers open to their assistance. As historian Alex Roland described it: 'instead of assuming that the old weapon will serve, officers now assume that the old weapon is obsolete, or at least obsolescent.'[225] The demand for operations research grew across the breadth of the army, even as Johnson and his organization were becoming increasingly isolated at the top. Operations research was, in terms of peacetime innovations, primarily an intellectual one. Officers making fundamental decisions on the form and functions of the future army were now in a position to consider three sources of professional knowledge: history, personal experience, and the results of operations research.

[225] Alex Roland, 'Technology, Ground Warfare, and Strategy: The Paradox of American Experience', Journal of Military History, Vol. 55, No. 4 (October 1991), p. 466.

Chapter Two - The Birth of Combat Developments

This chapter examines of the institutional processes through which the U.S. Army sought to determine requirements for future wars. Known as 'combat developments', this process represented a deliberate approach to the research, development, testing, and integration of new doctrine, organization, and materiel solutions.[1] The previous chapter described how the army adopted a scientific process, operations research, as an integral part of both its approach to problem solving and thinking about future war. This chapter describes combat developments as a set of activities that occur across the institutional army, for the purpose of determining the full-range of requirements for a future war. This chapter is divided into four parts. First, it defines combat developments. Second, it provides a brief overview of the era before the Second World War, when the institutional approach to developing capabilities for the future rarely extended beyond mobilization and manpower issues. The third section describes how the tension between the organizational traditionalists and new combined arms functionalists delayed the emergence of combat developments as an institutional process during the early Cold War. The last section describes the eventual triumph of the functionalists and how this resulted in a coherent institutional process designed prepare the army for future conflicts.

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[1] The term combat developments and combat development are used interchangeably throughout the literature.

Combat Developments and the Army

Modern armies are complex systems of men, ideas, and materials designed to operate as a single entity toward a designated purpose.[2] The nature of land warfare, unlike air or naval war, makes developing and testing new systems difficult. New technology or doctrinal based changes in air warfare, for example, can be developed, tested, and demonstrated by relatively small organizations in general isolation from the whole. This is in sharp contrast with an equivalent change in land warfare. The introduction of a new weapons system, doctrine, or organization, for example, has significant ripple effects across all the of semi-autonomous parts of the ground-force. Combat developments is a term that captures the institutional process of moving from an idea to a concept, to an evaluating and testing scheme, and finally to the publication of a requirements document which aims to introduce a change or new capability.[3] The input to the process is an idea or concept, perhaps the result of an operations research study. The output of the combat developments process is essentially a plan detailing to the various entities that comprise the institutional army what should be changed, created, or purchased and, in many cases, how the change should be integrated into the existing force.

Combat developments, as a generic description of how one introduces a new military capability, have always existed. Some degree of planning and coordination was always required to add new capabilities to the army from its earliest days. The problem, until the early Cold War, was that the army lacked a defined institutional process to develop capabilities holistically. For most of the army's history, a combat arm, the ordnance corps, an instructor at a military college, a senior field commander, or a member of the War Department staff could weigh in on the loosely defined

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[2] A system in this case is defined as 'a group of interacting, interrelated, or interdependent elements forming a complex whole.'

[3] A capability is a description of what an army must be able to do. For example, an army may be required to deploy strategically, conduct sustained combat operations in an urban environment, or conduct airborne operations. The elements of a capability vary but are generally described as combinations of means and ways across the doctrine, organization, training, materiel, leadership and education, personnel, and facilities. See *Joint Capabilities Integrations and Development System (CJCSI 3170.01g)* (Washington DC: The Joint Staff, 2009).

processes of combat developments in a positive or negative way depending on a constantly shifting set of variables. The right combination of military genius, opportunity, and timing often spelled the difference between a new capability to conduct operational manoeuvre and a mobile infantry support gun. Clausewitz's description of the nature of war — as the 'interplay of possibilities, probabilities, good luck and bad' — is also an apt description of the army's peacetime development process. But success in war, like cards, is not solely a matter of chance. A deliberate program of study, practice, and determination in the approach to peacetime innovation can improve, but never guarantee, the odds on yet undetermined field of battle.[4] In 1946, Major General Otto Nelson Jr., articulated the requirement for such a new process:

> Just as there must be machinery to enable top leadership and management to be effectual through the budgetary process, so too must there be the organizational means to facilitate the performances of the most difficult and the most important responsibility of military leadership to discover, develop, adopt, and exploit new and improved weapons, equipment, tactics, and techniques, and to discard the obsolete.

As one of the mechanics of General George C. Marshall's wartime transformation of the war department and general staff, Nelson was clear-eyed about the challenge of forcing an organizational form to follow a new function. He warned that despite the obvious need, 'there are powerful forces of an institutional character that tend to stifle the development of initiative in the armed forces'.[5] The internal institutional challenge was clear: convince a conservative and triumphant army that the process, which created the army of 1945, was inadequate to the challenge of preparing for next war. In its simplest form, the combat developments process needed to answer three questions: how should the army be organized, how should it be equipped, and how should it fight?[6] Answering these questions, as Nelson noted above, required a new

[4] Carl Von Clausewitz, *On War*. trans. by Michael Howard and Peter Paret, ed. by Michael Howard and Perter Paret (New York: Alfred A. Knof, 1993), p. 97. (Book One, Chapter 1, 21)

[5] Otto L. Nelson Jr., *National Security and the General Staff* (Washington DC: Infantry Journal Press, 1946), pp. 599-600. Nelson was a highly regarded expert on the subject of military staffs. His 1946 book was based on his 1940 Harvard PhD dissertation. Nelson also served on the 1942 War Department Reorganization Committee.

[6] These three questions were the essential elements of the eventual Combat Development Command's mission statement as articulated by its first commander. Lieutenant General John P. Daley, 'Address to

institutional approach. The story of the creation of combat developments between 1945-1960 is the story of an institutional innovation.

Antecedents – Combat Developments before the Second World War

Many elements of the process that would come to be called combat developments existed before the Second World War; after all new weapons, associated doctrines, and necessary organizations were in some form continuously under development by and for the army throughout its 170-year history. However, new capability development prior to Second World War was rarely future oriented and almost always the result of highly idiosyncratic processes. As one official historian described changing the army on the eve of Second World War 'the entire process of conception, development, standardization, and eventual procurement [...] escape precise definition in terms of organizational and jurisdictional boundaries'.[7]

The lack of a coherent institutional approach to the challenge of preparing capabilities for future war was, like most characteristics of large organizations, the result of many factors. Complex influences of American history including the nation's political culture, strategic geography, economic resources, and the particular character of its previous wars all converged to shape how the army prepared for future war. These factors also shaped the particular institutional characteristics of the army. For example, for most of the army's history before the early 1940s, a purposefully weak command and general staff system contended with a powerful and semi-autonomous combat arms and bureaus system. The structural competition between the users and producers of military capabilities made coalescing around a single institutional view of the future all but impossible. In many ways the story of how the army created a combat developments capacity is the story of the on-again-off-again civil war between the army's institutional 'tribes'.[8]

Army Policy Council, Status Report on U.S. Army Combat Development Command, 20 March 1963' (Washington DC: Combat Developments Command, 1963). (MHI UA 23.3 D34 1963).

[7] R. Elberton Smith, *The Army and Economic Mobilization*, The United States Army in World War II (Washington DC: Center of Military History, 1959), p. 50..

[8] Although the specific composition of each category did change over time, in 1939 the chiefs of the combat arms consisted of the Infantry, Cavalry, Field Artillery, Coast Artillery, and the Air Corps. The technical services were; the Quartermaster Corps, the Ordnance Department, the Medical Department,

It would not be surprising that such a system would create internal incentives whereby the various parts of the institutional army operated in an atmosphere of 'isolation, competition, and dissention'.[9] In fact, any cooperation in such an institutional environment was, as Elting E. Morison acerbically described it, the result of a 'genial conspiracy among the responsible officers' and nothing more.[10]

In part or in whole, deliberately or by default, some degree of preparation in terms of doctrine, organization, training, materiel, leadership and education, personnel, and facilities is required before battle. Unless the forces involved are leaderless mobs, doctrine or some agreed upon concept must be developed and promulgated; technologies primarily in the form of weapons and their supporting systems must be created; and the force must be deployed with some organizational structure to facilitate the actual fight and maintain control. From its earliest days, the army was no different.

The reason such an inefficient system remained in place for so long was part political but an equal measure was given the country's natural strategic defences and reticence to fund a large standing army, there was little to develop. Occasional bursts of innovation and adaption during the wars of the late eighteenth and throughout the nineteenth centuries were the exception and not the rule. Soldiers in the War of 1812 saw little if any appreciable difference in the quality of arms, or the provisioning of same, from that which their fathers experienced in the revolution.[11] Soldiers marching into Mexico City in 1847 were only just beginning to benefit from new infantry weapons. A majority still carried flintlock's little changed for generations. As a history of the American rifle described the situation, 'between the 1790s and the 1840s the

the Inspector General Division, the Chemical Warfare Service, the Corps of Engineers, and the Signal Corps. Finally, the administrative bureaus were the Judge Advocate General, The Adjutant General, the Provost Marshal General, the Chief of Special Services, the Chief of Chaplains, and the Chief of Finance.

[9] Marc K. Blackburn, *The United States Army and the Motor Truck: A Case Study in Standardization* (Santa Barbara: Greenwood Publishing Group, Inc., 1996), p. 2. See also Ronald Spector, 'The Military Effectiveness of the United States Armed Forces, 1919-1936', in *Military Effectiveness in the Interwar Years*, ed. by Allan R. Millett and Williamson Murray, 2 (Boston: Allen and Unwin, 1988) (pp. 70-97).

[10] James E. Hewes Jr., *From Root to McNamara: Army Organization and Administration, 1900-1963*, Special Studies (Washington DC: Center of Military History, United States Army, 1975), p. 63; Elting E. Morison, *Turmoil and Tradition: A Study of the Life and Times of Henry L. Stimson* (New York: Houghton Mifflin Company, 1960), p. 414.

[11] See Merritt Roe Smith, 'Army Ordnance and the "American System" of Manufacturing, 1815-1861', in *Military Enterprise and Technological Change: Perspectives on the American Experience*, ed. by Merrit Roe Smith (Boston: The Massachusetts Institute of Technology, 1985), pp. 39-86 (pp. 49-50).

general emphasis in the weapons develop had been not on making firearms more lethal but on making factories more efficient at producing them'.[12] A comparable situation existed with doctrine. Manuals for drill and ceremony were more common than any describing common battlefield tactics in the years prior to the Civil War. The first tentative step towards a concept of army-wide doctrine would not emerge until after America's bloodiest war.[13] The crushing demands of the Civil War stimulated or drove the development of new capabilities but did little to change the institution's approach to the problem of future war.

The army was born as a twin. It consisted of two halves of a single institution that for much of its existence operated not so much as close siblings, but as rivals for the attention of fickle parents. The never-ending argument was simple. The combat arms sought a process where more men and new materiel were available on demand while the technical services, primarily the procurement departments of quartermaster and ordnance, sought to sustain the army in the most efficient way over time. The tension between the twins was purposeful since it provided Congress a source of control over the commander-in-chief (the president). The depth of the cultural divide between the users and suppliers of arms is indicated in a 1861 letter to the secretary of war from Brigadier General James Wolfe Ripley, a forty-seven year veteran of the army and at the time, the Union's chief of ordnance.

> A great evil now specially prevalent in regard to arms for the military service is the vast variety of new inventions [...that] has already introduced into the service many kinds and calibers of arms, some in my opinion, unfit for use as military weapons, and none as good as the U.S. musket, producing confusion in the manufacture, the issue and the use of ammunition, and very injurious to the efficiency of troops. This evil can only be stopped by positively refusing to answer any requisitions for, or propositions to sell new and untried arms, and steadily adhering to the rule of uniformity of all arms for all troops of the same kind, such as cavalry, artillery, and infantry.[14]

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[12] Alexander Rose, *American Rifle: A Biography* (New York: Delacorte Press, 2008), p. 109. Bruce Winders, *Mr. Polk's Army: The American Military Experience in the Mexican War* (Austin: Texas A&M Press, 2001), pp. 88-112. The Army in Mexico did benefit from recent period in artillery renewal, which introduced several new weapons including a series of howitzers and mortars.

[13] The first example of what would be considered doctrine in a twentieth century sense was the 1863 General Orders No. 100, *Instructions for the Government of Armies of the United States in the Field.* The U.S. Army's first combined arms doctrine, *Field Service Regulations,* was not published until 1905.

[14] J. W. Ripley, Ordnance Office to Secretary of War, sub: Notes on subject of contracting for small arms, June 11, 1861. *The War of the Rebellion: A Compilation of the Official Records of the Union and*

The 'evil' Ripley described was the flood of new weapons, some based on requirements and some unsolicited. Ripley's concerns were reasonable from a logistical efficiency perspective but in pursuing 'uniformity of all arms for all troops', he was evidently unconcerned with user requirements.

A similar pattern developed around the development of doctrine after the war. Doctrinal debates began to mature in the late 1800s with the emergence within the army of a group of reformers determined to learn from the lessons of Civil War and the battlefields of the new European war.[15] Serious study of higher-level tactics, military theory, and eventually service level doctrine saw their beginnings in 1882 at the Infantry and Cavalry School, the predecessor to the CGSC. However promising these early combined arms musings, the army still lacked a process to move new ideas and materiel throughout the institution. The army struggled for more than twenty years to develop and issue a new rifle or determine how to mobilize and deploy an expeditionary force. Most of the lessons of the 1898 Spanish-American War revolved around organizational and staff failures as well as a lack of a coherent system to articulate requirements for future war. A major factor behind the so-called Root Reforms of 1903 and the development of a general staff was the lack of a process to match the needs of the combat arms.[16]

Despite reforms, in the years before the First World War the technical services either controlled or institutionally dominated the question of which capabilities the

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Confederate Armies, ed. by Fred C. Ainsworth, Joseph W. Kirkley, 1 (Washington DC: Government Printing Office, 1899), pp. 264-265. David A. Armstrong, *Bullets and Bureaucrats: The Machine Gun and the United States Army 1861-1916* (Westport: Greenwood Press, 1982), p. 13. Ripley was upholding the position of the first chief of ordnance, Colonel Decius Wadsworth who in 1812 made 'Uniformity, Simplicity, and Solidarity' the motto of the new department. Smith, 'Military Enterprise and Technological Change' (p. 49).

[15] Members of this group include: Emory Upton, Arthur L. Wagner, William T. Sherman, and Wesley Merritt. See T. R. Brereton, *Educating the U.S. Army: Arthur L. Wagner and Reform, 1875-1905* (Lincoln: University of Nebraska Press, 2000); Brian McAllister Linn, *The Echo of Battle - the Army's Way of War* (Cambridge: Harvard University Press, 2007), pp. 40-67. Samuel P. Huntington, *The Soldier and the State: The Theory and Politics of Civil Military Relations* (New York: Vintage Books, 1957), pp. pp. 222-269.

[16] In arguing for the creation of a general staff, Secretary of War Elihu Root told a congressional committee 'our organization is weak at the top [...] because the system is defective, because there is a distribution of powers and no coordination of the exercise of powers provided for in the system'. Testimony before the Committee on Military Affairs, 13 December 1902 published in Elihu Root, *Establishment of a General Staff Corps: Statements by the Secretary of War* (Washington DC: Government Printing Office, 1902), p. 11.

army should develop. The army considered weapons, and by default weapons development, to be a logistical or procurement issue. Thus, the driving logic of combat developments was less fulfilling a requirement for a potential war, but maximizing peacetime economy and stockpiling for mobilization. Moreover, individual requirements tended to follow a narrow path from the using community to the procurement community and back. Rarely, if ever, were weapons judged against alternative solutions emanating from different combat arms or viewed in the context of emerging concepts of employment.

The army generally developed requirements within a using combat arm. By law most design and development activities were conducted within existing government owned or operated armouries. With no single vision, each arm or bureau was free to make a claim against the limited resources afforded to the army in peacetime. Combat development activities were isolated affairs rarely brought together with a purpose to validate the whole. Once a prototype of a new weapon was developed, an ad hoc board of officers established by the using arm evaluated it. If the weapon passed its user evaluation, even those based on often-arbitrary technical requirements, it was refered back to the technical service for procurement or manufacture. Often the boards, either by manipulation of membership, circumscribing their mandates, or ignoring their findings, became venues for inter-arm bureaucratic competition.[17]

Between the World Wars

The general pattern of 'combat developments' began to change in the aftermath of the First World War. One of the most significant lessons of the war and the one that received the lion's share of attention was the inability to mobilize and synchronize both the military and the civilian economy for war. Temporary organizations were created to bring coherence to the chaos of mobilization. These organizations worked because of strong and well-connected personalities, but the war

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[17] An ordnance officer wrote in 1896 that 'owing to want of harmony of views' boards made up of mixed officers were much less effective that those composed of purely ordnance officers. Major C. E. Dutton, 'The Ordnance Department,' in *The Army of the United States: Historical Sketches of Staff and Line with Portraits of Generals-in-Chief,* ed. by Theohilus Rodenbough, F., Willian L. Haskin (New York: Maynard, Merrill, & Co., 1896), p. 129.

ended before the inherent strengths or weaknesses of these adaptations could outweigh the inertia of pre-war institutions. Other factors were indirect and resulted from changes to the institutional structure of the war department or temporary innovations such as the organized integration of the scientific community into the war effort. As it did with many things, the First World War did not represent a turning point, but provided a glimpse of the future of 'combat developments.'

Some development activities, such as the National Advisory Committee for Aeronautics (NACA) continued after the war but most did not. However, the potential for change did imbue several officers with an idea of the potential for deliberate institutional activities dedicated to development. As one commentator noted, there were two kinds of officers at the end of the First World War, the technological optimists, officers like Brigadier General Billy Mitchell, and sceptics, like General John J. Pershing.[18] Mitchell, the iconic American advocate for air power, argued in 1921 that 'the first battles of any future war will be air battles...the nation winning them is practically certain to win the whole war'.[19] One of the reasons Mitchell and his followers were so threatening to the traditional arms was the disruptive implication of their proposals. Pershing, despite his support for new technologies during his command of the American Expeditionary Force (AEF) was a technological pessimist. Only a few years before he had employed horse cavalry in the punitive expedition into Mexico. In 1919, in response to the more zealous voices promoting aviation, Pershing argued:

> [I]n preparing for war aviation is not an independent arm and cannot
> be for a long time to come, if ever. War has not changed in thousands
> of years in that regard. The man who carries the spear or the rifle or the
> bayonet [...] it is the man that we are trying to support [...] in order to
> win the victory.[20]

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[18] David E. Johnson, *Fast Tanks and Heavy Bombers: Innovation in the U.S. Army 1917-1945*, Paperback (Ithaca: Cornell University Press, 1998), p. 58.

[19] William Mitchell, *Our Air Force: The Keystone of National Defense* (New York: E.P. Dutton and Company, 1921), p. xix. Mitchell's argument was well received in some circles for strategic reasons because it fell within the preferred isolationist camp that wanted to emphasize naval power and the protective value of oceans. Ironically, the Navy was his preferred target in demonstrating the advantages of air power.

[20] Sixty-Sixth Congress (First Session), 'Army Reorganization (H.R. 8287, 8086, 7925, 8870) Hearing before the U.S. Congressional Committee on Military Affairs ', 29 (Washington DC: U.S. Congress, 1919), p. 1550. The Mexican Expedition, which was built around a force of 5,000 horse-mounted cavalry, did include eight Curtis JN2s airplanes of the 1st Aero Squadron (most would crash early in the operation) and was also supported by a small contingent of motor transport.

In the end the sceptical view dominated the army for historical, cultural, economic, and bureaucratic reasons. The 1920s saw the combat arms retreat into their traditional domains where they sought only to expand their capabilities along narrow paths. The technical services re-established a state of near complete independence after their temporary subservience to the temporary agencies of mobilization and the Services of Supply in the AEF. However, beneath the surface and with none of the notoriety that would accrue to public mavericks or prominent conservatives, there was a subtle shift in how the army should develop capabilities for the next war.

One of the most important post-war boards among those established to study the lessons of the Great War was the so-called Westervelt Board. Established in 1918 to make recommendations on the future of field artillery, the board made the sweeping declaration that American armaments were unsatisfactory and required near complete replacement. Moreover, the board noted that the army in the field had reached the limits of animal power and nothing short of complete motorization should be considered for the future. As the board's namesake later recalled, the recommendation elicited an 'amazed look upon the faces of many hardened veterans in high places to whom the Board first revealed its dream of complete motorization'.[21] Motorization of the entire force would demand the development of new concepts (technology matched to doctrine and organization) and would stretch across all combat arm and services. As the official history of ordnance in the Second World War noted:

> The post-war innovation whereby not the Ordnance Department but
> the using arms stated their needs and specified the military
> characteristics new equipment [...] users and Ordnance Department
> alike were strongly influenced by Westervelt Board recommendations.
> Indeed in 1939 and 1940 officers still cited the board as the
> incontrovertible authority on armament.[22]

The idea that users, not logisticians or procurers, were the best judges of weapon system requirements was a major milestone toward a coherent combat developments approach. But as of yet responsibility and authority to develop new

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[21] William I. Westervelt, 'A Challenge to American Engineers', *Army Ordnance*, 1 (1920), 59-64 (p. 60). Cited in Contance McLaughlin Green, Harry C. Thomson, Peter C. Roots, *The Ordnance Department: Planning Munitions for War* United States Army in World War II, the Technical Services (Washington DC: Office of the Chief of Military History, 1955), p. 172.

[22] Green, *Planning Munitions for War*, p. 172.

capabilities remained diffuse. The chiefs of both the combat arms and the technical services remained responsible for determining the military characteristics within their specified domains. As an official army history noted of the development of tanks during the interwar period, 'the circle was endless: doctrine depended on tactical use intended; tactical use depended on what tanks were capable of; what tanks were capable of depended on developing models for predetermined use.'[23] What was lacking was an institutional place for concepts and experimentation to stimulate both the user and developer communities in such a way that parts did not detract from the whole or become just another venue for bureaucratic competition. A 1929 *Infantry Journal* article summed up both the frustrations and expectations of young officers in the interwar period:

> Our Army is lacking a suitable agency for general research, experimentation, and development. We have branch boards (Infantry Board, Tank Board, Air Corps Board, Field Artillery Board, and so on), each of which can make studies, within limits. But these minor agencies are severely limited as to what they may do, and they have, individually, scant resources with which to operate. And most of all, they are isolated from one another [...] Criticism that attributes our slow progress to ultra-conservatism is unjust. The fault lies not there but in the lack of a suitable agency.[24]

Institutional conservatism was the dominant cultural characteristic of the army on the eve of the Second World War. Small, dispersed, underfunded, and socially insulated, the army suffered what Major General John S. Wood called 'the apathy that follows periods of high endeavour.'[25] By the early 1930s, with the notable exception of an increasingly independent air arm, a significant percentage of the army's First World War ground equipment and concepts were out-dated and worn-out. The army was is in a readiness 'death spiral'. One commentator described the problem succinctly; 'without money, the army could not afford the personnel and material required to conduct meaningful training [...] the inability to train deprived the army

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[23] Green, *Planning Munitions for War*, p. 192.

[24] Ralph E. Jones, 'The Weak Spot in the Military Progress,' *Infantry Journal*, 34 (March 1929), p. 290. Cited in Johnson, *Fast Tanks and Heavey Bombers*, p. 58.

[25] Quoted in Johnson, *Fast Tanks and Heavey Bombers*, p. 220.

of opportunities to test new ideas [...] stagnation of doctrine accompanied the resulting deterioration of readiness.' [26]

The onset of the Great Depression meant the continuation of the army's anaemic funding. The institutions' conservative nature all but guaranteed the army would pull back from innovation and strive to preserve its core capabilities. Army Chief of Staff, General Douglas MacArthur, reported in 1933 that continued use of 'obsolete and inefficient equipment' and the suspension of 'technical research and development work' was the preferred lesser of two evils, when the alternative was 'the deterioration either in strength or efficiency of the human organization maintained as the backbone of our land defence establishment'.[27]

One historian has described the army at this time as an institution being pulled in two directions. On the one hand it was 'psychologically as well as organizationally [...] an extension of the Indian-fighting constabulary', where maintaining the small but highly professional cadre of regular army soldiers was the key to preparing for future war. The development of new capabilities, such as broad-based mechanization, threatened the concept of an infantry-centric force.[28] The official lessons of the army's recent combat experience provided the foundation of this approach with dogmatic statements like 'the infantry of the army must be recognized as the basic arm and all other arms must be organized and made subordinate to its needs, functions and methods.'[29] Challenges to this primary culture inhibited the development of an army wide process of preparing for future war and had the effect of suppressing new capabilities even as their military potential became increasing self-evident. Army leaders 'limited their efforts to improving past performance rather than learning from

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[26] William O. Odom, *After the Trenches: The Transformation of U.S. Army Doctrine, 1918-1939* (College Station: Texas A&M University Press, 2008), p. 200.

[27] Douglas MacArthur, 'Annual Report of the Chief of Staff, US Army FY Ending June 30, 1933', Annual Report of the Secretary of War to the President, 1933 (Washington DC: War Department, 1933), p. 19.

[28] David E. Johnson, 'From Frontier Constabulary to Modern Army: The United States Army between World Wars', in *Challenge of Change: Military Institutions and New Realities*, ed. by Harold R. Winton and David R. Mets (Lincoln: University of Nebraska Press, 2000), pp. 162-219.

[29] American Expeditionary Forces, 'Report of Superior Board on Organization and Tactics' (Chaumont: United States Army, 1919), p. 18. It would be difficult to argue against this official line at the time given the generally accepted official view that operations in the First World War had validated the Army's approach. See Russell F. Weigley, *History of the United States Army* (New York: Macmillan Publishing Co., Inc., 1967), pp. 394-400.

and building on present achievements, applying new technology, and developing new doctrine'.[30]

The army on the eve of the Second World War 'believed that victory in a major war must be achieved through the application of superior, overwhelming power'.[31] The process through which it generated the necessary power was detailed mobilization planning. However, until 1938, the army's plans were written with 'an air of unreality because their recommendations were presented not with any hope of obtaining immediate results, but so that those responsible would understand the situation'.[32] Mobilization plans in 1928 and 1933 rested on the assumption that 'equipment for those 1,000,000 [newly mobilized] men was no severe problem since it [was] already stored in army depots (First World War surplus) or be made readily available from commercial sources'.[33] For those officers during the period concerned with mobilization planning, new capabilities represented a different kind of threat. The late development of disruptive new capabilities introduced risk to the execution of complex procurement, production, and mobilization plans.

Finally, reinforcing the army's cultural proclivities was the politics of isolation and the economic impact of the Great Depression. These factors combined to make army budgets a low priority for administration and the public alike. Funding for research and development was a particular challenge. In 1932, the War Department published a six-year program to align equipment and organizational requirements of the soon to be revised 1933 mobilization plan. This forward-looking plan included a prioritized list for research and development with the highest priorities given to motorization, mechanization, and aircraft. Even as it was drafting the plan, the army saw its funding drop from $346,979,179 in 1931 to $277,066,381 in 1934.[34] As with

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[30] See George F. Hoffman, 'Army Doctrine and the Christie Tank: Failing to Exploit the Operational Level of War', in *Camp Colt to Desert Storm: The History of U.S. Armored Forces*, ed. by George F. Hoffman and Donn A. Starry (Lexington: The University Press of Kentucky, 1999), pp. 92-143 (p. 131).

[31] Russell F. Weigley, 'The Interwar Army', in *Against All Enemies: Interpretations of American Military History from Colonial Times to the Present*, ed. by Kenneth J. Hagan and William R. Roberts (New York: Greenwood Press, 1986), pp. 257-277 (pp. 270-271).

[32] Joseph C. Bernardo, Eugene H. Bacon, *American Military Policy - Its Development since 1775*, 2nd (Harrisburg: Stackpole Company, 1961), p. 403.

[33] Marvin A. Kreidberg, Merton G, Henry, *History of Military Mobilization in the United States Army 1775-1945*, DA Pamphlet No. 20-212 (Washington DC: Department of the Army, 1955), p. 446.

[34] Cited in Johnson, 'From Frontier Constabulary to Modern Army' (p. 178).

the mobilization plans it was to support, the six-year program did not survive. The army was struggling to find what it called the 'proper balance' between men and materiel. The budget debates of the mid-1930s treated personnel and materiel as 'opposing conceptions of warfare' where personnel won out over arguments for increased mechanization.[35]

In October 1936 an increasingly unstable international situation caused the army's new Chief of Staff, General Malin Craig, to yet again change the institution's research and development priorities. Funding a broad, but shallow, set of activities was consuming too much of the army's meagre resources. With the exception of aviation, Craig was willing to accept that the army would not have the most up-to-date capabilities. His real concern was that 'the Army would never get equipped'. In anticipation of possible mobilization, something not spoken of publically, the priority was to 'get the army equipped with the best materiel currently available'.[36] The result was that by 1937 development of new combat capabilities for land power came in a distant second to development of purely defensive or aviation-related capabilities.[37]

One creative exception to the general rule of limited research and development was the use of so-called educational orders with civilian industry. Leveraging an initial sum of $2,000,000 in 1939, these small contracts allowed the existing arsenal system to 'prime the pump' of civilian industry by having it manufacture to specification a testable quantity of new materiel without commitment to production. Between 1929 and 1941, almost $35,000,000 was available for educational orders.[38] Such small-scale efforts allowed the creation of the necessary manufacturing materials, technical design staffs, and relations necessary for full-scale mobilization and kept a spark of creativity alive in the combat arms boards.

In summer 1939, the Army Chief of Staff, General George C. Marshall reported to the secretary of war that the army was 'that of a third-rate power.' He

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[35] Elias Huzar, *The Purse and the Sword: Control of the Army by Congress through Military Appropriations, 1933-1950* (Ithaca: Cornell University Press, 1950), pp. 139-140. One congressman complained that MacArthur was trying to 'Chinaize our army by giving it more men, more men, and less equipment.'

[36] Memorandum, ACofS, G-4, for CoS, 30 Oct 36, sub: Research and Development for FY 1939, G-4/29552. DRB TAG. Cited in Kreidberg, *History of Military Mobilization*, p. 455.

[37] Mark Skinner Watson, *Chief of Staff: Prewar Plans and Preparations*, United States Army in World War II, the War Department (Washington DC: Center of Military History, 1950), p. 43. See also Green, *Planning Munitions for War*, pp. 204-208.

[38] Kreidberg, *History of Military Mobilization*, p. 531.

complained that as a result of almost 'continuous paring of appropriations' over the past twenty years, the army's equipment was still 'in a large measure obsolescent'.[39] As global events pushed the United States toward partial and then full mobilization, the chronic underinvestment in development meant high-rate production went to capabilities with existing (and therefore outdated) designs.

The organization and doctrinal aspects of a military capability were equally in deficit by 1939, but had greater time to recover. The use of large-scale field manoeuvres on the eve of America's entry into the war was a critical and successful aspect of pre-war 'combat development' activity. Marshall declared that the manoeuvres 'constitute a field laboratory to accept or discard new methods'.[40] The Louisiana manoeuvres established a high fidelity 'experiential' venue, through which the institution could test new doctrines, organizations, and technologies. Under direction of then Major General Leslie J. McNair, the manoeuvres 'followed the theory that the normal functioning of a military machine with all of its attendant problems could best be achieved by having all of its parts operating simultaneously in a representative environment.'[41]

The logic of mobilization planning placed an institutional focus on synchronizing requirements with production capacity. The advantages accrued by the quasi- mobilization and Lend-Lease, observations from the war in Europe, in addition to the buffer of secure borders allowed the army to make up some of the ground lost

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[39] George C. Marshall, 'Biennial Report of the Chief of Staff of the United States Army (July 1, 1939 to June 30, 1941) ', in *The War Reports of General of the Army George C. Marshall, General of the Army II.II. Arnold, and Fleet Admiral King* (Philadelphia: J.B. Lippincott Company, 1947), pp. 13-60 (p. 16). Chronic underfunding of the Army did not begin with the Great Depression but rather with the first budget following the enactment of the 1920 National Security Act. In terms of budget, the situation began to slowly recover between 1935-1939. However, with minor exceptions, the development options were still constrained by a dysfunctional development process. Odom, *After the Trenches*, pp. 98-117. See also Kreidberg, *History of Military Mobilization*, pp. 377-532; Weigley, *History of the United States Army*, pp. 395-420.

[40] Marshall Speech, 15 September 1941, Milwaukee, Wisconsin in *The Papers of General George Catlett Marshall, "We Cannot Delay" - July 1, 1939 - December 6, 1941*, ed. by Larry I. Bland, Sharon R. Ritenour, Clarence E. Wunderlin, Jr., II (Baltimore: The Johns Hopkins University Press, 1986), pp. 606-607.

[41] Jean R. Moenk, 'A History of Large-Scale Army Maneuvers in the United States, 1935-1964' (Fort Monroe: Historical Branch, Office of the Deputy Chief of Staff for Military Operations and Reserve Forces, U.S. Continental Army Command, 1969), p. 4.

in developing necessary capabilities.[42] After an initial surge of activity to build a force capable of sustained global commitment, new dynamics took hold. The institutional army shifted its focus from quantity to quality. As one historian noted, it was the quality as well as quantity of American arms that 'turned the tide of war but also reduced the loss of American lives'. The general lesson was that by 'substituting prodigality of materiel for prodigality of manpower the United States demonstrated that its oft-criticized "materialism" was an instrument for enhancing [...] effectiveness'.[43]

Combat Developments and Second World War

A journalist and military analyst of the time wrote of America's Army in 1940 that 'many of our present tactics stem from an age that is gone; the dead hand of tradition still lies heavily upon our military thought processes. We must renovate our thinking, for our final citadel is the citadel of the mind. It must be broad and spacious and strong, receptive of new ideas.'[44] As it would turn out, the citadel Baldwin referred to, while robust, was effectively breached during the Second World War. A new generation of senior officers benefited from or had a direct hand in the formulation of new concepts, doctrines, and weapons. They were receptive to the promise of new capabilities based on personal experience. More importantly, although not always to the benefit of the army, the country developed an elevated sense of the possible with regard to technology-centric military capabilities.[45]

The hardest challenge was not breaching the outer walls, which fell under the conditions of near immediate feedback and the existential requirement to adapt to the conditions of current war. The challenge was assailing the inner walls, the 'dead hand of tradition.' The problem wasn't just nostalgic officers, who dreaded the loss of the

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[42] For example the artillery in use in 1938 was almost completely replaced by new designs and fielded by 1943. Harry C. Thomson, Lida Mayo, *The Ordnance Department: Procurement and Supply*, United States Army in World War II (Washington DC: Center of Military History, 1960), pp. 68-74.

[43] Smith, *The Army and Economic Mobilization*, p. 706.

[44] Hanson Baldwin, 'The New American Army', *Foreign Affairs*, 19 (1940), 34-54 (p. 34).

[45] News stories, popular magazines, journals, and books flooded the market by the end of the Second World War extolling the fear and wonder of new weapons in the coming age of 'Push Button War.' See Hanson W. Baldwin, 'The Atom Bomb and Future War: There May Be Devestating 'Push-Button' Battles', *Life*, 20 August 1945, pp. 17-20.

horse cavalry and dug in their spurs against the tide of mechanization. The real
problem was the fact the institution had no rational process to, as Nelson argued,
'discover, develop, adopt, and exploit new and improved weapons, equipment, tactics,
and techniques, and to discard the obsolete'.[46] The challenge was not narrow-minded
troglodytes, but the nature of organizational relationships. Disparate tribes that tended
to inhibit innovation during peacetime never matured even under the pressure of war
because mobilization created highly centralized but temporary workarounds to
institutional dysfunction. The army's transition from 'parsimony to abundance'
occurred in May 1940 with the approval of more than $1,800,000,000 for acquisition
of equipment and personnel required under the protective mobilization plan.[47] The
reality, as it had been understood for a decade, was that to equip and train 1,000,000
men by 1 October 1941, the overwhelming emphasis had to be on existing
capabilities. With few exceptions, emerging ideas stood in line behind those that were
ready for production.[48]

One of the exceptions to the rule in terms of early combat developments was
the effort to give the army a modern anti-tank capability. The threat posed by German
armour was not a surprise, and the requirement for a counter was not new. In 1937, in
reaction to overseas developments, the chief of staff ordered the ordnance department
to 'concentrate intensively' on developing an antitank weapon that would place the
army on a 'substantially equal footing with a possible enemy.[49] Doctrine for a modern
anti-tank defence was first developed and then improved at the Command and
General Staff College between 1936 and 1939. The 1939 Field Service Regulations
included what one history called 'some sound fundamental principles'.[50] The problem
was that the army had failed to develop the antitank guns or the organizations to
employ them. There was a significant gap between the means and ways. Top-down
guidance for the army's anti-tank capability was passed in accordance with existing

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[46] Nelson Jr., *National Security and the General Staff*, pp. 599-600.

[47] Kreidberg, *History of Military Mobilization*, p. 654.

[48] Memorandum Colonel Burns, Executive Assistant to Secretary of War to Assistant Secretary of War, 13 Jun 1940, Subject: National Policy on Munitions Productive Capacity. Cited in Kreidberg, *History of Military Mobilization*, p. 658. Burns projected production requirements for January 1942 to support 2 million men and 4 million for 1943.

[49] Christopher R. Gabel, *Seek Strike and Destroy: U. S. Army Tank Destroyer Doctrine in World War II* (Fort Leavenworth Combat Studies Institute, 1985), pp. 3-18.

[50] Gabel, *Seek Strike and Destroy*, pp. 5-6.

regulations to the infantry arm as 'the most interested arm' with instructions to develop the detailed doctrine and provide technical requirements to the ordnance branch.[51] Accordingly, specifications for the anti-tank weapon were narrowly tailored to 'the maximum that four men could comfortably wheel over the ground' before anyone had examined serious alternative or concepts of employment.[52] Owing to the emphasis on quick mobilization, and despite scattered protests from within the ordnance and artillery communities, the army made the decision to rapidly procure some 2500 copies of the German PAK 36 (a 37-mm antitank cannon), a weapon that, in the opinion of one observer at the time, 'does not guarantee success in engaging tanks known to be used by any prospective enemy'.[53] As the case of the army's anti-tank capability demonstrates, the problem was not just one of hardware. The part of the 'capabilities development' process responsible to develop and promulgate combined arms doctrine was, as a 1939 Army War College (AWC) study put it, 'a rather hit or miss affair'. The development of all but the narrowest doctrinal topics generally split between the chiefs of the various combat arms, the instructors at the CGSC, and an increasingly overworked general staff. As a result, the instructors at the CGSC often developed instructional versions of 'current' doctrine, which they passed to students and which became the army's de facto doctrine. With 'meagre impetus from the top', efficacy of doctrine development was 'directly dependant upon the personality and judgment of the officers concerned and varies from year to year'.[54]

In 1941 this lack of a coherent combat development function within the army was painfully evident to Marshall. As the potential operational failings of the anti-tank weapons became clear, he sent a memorandum to his Assistant Chief of Staff, G-3 Brigadier General Harry L. Twaddle and noted, 'the organization, tactical doctrine, and development of such a force seems beyond the scope of any chief of arm and needs thorough coordination as well as strong direction.' Recognizing the complexities and entrenched interests, Marshall admonished the G-3 that this 'subject should be attacked with imagination and with untiring effort. I believe that it is a

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[51] Army regulations placed all research and development under the technical services and limited the using branches to developing requirements. *Army Regulation 850-25: Miscellaneous - Development, Classification of, and Specification for Types of Equipment* (Washington DC: War Department, 1924).

[52] Green, *Planning Munitions for War*, pp. 182-186.

[53] Gabel, *Seek Strike and Destroy*, pp. 3-18. Quote cited in Green, *Planning Munitions for War*, p. 186.

[54] Odom, *After the Trenches*, p. 227.

function of the general staff and should be initiated and carried through in your office. I do not want the question of another branch or arm brought up at this time.' Marshall then laid out an institutional solution to this challenge:

> There seems to be an element missing in the War Department General Staff, namely a group whose sole responsibility is thinking and planning on improved methods of warfare. Our organization and methods should not lag behind developments abroad. You should organize in your division a small planning and exploring branch, composed of visionary officers, with nothing else to do but think out improvements in methods of warfare, study developments abroad and tackle such unsolved problems as measures against armoured force action, night bombardment, march protection and the like. Such a group should be divorced of all current matters and should work closely with the National Defense Research Committee, Inventors' Council, G-2 and the development people in G-4.[55]

Part of the solution came in the activation of the GHQ in July 1940. The GHQ emerged out of the War Plans Division (WPD) in accordance with a concept dating back to the 1921 Hobard Board to provide the chief of staff with a deployable headquarters to command forces in the field. Under the leadership of General Leslie J. McNair, GHQ initially focused on training a rapidly expanding army. Within a month, McNair's responsibilities expanded to include;

> The preparation of plans and studies and the supervision of activities concerning actual operations [...] In conjunction with WPD, G-3, and G-4 on major items of equipment, and the organization or activation of combat or service units essential to prospective plans.[56]

This change established the GHQ as the army's overall combat developments activity. During the conduct of GHQ-directed manoeuvres in Louisiana and the Carolinas, McNair examined new capabilities in as high fidelity a setting as was possible at the time. McNair directed that the manoeuvres have 'all the realism of actual warfare except the destruction and casualties'.[57] Armed with knowledge of

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[55] Memorandum for the Assistant Chief of Staff, G-3, subj: Defense against Armored Forces, 14 May 1941. *The Papers of General George Catlett Marshall, "We Cannot Delay" - July 1, 1939 - December 6, 1941*, ed. by Bland, pp. 500-501.

[56] Memo, AcTG ACoS WPD for CofS, 12 Aug 40, sub: Allocation of Responsibilities between WPD and GHQ, WPD 3209-5. Cited in Ray S. Cline, *Washington Command Post: The Operations Division* United States Army in World War II, the War Department (Washington DC: Center of Military History, 1990), p. 61.

[57] Kent Roberts Greenfield, Robert R. Palmer, 'Origins of the Army Ground Forces, General Headquarters U.S. Army, 1940-1942, Study No. 1' (Washington DC: Historical Section, Army Ground Forces, 1946), p. 23.

current capabilities and a close relationship with the emerging requirements from war plans, the GHQ was in a position to introduce and protect innovative organizations. It established new activities to perform the 'combat development' function for a range of emerging capabilities such as the antiaircraft training centre, the provisional parachute group, the tank destroyer tactical and firing centre, and two amphibious forces with the Atlantic and Pacific Fleets.[58] While each new activity was unique all shared the same general attributes as the tank destroyer tactical and firing centre, in that they were:

> a new arm of the service, the War Department surmounted the lethargy and apathy that had existed in the present arms and had stunted progress in the antitank field for so long. Also by centralizing authorities for antitank matters, the War Department assured the systematic development of tank destroyer doctrine, equipment, and personnel.[59]

The establishment of the GHQ as a quasi-combat development activity did not solve the issues inherent in developing new capabilities. The diffuse nature of responsibility for moving capabilities to the field remained a concern throughout the war. In early 1942, Brigadier General Dwight D. Eisenhower penned a note to the war plans division logistics officer and requested an update on the latest in tanks and anti-tank guns. His memorandum closed with a line that defined the problem: 'I know that G-4 takes these matters up with ordnance as a matter of responsibility — my thought is that we're just *vitally interested — not responsible*'.[60] (Emphasis added). The phrase 'vitally interested not responsible' could be a moniker for the development of capabilities well into the future. On 9 March 1942 the War Department and general staff reorganized to delineate between the planning and supervision function of the latter and 'operative' functions necessary to generate and sustain theatre commanders:

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[58] Kent Roberts Greenfield, Robert R. Palmer, Bell I. Wiley, *The Army Ground Forces: The Organization of Ground Combat Troops* United States Army in World War II (Washington DC: Center of Military History, 1987), p. 32.

[59] Gabel, *Seek Strike and Destroy*, p. 18.

[60] Handwritten Note, Eisenhower to Robert W. Crawford, WPD 4308-12, dated 13 January 1942. Reproduced in *The Papers of Dwight David Eisenhower - the War Years*, ed. by Alfred D. Chandler, I (Baltimore: The Johns Hopkins Press, 1970), p. 53.

army ground forces (AGF), the services of supply, later renamed the army service forces (ASF), and the army air forces (AAF).[61]

The AGF, more so than the temporary experiment with the GHQ, served as a laboratory for future combat development efforts. It received the charge to 'provide ground force units properly organized, trained and equipped for combat operations'.[62] To do so its commander absorbed the development responsibilities of the GHQ as well as those of the chiefs of infantry, cavalry, field artillery, and coastal artillery. Thus, AGF provided much needed coherence to the development of doctrine, the definition of requirements, and the development of tables of organization and equipment.

From the perspective of combat developments the table of organization and equipment (T/O&E) became the integrating tool for creating combined-arms capabilities during the war.[63] This document prescribed the tactical organization to include manpower and equipment into identifiable building blocks for larger military organizations. Changes to the T/O&E, based on resource constraints, lessons from previous operations, and new requirements from the field, often stimulated changes to doctrine, development of new equipment, or elimination of dated doctrine and equipment. Regardless of the source of change, the T/O&E was the focal point of AGF 'combat developments'. Unit and individual training became inseparable from the organizational design the T/O&E articulated. Similarly, changes in doctrinal concepts forced changes to the organizations tasked with execution, which in turn drove training.

The official army history notes that early in the war T/O&E changes derived from two sources. The first was a combination analysis of military theory, historical experience, and foreign experience. This was the traditional domain of military

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[61] As noted earlier in this dissertation, the Army Air Forces are not included in the analysis due to the increasingly independent and separate nature of their combat development activities.

[62] 'Study No. 2 Chapters I and II of A Short History of the Army Ground Forces' (Washington DC, n.d.), p. 26 <http://www.history.army.mil/books/agf/AGF002/index.htm> [accessed 5 March 2011]. This document can be found at Center of Military History Online Bookshelves http://www.history.army.mil/books/agf/AGF002/index.htm

[63] T/O&Es, when summarized with other related organizational documents, formed what was called the Troop Basis. The Troop Basis prescribed the 'kind of army authorized to exist.' See Robert R. Palmer, "Ground Forces in the Army December 1941-April 1945: A Statistical Study," in Greenfield, *The Organization of Ground Combat Troops*, pp. 163-165. The AGF was responsible for the T/O&E of the infantry, cavalry, field artillery, coastal artillery, and eventually armour.

experts in which experience, no matter how distant or specifically relevant, was considered the primary source of knowledge for change. The second, after 1942, was 'the guiding ideas of General Leslie McNair' based on his 'intimate understanding of the army.' That McNair was a driving force behind early combat development activities was not a surprise to his peers, given his 'experience and inclination'.[64] Beginning in 1938, he had used exercises to drive a series of questions, which in turn generated useful data for analyses. He sought to find a balance between the 'specialist and the man on the spot' by enforcing 'a rigorous sense of what was meant by fact as distinguished from theory or speculation'.[65]

In December 1942, McNair dispatched observers to North Africa to report on operations. While he cautioned that these reports 'represent the views of the individual observer and are furnished for information only' they were widely circulated helped to drive doctrinal changes and training plans. One such report was submitted by Major Allerton Cushman, who was dispatched from the newly established tank destroyer centre to North Africa to report on operations in Tunisia. Cushman's report commented on the efficacy of American training, doctrine, morale, organization, and equipment and thus contrasted it with that of the enemy. After observing several operations in a short period of time, he warned those charged with preparing the army for war: 'the German Army makes war better than we are now making it [...] unless this is realized and unless steps are taken to improve the quality of our fighting forces, we are bound to suffer defeat, when meeting it on anything like equal terms.'[66]

McNair made his own observations on the situation in North Africa. In addition to drawing his own conclusions, many in line with those of Cushman and others, he spoke to senior field commanders about their conclusions and recommendations. However, he saw field observations as only one of several valid inputs to the complex issue of designing, fielding, and equipping a force. After discussing possible changes to the armour division T/O&Es with Patton in North Africa in April 1943, he reported to the AGF requirements section that 'even though

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[64] Greenfield, *The Organization of Ground Combat Troops*, p. 271.

[65] Greenfield, *The Organization of Ground Combat Troops*, p. 272.

[66] Army Ground Forces, *Memorandum from Hq Army Ground Forces, Sub: Observer Report, 319.1/48 (Foreign Obs)(S), 29 March 1943* (Washington DC: , 1943). (CARL N-6234).

they [Patton, etc] have the prestige born of combat experience, I certainly feel that their offhand and fragmentary views are not infallible.'[67]

The issue with which McNair and the army were grappling was the inordinately complex set of competing forces at work when developing new capabilities. There is a tendency when judging the efficacy of one case of innovation or adaptation over another to underplay the context in which both the individuals and the institutions operated. This hindsight-view of innovation often compares the 'optimal' solutions with the capability actually developed. The problem was that officers like Marshall and McNair were not trying to develop the optimal solution, but the best possible. All combat developments, especially in wartime, must account for the limits of industry, the unknowns about the adversary, the vagaries of the operational environments, the unique strengths and weaknesses of newly mobilized soldiers, the time available, and the fact that bureaucratic competition and friction did not disappear during a crisis, they only changed form. Marshall, described what an unbounded combat developments system might look like in a September 1942 memorandum to McNair:

> I have felt for a year or more that our figures as to divisional
> transportation were extravagant, that they represented what a division
> commander asked for rather than meeting the problem on the basis of
> over-all requirements. I might say right here that if we gave each
> theater commander what he asks for we would have only one theater
> and all the rest would have to be evacuated for lack of means.[68]

As American army units entered sustained combat both in European and Pacific, the AGF shifted to 'analyzing, comparing, evaluating, and recommending action upon theater requests for increases or modifications in allowances to personnel and equipment'.[69] The holistic and interactive nature of this process was, for the first time, explicitly recognized in both the organization and authorities of those charged with combat development. From its inception the AGF had two missions. One was

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[67] Robert R. Palmer, 'Reorganization of Ground Troops for Combat - Study No. 8' (Washington DC: Headquarters - Army Ground Forces, 1945), pp. 272-273 <http://www.history.army.mil/books/agf/AGF08/index.htm>. According to McNair, after a brief explanation Patton supported the AGF's proposed armoured division reorganization plan.

[68] *The Papers of George Catlett Marshall, "the Right Man for the Job," December 7, 1941- May 31, 1943*, ed. by Larry I. Bland, Sharon R. Ritenour, III (Baltimore: The Johns Hopkins University Press, 1991), p. 370.

[69] Greenfield, *The Organization of Ground Combat Troops*, pp. 268-271.

training; the other was termed the 'developmental mission'. The traditional boards, schools, and personnel functions of the infantry, cavalry, field artillery, and coastal artillery together with the new armoured force and tank destroyer centre were combined under the requirements division of AGF Headquarters. The output was development of equipment requirements, tables of organization, and doctrine and 'training literature' for the 'for the arms and "special combat units" combined in the ground forces'.[70] With exception of special boards and activities of supervising committees on large field exercises, the AGF's requirements division was the first example of institutional combat developments in the army. As the war progressed and the traditional arms became more 'combined' on the battlefield, the AGF increasingly delved into doctrine that cut across the traditional boundaries held by the former chiefs of arms.

The 1942 WDGS reorganization did not resolve the inherent complexity of the combat developments function. The user community, now represented at the highest level by the single voice of the AGF, still had to work closely with the providers of the materiel component. The process of developing and delivering new capabilities was much improved, but still required considerable staff coordination and time. Throughout the war, despite efforts to create a responsive system, Marshall was often frustrated to the point that he took direct action. Marshall's biographer recounted specific examples of his top-down interest in innovation. One was the simple modification of anti-aircraft shells for use in trench mortars in the Pacific where there was a desperate need to 'lessen the casualty rates in the way of heavier gunfire'. As Marshall recalled, he personally dispatched an officer from Washington because he did not want to hear 'about something that took a year to produce.'[71] Part of Marshall's frustration was a result of complex relationships between the AGF and the ASF and more importantly between the ASF and the technical services it oversaw. The friction was reduced but not eliminated when officers from the requirements section, AGF, were stationed at major ASF ordnance, signals, and quartermaster installations to facilitate direct liaison.[72]

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[70] 'Study No. 2 Chapters I and II of A Short History of the Army Ground Forces', p. 39.

[71] Forrest C. Pogue, *George C. Marshall, Organizer of Victory* (New York: The Viking Press, 1973), p. 137.

[72] 'Study No. 2 Chapters I and II of A Short History of the Army Ground Forces', p. 45.

Creation of the ASF represented a temporary subjugation of the technical services under a single command.[73] The ASF, under the direction of General Brehon B. Somervell, was designed to relieve the fighting arms of the 'distraction and effort required by supply, procurement, and general housekeeping duties.' An exception to this mission was the 'experimental development and procurement peculiar to the air forces.'[74] In practice the ASF shared responsibility for research and development and testing of new equipment with the AGF.[75]

Two full years into mobilization and war the problems were less an issue of identified needs, manufacturing capacity, or resources than it was the perennial issue of how to rationalize the process of combat developments. The requirement for heavy artillery is a case in point. Ordnance officers and army staff planners on the general staff had disagreed on the need for heavy artillery in terms of both the concept for employment and the manufacturing opportunity costs at the war's beginning.[76] In late 1942 McNair 'unsuccessfully urged' production of heavy artillery. In April 1943, he further complained about the lack of heavy artillery units.[77]

In May 1943, the Ordnance Department finally relented and endorsed the recommendation to begin production of heavy artillery. The recommendation was approved by Somervell on 16 July and forwarded to the general staff where the original debate between ordnance officers and army level planners re-opened. The WDGS complained that the requirement for heavy artillery was not properly staffed and 'they did not approve of the general idea'. In August 1943, the deputy chief of staff, General Joseph T. McNarney, complained, that the problem of providing the necessary means of war was not one of resources but of 'poor staff procedures'.[78] The delay and debate were made worse by the practical issues of production where

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[73] War Department Circular 59 established the Services of Supply (SOS) along with the Army Ground Forces, and Army Air Forces. The AEF title SOS was replaced by ASF in March 1943.

[74] War Department press release, Bureau of Public Relations, 'Reorganization of the War Department,' 2 March 1942. Cited in John D. Millett, *The Organization and Role of the Army Service Forces*, United States Army in World War II (Washington DC: Center of Military History, 1954), p. 37.

[75] As noted the AAF was granted independence for all of its 'unique' R&D requirements.

[76] The heavy artillery in question ranged from 155-mm guns and howitzers to 240-mm howitzers and later 16-in rail guns.

[77] Thomson, *Procurement and Supply*, pp. 100-101.

[78] War Department, *Minutes, Meeting of the General Council, Office of the Deputy Chief of Staff, 9 August 1943* (Washington DC, 1943). (MHI UA 23.7.U549).

'capacity that had been laboriously built over a long period of time and then dismantled had now to be built up again.'[79]

The organization of the ASF, unlike that of the AGF, remained unstable throughout the war. The independent nature and external constituencies of the technical services fought back at every attempt to make permanent modifications necessitated by war. [80] A prequel to the post-war debate over whether the technical services are more effectively organized along functional lines first broke out in 1943. The issue was how to reduce the complexity of the increasingly functional combat arms users, having to work through narrowly specialized, commodity based, technical services. Somervell argued his case for functionalization to under secretary of war John J. McCloy in September 1943. He noted that, while the current organization of the ASF was successfully supporting the needs of the war department, 'we can do a better job' and he argued that the proposed reorganization 'would have far reaching effects, extending to the next war'.[81] The plan, well designed but poorly staffed, became a political issue that drew in the long silent protectors of the pre-war system. Marshall later observed, 'if we are ever to secure acceptance of the idea of a single department, I believe that we must first demonstrate within the army a satisfactory relation of service agencies to the combat forces'.[82]

The problem had as much to do with internal ASF relationships as it did with the normal complexity of relationships between the ASF and the AGF. The organizational arrangement between the ASF and the technical services, such as the ordnance department, began as a tense one and deteriorated throughout the war. Somervell, and his ever-increasing staff, were judged to be amateurs by long-standing ordnance officers. For their part the ASF staff came to view many in the ordnance community as a 'decided fraternity or clique' who jealously guarded their domain.[83]

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[79] Thomson, *Procurement and Supply*, p. 102.

[80] The complex politics and insightful institutional lessons of this episode are clearly explained in Millett, *The Organization and Role of the Army Service Forces*, pp. 401-416.

[81] Memorandum Hq, USAFICPA (signed by Somerville) for Marshall, 12 Sep 43, CG ASF cited in Millett, *The Organization and Role of the Army Service Forces*, p. 406.

[82] Memorandum for the Commanding General, Army Air Forces, October 26, 1944 [Washington, D.C.], Subject: Army Service Force Responsibilities. Larry I. Bland, Sharon Ritenour Stevens, *The Papers of George Catlett Marshall, Aggressive and Determined Leadership, June 1, 1943 - Deceber 31 1944*, 4 (Baltimore: The Johns Hopkins University Press, 1996), pp. 638-639.

[83] Green, *Planning Munitions for War*, p. 91.

An official history of the ordnance department noted that as Somervell sought tighter central control over his charge, the ordnance department 'vigorously resisted further moves to limit its prerogatives and to interfere with its methods of operation'.[84]

Post-War - Traditionalists Versus the Functionalists

The army's first post-war Chief of Staff, General Dwight D. Eisenhower, set in motion a series of conflicting institutional policies that both promoted the continued evolution of combat developments and inhibited its near-term success. The first initiative created an independent research and development division on the general staff and the second aimed to eliminate the ASF. Of course these two decisions were not made in a vacuum, or even with the yet to be defined combat developments function in mind. They were part of a large set of changes emerging from national debates over what kind of national security system the United States should adopt, changes that would clarify the concept of 'combat developments', and yet delay its emergence for more than five years.

In a speech before Congress in October 1945, President Harry Truman succinctly articulated the accepted range of organizational options for a post-war military;

> [W]e can maintain a large standing Army, Navy, and Air Force. Or we can rely upon a comparatively small regular Army, Navy and Air Force, supported by well trained citizens, who in time of emergency could be quickly mobilized.'[85]

Prudence and tradition, Truman noted, demanded America prepare for the future with a citizen-based force. He cautioned, however, that '[i]n our desire to leave the tragedy of war behind us, we must not make the same mistake that we made after the First World War when we sank back into helplessness'.[86] To prevent such a calamity, he argued the nation needed to build this force on the foundations of two continuous

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[84] Green, *Planning Munitions for War*, p. 91.

[85] President Harry S. Truman, 'Address before a Joint Session of the Congress on Universal Military Training, 23 October 1945,' Government Printing Office, <http://www.trumanlibrary.org/publicpapers/indes.php?pid=183&st=&st1> [accessed 5 March 2011].

[86] Truman, 'Address before a Joint Session of the Congress on Universal Military Training,' October 23, 1945, pp. 407 and 411.

programs. The first was a realization of the long-standing call to create a robust

system of Universal Military Training (UMT).[87]

For veterans of the First World War and proponents of 'a military system of

maximum economy', UMT was the only rational option.[88] These same veterans also

understood manpower would not be enough. The recent war had demonstrated that

the weapons of the last war would be inadequate to the needs of the next. Truman's

second proposal was a 'continuous research in science and new weapons [...no]

matter what the cost, we cannot afford to fall behind in any of the new techniques of

war or in the development of new weapons of destruction'.[89] As the larger national

debate took shape, the army was busy conducting a series of studies to settle on a

post-war organization. A board of officers, later known as the Patch-Simpson Board,

convened in August 1945 to make recommendations to the chief of staff. The board's

recommendations, based primarily on a series of interviews, reflected more the

board's personality than analysis. The interviews were weighted toward the veterans

of the European Theater's that not surprisingly resulted in a view of the post-war

army that reflected Eisenhower's more than the Washington staff created by

Marshall.[90]

Eisenhower endorsed a modified set of recommendations presented by the

Patch-Simpson Board. One historian has called the decision 'a victory for those

favoring a return to the Pershing organization'.[91] The AGF would remain intact and

absorb the wartime service commands into six regional armies. The ASF would be

dissolved and its staff divisions' responsibilities absorbed by the newly established

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[87] Several version of a program of UMT were proposed as amendments to the National Defense Act of 1920 but never gather the necessary political support and were not adopted.

[88] Marshall's public position for UMT was articulated in an article by a fellow veteran of the First World War and tireless advocate for UMT, Brigadier General John McAuley Palmer in John McAuley Palmer, 'General Marshall Wants a Citizen Army', The Saturday Evening Post, 23 December 1944, pp. 9-57 (p. 57). The foundations of the UMT argument and Marshall's position were laid out in his mentor's books; John M. Palmer, America in Arms: Experience of the United States with Military Organization (New Haven: Yale University Press, 1941); John M. Palmer, An Army of the People: The Constitution of an Effective Force of Trained Citizens (New York: G.P. Putnam's Sons, 1916).

[89] Truman, 'Address before a Joint Session of the Congress on Universal Military Training,' October 23, 1945, pp. 407 and 411. On 6 September, Truman requested that Congress create single Federal agency that, among other things, would 'promote and support fundamental research and development projects in all matters pertaining to the defence and security of the Nation'.

[90] Hewes Jr., From Root to McNamara, pp. 146-154.

[91] Hewes Jr., From Root to McNamara, p. 161.

WDGS directors. The six administrative services and eight technical service chiefs would once again wear two hats, those of a staff officer supporting a chief of staff and a commander responsible for a service or function.[92] The return of the semi-independent chiefs of administrative and technical services was a course that represented nothing more than a 'preparations for a hoped-for tranquil peacetime'.[93]

The Eisenhower reorganization of 1946, represented a mixed bag in terms of the evolution of combat developments.[94] On the positive side, a new position, director of research and development, was created and placed at the same level as an assistant chief of staff. The creation of the position had wide support among the war department's senior leadership. Undersecretary of War Robert P. Patterson, writing to Eisenhower in March, stated that 'for some years I have given close attention to the Army programs on research and development [...] the importance of the work in the future cannot be doubted, and I believe that it would be well to consider certain organizational changes.' Patterson called for the position to be filled 'by a man of unusual vision and executive ability [...] at the same time he must get on well with civilian scientists'.[95]

Post-War Equipment Boards

As occurred after the First World War, the post-war environment included an extensive round of conferences and equipment boards designed to record lessons of the war.[96] The post-war boards covered everything from narrow technical topics to

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[92] For a description of the ASF view and its demise see Millett, *The Organization and Role of the Army Service Forces*, pp. 421-427.

[93] Weigley, *History of the United States Army*, p. 67. Ironically, by 1958 President Eisenhower would bemoan the fact that the 'the entire structure, called the National Military Establishment, was little more than a weak confederation of sovereign military units.' U.S. National Archives and Records Service, 'President Eisenhower's Message to Congress, 3 April 1958, U.S. Congress,' *Public Papers of the Presidents: Dwight D. Eisenhower: 1958* (GPO, Washington D.C.: 1959), p. 276.

[94] The reorganization was instituted as a result of the Patch-Simpson Board surveys conducted between August 1945 and January 1946. The changes were instituted through Army Circular 138, 14 May 1946.

[95] Memorandum Patterson to Eisenhower, Research and Development Division, 17 March 1946 (COS, 1946, 321) cited in Dwight David Eisenhower, ed., *The Papers of Dwight David Eisenhower*, Vol. 7, (The Johns Hopkins University Press, Baltimore: 1978), pp. 999-1000 (note 1).

[96] The major post-war equipment, organization, and doctrine boards were; The Theater General Board; the U.S. Far East Theater Board; he Army Ground Forces Equipment Board; the Infantry, Artillery, and Armored Conferences; and the War Department Equipment Board (Stilwell Board). The Army

operations and strategy. The two major theatre commands also convened boards and studies to capture the specific lessons of their areas and reflect them back to the army. The quality and utility of these efforts varied greatly and few endeavoured to look ahead and apply the lessons of the Second World War to any possible future context. The exception was the 1946 War Department Equipment Board (the Stilwell Board).

The Stilwell Board articulated the need for a 'long range development program,' to serve two parallel functions: 'Vigorous research and development of new or anticipated types of equipment, and continued improvement of existing equipment as an interim measure [...and] supervise continuously research and development, merging or terminating projects at the feasible, economical moment and assuring a step-by-step change-over from the discarded material to the new'.[97]

The Stilwell Board also described the need to account for changes in both doctrine and organization as technology is advanced. The board listed two key components, under its 'Principles Applicable to Development of Equipment', of the future combat developments system. First, it recognized the dialectic nature of developments, where a new tactic or organization might require new technology and the opportunity of a new technology might be fully realized only in close development with the system of employment. The report, therefore, warned that technology might provide 'a new article but lack the demand to create it due to the failure of the tactical user to visualize and request what is unknown to him'. Similarly, 'the concepts of future tactics, organization, and equipment should be examined and stated clearly' in order to direct research. Without specifying how the war department might achieve this balance, the board did make a specific recommendation to raise the visibility of the issue and thereby change the prevailing press for a return to the pre-war status quo. 'Those responsible for the guidance of the research and development program' the board report argued 'should be on the same staff level with and participate in all strategical and operational planning in order that needs for new

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Equipment Board (Hodge Board) in 1950 drew on many of these previous boards to update their findings to 'orient the equipment R&D program to realistic economies under current peacetime budgets [to] ensure maximum security within means available.' Office Chief Army Field Forces, 'Report of the Army Equipment Board ' (Fort Monroe U.S. Army, 1950). (MHI UC463.U549 1950)

[97] 'Report of War Department Equipment Board (Stilwell Board)' (Washington DC: War Department, Office of the Chief of Staff, 1946), p. 2.

equipment may be determined, and research and development thereof be initiated at the earliest moment'.[98]

As a result, the board recommended creation of a 'separate General Staff Division on the Directorate Level of the War Department.' This new entity would be led by a senior general, supported by a deputy who is a 'nationally known scientist' and a staff of experts from the combat arms and technical services.[99] The new position, director of research and development, was empowered by a wide-ranging mandate including authority to 'supervis[e] the testing of new weapons and equipment and for the development of tactical doctrines governing their employment in the field'.[100]

Beyond giving research and development the bureaucratic visibility it was seen to deserve, the board began the process of separating research and development from 'the functions of procurement, purchase, storage, and distribution.'[101] The separation was strongly supported by two of the war's most respected scientists, Dr. Vannevar Bush of the OSRD and Dr. Edward Bowles, the Secretary of War's 'expert consultant' on research. In addition, an important source of support came from Brigadier General William A. Borden, a talented ordnance officer, director of the army's new developments division, and Marshall's personal research and development 'trouble-shooter' during the war. To men like Bush, one of the key lessons of the war was that research and production are antithetical. The 'cornerstone' of the procurement programs was 'quantity production, with an emphasis upon interchangeability of parts and the discouragement of adaptations.'[102] Such a system

[98] 'Stilwell Board', pp. 2-3.

[99] 'Stilwell Board', p. 2. (Part A, Section I)

[100] Hewes Jr., *From Root to McNamara*, p. 157. Hewes also notes that this proposal would have centralized supervision over what became known as 'combat developments' for the first time in a single staff agency.

[101] Memorandum to Directors and Chiefs of War Department, General and Special Staff Divisions and Bureaus, and the Commanding Generals of the Major Commands, from CSA, Subject: Scientific and Technological Resources as Military Assets, COS 020 (10-4-44), Sec 1 (30 April 1946), Document 883. *The Papers of Dwight David Eisenhower - the Chief of Staff*, ed. by Louis Galambos, VII (Baltimore: The Johns Hopkins Press, 1978), pp. 1046-1047.

[102] Irvin Stewart, *Organizing Scientific Research for War: The Administrative History of the Office of Scientific Research and Development* (Boston: Little, Brown, 1948), p. 330. The creation of the New Developments Division during the Second World War was in part a reaction to the inability of the procurement systems to deliver on near term R&D efforts. See Hewes Jr., *From Root to McNamara*, pp. 123-124.

was incapable of adapting to rapidly changing requirements, small niche capabilities, or event the demands of battlefield commanders. The situation was not likely to improve in peacetime when demands for efficiency would easily trump arguments for future capabilities.

Despite the temporary liberation of research from logistics under Eisenhower's reorganization, the staff functions associated with the emerging combat developments grew more complex after the dissolution of the ASF. [103] The creation of five staff directorates with a mandate to 'plan, direct, coordinate, and supervise' restored the technical services to a position of influence almost equivalent that of 1941. [104] The bureau chiefs 'kept their own research and development functions which remained subordinate to production and procurement almost by definition since the technical services were themselves commodity or service commands'. [105] Despite a diminution of responsibilities, the technical services' influence over the process of creating future capabilities complicated the combat developments function until creation of the Army Material Command in 1962.

Under the terms of Army Circular 138, the AGF continued in its original role of providing 'ground force units properly organized, trained and equipped for combat operations.'[106] The developmental role of the AGF, through the experience of Second World War, was maturing as a combined arms voice of the user community. The restoration of 'dual-hatted' officers in the technical services, despite the high-level advocacy of Research and Development (R&D) at the directorate level, undercut any advantage created by the separation of R&D from logistics. It was, as Marshall recalled a decade later, the triumph of the bureaucracy over institutional change: 'His (Somervell and the ASF) handling of things awakened, naturally, the hostility of the staff departments... I think all the reorganization so far as supply and the services

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[103] The return to the staff model in place prior to the 1942 reorganization resulted in twenty-nine individual staffs or division reporting directly to the chief or his deputy. See Weigley, *History of the United States Army*, p. 487.

[104] Weigley, *History of the United States Army*, p. 488.

[105] Hewes Jr., *From Root to McNamara*, p. 161.

[106] War Department Circular 59, 2 March 1942, Para 5b.

were concerned was built on avoiding any future development of a man like General Somervell.'[107]

The period between the end of the Second World War and beginning of the Korean War was, for the army and the concept of combat developments, one of constant organizational change, chronic underfunding, and fundamental debates on what kind of army was required for the future. The institutional assumption emerging from the post-war debates was that the United States required a regular, reserve, and mobilization capability. Speaking in 1947, Eisenhower signalled the army's return to the necessarily austere development logic of the 1930s when he stated that although the 'methods and weapons of war will be varied and improved'; there would be revolutionary change over the next decade. Since a decade was 'as far or further than the nature of a future war can be reasonably estimated' he implied little in the way of developments would be necessary. Returning to the mobilization logic he knew so well, Eisenhower defined the army's requirements as a 'force in being to meet the initial aggression and also as a springboard for mobilization.' The actual size should rest on the nature of the threat as well as 'the degree of readiness of the reserve components and the timing and availability of arms and equipment [...] which must be mobilized'.[108] The biggest change from the 1930s model was the speed with which the army would have to react not the approach it would take.

The question of speed was all-important, since the next war, it assumed, would arrive with no notice and rapidly reach the scale of the Second World War. There were two distinct approaches on how to approach the challenge. One option was to change the ratio of forces in being to those that would require mobilization. A large standing Army would obviously reduce the pressure on mobilization, but was difficult to justify on historic and financial grounds. An alternative was to utilize some form of UMT to reduce the time required to mobilize and thereby reduce the need for a large standing force. The second option was the quintessential combat developments challenge and helps to explain the continued drive to find a combat developments

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[107] Forrest C. Pogue, 'George C. Marshall: Interviews and Reminiscences for Forrest C. Pogue, Interview 15,' (14 February 1957), pp. 444-445 http://www.marshallfoundation.org/library/pogue.html, accessed 1 August 2009.

[108] Memorandum by the Chief of Staff, to Joint Chiefs of Staff, CCS 320.2 (5-1-45), Sec 1, Subject: Military Necessity, Which Exists for A Universal Military Training Program, 13 January 1947. *The Papers of Dwight David Eisenhower - the Chief of Staff*, ed. by Galambos, pp. 1440-1441.

solution. The army, in order to get out of the force in being versus the speed of mobilization spiral, would need to leverage scientific developments in such a way as to 'affect the size and composition of the military establishment'. As Eisenhower acknowledged, this option was 'dependent upon the willingness of the U.S. to finance and support the requisite research and development program'.[109] Politically, arguing for a robust program of combat developments undercut the army's argument for UMT and made rebutting the air force argument that technology could deliver a faster response at a lower cost, difficult.

An Organizational Battle Between the Army's Past and its Future

After Eisenhower's reorganization of 1946, changes to the army's internal organization were driven by or in reaction to the unification of the armed forces under the National Security Act of 1947 and the rapid growth of the new Department of Defense.[110] Significantly, the act created the United States Air Force, formalizing an evolution in progress for more than twenty years; created a department of the army; formalized the wartime joint chiefs of staff; and created a research and development board. In terms of the evolution of army combat developments, the act was, like the Eisenhower reorganization, a mixed bag. The act lent tacit support to the position of the technical services by failing to endorse an ASF-like entity for the new department. Instead it called for the secretary to 'take appropriate steps to eliminate unnecessary duplication or overlapping in the fields of procurement, supply, transportation, storage, health and research'.[111]

The Department of Defense grew and changed rapidly over the ensuing decade. Despite its support for unification, the changes wrought by the act were perhaps most

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[109] Memorandum by the Chief of Staff, to Joint Chiefs of Staff, CCS 320.2 (5-1-45), Sec 1, Subject: Military Necessity, Which Exist for A Universal Military Training Program, 13 January 1947, *The Papers of Dwight David Eisenhower - the Chief of Staff*, ed. by Galambos, pp. 1440-1441. In this memorandum Eisenhower was writing to the JCS with recommended changed to a JSSC response to President Truman's ad-hoc board on UMT. Eisenhower's answer can be read, in light of his strategy after becoming President, as referring to the substitution of nuclear weapons for manpower. However, his warning that basic force requirements of Second World War would be relatively stable through the late 1950s implies a more traditional view.

[110] The National Security Act of 1947 established the National Military Establishment (NME). The NME was later re-designated the Department of Defense (DoD).

[111] The National Security Act of 1947, PL 235 – 61 Stat. 496, USC 402, (26 July 1947), Section 202 (a) (3).

difficult for the army. In the wake of the act, the navy's internal structure was perhaps least affected. The new air force started with an essentially blank slate to build institutional processes unencumbered by tradition. The army, on the other hand, had to build a new department from the remains of the WDGS, which was still transitioning from its wartime configuration. The act also reinforced a 'general trend with respect to federalism [...] from a loose organization to a unified organization'.[112] For defenders of the status quo with regard to the technical services and development responsibilities, 1947 was a watershed. The centralization of army functions was a 'slow and painful process' that was 'shaped in conflict with the technical and supply bureaus and with other entrenched interests in the Army which survived from its long period of decentralization'.[113]

In March 1948, after almost two years of study, the army converted the AGF from its wartime responsibilities over operational matters to a 'Field Operating Agency'. Redesignated as office army field forces, the AFF was responsible for 'supervising training, preparing training literature, developing tactical doctrine, and supervising the activities of the Army Ground Forces boards in developing military equipment'.[114] Even as this change was a move toward an institutional capability to prepare for future war, there were several regressive moves. First, and in a clear concession to the technical services, the same directive circumscribed the AFF's mission to only a part of the army. The AFF was restricted from exercising any authority over the training and education activities of the technical services, but urged 'the closest collaboration and coordination'.[115] Second, a few months before the creation of AFF, the army reversed the move toward a higher research and development profile initiated by Eisenhower by abolishing the directorate of research and development and moved its responsibilities under the directorate of service, supply, and procurement.[116]

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[112] Huntington, *The Soldier and the State: The Theory and Politics of Civil Military Relations*, p. 431.

[113] Paul Y. Hammond, *Organizing for Defense: The American Military Establishment in the Twentieth Century* (Princeton: Princeton University Press, 1961), p. 283.

[114] Hewes Jr., *From Root to McNamara*, p. 171. The AFF was not a command, hence the 'office' designation. The head of the office was designated the 'chief.'

[115] Hewes Jr., *From Root to McNamara*, p. 172.

[116] Army Circular 73 (19 December 1947). This change was as the result of a recommendation by the Eisenhower appointed Board of Officers to Review War Department Policies and Programs (also known as the Haislip Board) in preparation for the National Security Act of 1947.

Even as the army was settling the question of training and doctrine, the issue of the need for peacetime ASF resurfaced. Eisenhower directed his to staff to explore the idea of an expansible logistics headquarters for war. Eisenhower's concept was that the director of service, supply, and procurement might 'provide the nuclear organization for an ASF as an operating command in war.'[117] Raising the possibility of restoring ASF led to a frenzy of activity on the part of reform minded officers like Lieutenant General Henry S. Aurand, director of service supply and procurement. He proffered a range of proposals to the new chief of staff, General Omar Bradley. The technical services, sensing a threat to their position, argued against ever 'creating another ASF or logistics command whether in peace or war'. Such a change would, they argued, 'require the reorganization and re-education of all the armed forces and war industries'.[118] The assistant secretary of the army Gordon Gray acceded to the status quo and the technical services dodged another bullet.

The next major study of army organization occurred in summer 1948. Building on the work of previous studies, Colonel Kilbourne Jöhnston, then assigned to the management division of the army comptroller's office, wrote a two-volume staff study that laid bare the complex and unwieldy department of the army. In Johnston review of army reorganizations he noted the back-to-back failure in two world wars of the army's peacetime staff structure. In both cases, the army failed to make the transition to war without the imposition of an emergency reorganization. The study also highlighted the 'unwieldy span of control' of the army's peacetime staff. Johnston's survey found some 294 divisions, 884 branches, 638 sections, along with 86 standing committees and boards in addition to numerous temporary committees in the army's organizational structure. The effect, in addition to delays caused by excessive staff layering, was that 'there [were] no effective procedures for integrating or balancing requirements with resources.' The major cause of the problem, Johnston found, was that institutional 'evolution [had] rendered the technical services bureaucratic to the point of obsolescence'. Under the conditions of the Cold War, as during the Second World War, the army needed to move to a few key

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[117] Hewes Jr., *From Root to McNamara*, pp. 175-176.

[118] The technical services position was argued by the chief of engineers and cited in Hewes Jr., *From Root to McNamara*, p. 178.

functional organizations responsible to the chief of staff.[119] The two sides carried 'diametrically opposed points of view'. On the one hand 'military procurement in time of war is intimately related to all the economic controls and production controls necessary on a modern total war'. On the other 'military procurement is intimately related to strategy, tactics' demanding the combining as many functions as possible.[120] This unsettled argument from the First and Second World Wars was just a relevant in the new Cold War.

The response from the technical services was predicable. They argued that 'functionalization would divide responsibility for producing, procuring, and supplying commodities instead of placing responsibility for them properly in one agency from factory to firing line'.[121] The chief of ordnance, Major General Everett S. Hughes argued that Johnston's concept for a return to something akin to the Second World War model would violate 'generations of experience' and should not be made unless they were 'conclusively advantageous'. If there were ever an indication of the institutional power wielded by the chiefs of the technical services in the late 1940s it lies in the tone and substance of response to their concerns by the chief of staff. Bradley pleaded with the chiefs at least to consider supporting the placement of the technical services under the deputy chiefs of staff for administration. Because '[w]e are every day convinced that the present organization here at the top will break down [...] we just can't handle it'.[122] In the end the secretary of the army approved Bradley's recommendation and the technical services acquiesced since the change affected their external but not internal relationships and authorities.[123]

The 1940s came to a close with one final Army organizational study and one more failed attempt to break the power of the technical services. This time an outside

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[119] Hewes Jr., *From Root to McNamara*, pp. 182-185.

[120] Major General C.F. Robinson, 'Factors and Objectives on Military Procurement (9 Janurary 1948)', Presentatin to the Industrai College of the Armed Forces (Washington DC: Industrial College of the Armed Forces, 1948), p. 3 <https://digitalndulibrary.ndu.edu/u?/icafarchive,8449>. The records of this presentation can be found https://digitalndulibrary.ndu.edu/u?/icafarchive,8449.

[121] Memorandum Brigadier General Christmas, Chief of Logistics Directorate, Procurement group, 4 Aug 48 (revised 12 Aug 48), sub: Army Reorganization. Johnston Plan – Comments, Tab 13. Cited in Hewes Jr., *From Root to McNamara*, p. 187.

[122] Quoted in Hewes Jr., *From Root to McNamara*, p. 189.

[123] Department of the Army Circular 342 (1 November 1948) placed the "Technical Staffs and Services" under the Director of Logistics (as opposed to the Service, Supply, and Procurement), and placed the "Administrative Staffs and Services" under the Director of Personnel and Administration.

consulting firm of Cresap, McCormick, and Paget was asked to offer recommendations to improve the department's management. The April 1949 report, and, like the Johnston Plan the year before, it found the department hamstrung by duplication and red tape, inadequate co-ordination, inadequate planning, and over centralization by too many activities. This resulted in a situation, according to the report, where the department had poor procedures for planning, programming, and controlling its operations. [124]

The technical services, for the third time in little more than a year, found themselves fighting off what they viewed as an existential threat. In this light the response by the chief of ordnance was predictable:

> The report is basically unsound in its reasoning. It follows the line that any error in a huge organization can be cured only by reorganization. I have been in the army since 1908 and in the ordnance department since 1912. During that time I have participated in n+1 reorganizations and have observed that always afterward the ignorant, the undisciplined, the empire-builders, the lazy, and the indecisive continued to make the same mistakes they made prior to the reorganization [...] the only proponents of such a scheme [...] have not become familiar with the complete and absolute necessity for an organization established on a product basis from research and development though final disposition of the end item. [125]

Unfortunately for advocates of reform, the army's new chief of staff, General Lawton Collins, failed to recommend acceptance of the more transformative recommendations. In a soft argument for maintaining the status quo, Collins noted that 'reorganization itself was not a panacea for all ills' and the army's 'state of flux' since the end of the Second World War accounted for much of its inefficiency. [126] The secretary, while accepting most of that Collins recommended, stated the obvious;

> I am at a loss to know how we can meet new challenges or deal with old ones if we are to limit ourselves to what has already been tried. I

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[124] Hewes Jr., *From Root to McNamara*, pp. 194-195. Army staff analysis and reaction to this internal study was influence by recommendation of the wider ranging Presidential Commission on Organization of the Executive Departments Report (known as the Hoover Commission) to modernize the development and reporting of the Army budget.

[125] Memorandum, General Hughes for Army Comptroller, 23 May 1949, sub: Survey of the Department of the Army Final Report by Cresap, McCormick and Paget. Tab Ord. to Tab 1, Tabbed materials. Cited in Hewes Jr., *From Root to McNamara*, pp. 197-198.

[126] Cited in Hewes Jr., *From Root to McNamara*, pp. 201-202.

feel we should all continuously maintain inquiring, open, and receptive minds respecting these matters.[127]

Several long-simmering institutional issues came to the surface in 1950. Some, like those associated with readiness and equipment, were publically exposed in failures during the early months of the Korean War. Early tactical failures were a clear demonstration that the doctrine and weapons of the last war had an increasingly short life. Moreover, Korea dramatically changed how readiness, in its broadest sense, would come to be defined in the Cold War. Readiness in the post-war world increasingly referred to the ability of existing forces to deploy and fight on short notice and not solely to on ability to raise an army for war. Attempts to bridge the gap between cold-start mobilization and large standing forces through the implementation of UMT had failed. This general result should have come as no surprise given the army's experience in trying to mobilize an army with emerging concepts and old equipment in 1940. Equipment from the last war may look good on paper and the economic potential of American industry may have inspired confidence in a conference room, but they were demonstrably no longer the most important indicators of readiness.

But just as it had in every post-war period, the army's demobilization after the Second World War was swift, disorganized, and deeper than a rapidly growing list of requirements warranted. In 1948, the joint staff estimated a mere two-and-a-third army divisions were available to 'put out fires' while the bulk of the army's combat forces were occupying Japan and Europe were considered 'political forces unavailable for military planning.'[128] Europe was the focal point of national security efforts, but the disconnect between word and deed was glaring. In 1948, Field Marshal Bernard Montgomery, as chairman of the commanders-in-chief committee of the Western Union Defence Organization (WUDO), the North Atlantic Treaty Organization (NATO) forerunner, informed member nation leaders that 'my present instructions are to hold the line of the Rhine [...] presently available forces might

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[127] Memorandum, Secretary of the Army for CoS, 9 January 1950, sub: Recommendation of the Chief of Staff to the Secretary of the Army on the organization of the Department of the Army. Cited in Hewes Jr., *From Root to McNamara*, p. 205.

[128] Walter Millis, *Arms and Men: A Study in American Military History* (New York: G.P. Putnam's Sons, 1956), p. 317. Number of forces available based on a briefing by Major General Alfred M. Gruenther, 18 February 1948 to the White House.

enable me to hold the tip of Brittany Peninsula for three days [...] please advise.[129]
Even those forces nominally available to come to Europe's aid in a crisis were on a
starvation diet. Despite a small bump in spending in 1949 as a result of international
crisis, the defence budget for 1950 was one that Secretary Forrestal estimated would
only allow for, limited procurement, nominal reserves, and restrictive maintenance.[130]
As one historian noted 'the Truman administration's military and foreign policies
were now rushing forward but in exactly opposite directions'.[131]

Even as the army struggled to reconcile its budget and the increasing demands
of the Cold War, a more fundamental shift occurred over the question of who
controlled the institution of the army. Legislative tinkering with the structure and
authorities of various components of the department of the army and the army staff
was, and to a degree remains, a favourite activity of congressional committees. The
situation made it increasingly difficult under the National Security Act of 1947 for the
army to adapt itself to internal competition for resources and changing requirements.
One change was a gradual recognition of the fact that the army chief of staff should
not presume a 'command role' over the army. This change was less about actual
command — after all similar constraints on the command function stretched back to
the early nineteenth century and Secretary of War John C. Calhoun — than it was the
presumption of command and its effect on institutional preferences.[132] The move

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[129] Cited in Lawrence S. Kaplan, *NATO 1948: The Birth of the Transatlantic Alliance* (London:
Rowan & Littlefield, 2007), p. 151. As late as April 1949 both President Truman and his Secretary of
Defense believed that it would still be several years before the new NATO could 'hold the Rhine line.'
Montgomery was also known to say that all the Soviet Union needed to reach the Atlantic was an
adequate supply of shoes. See Robert H. Ferrell, *Harry Truman and the Cold War Revisionists*
(Columbia: University of Missouri Press, 2006), p. 71. The US plan for general war, code named
OFFTACKLE, was equally pessimistic of holding a defensive line at the Rhine or even a 'bridgehead'
on the continent in the early stages of a Soviet attack. See 'Proceedings of the Commander Conference,
USAF' (Ramey Air Force Base: United States Air Force, 1950), pp. 22-23.. Declassified copy at
National Security Archive (www.gwu.edu/~nsaarchive/nukevault/special/doc03a.pdf/ accessed 1 Jun
2009).

[130] Steven L. Rearden, *The Formative Years 1947-1950*, History of the Office of the Secretary of
Defense, I (Washington DC: Historical Office, Office of the Secretary of Defense, 1984), pp. 350-355.
Secretary Forrestal presented President Truman a range of budgets for 1950 that ran from $23 billion
down to $14.4 billion The President eventually sent the $14.4 billion budget to Congress (Final action
resulted in a budget of $14.346 billion) with the promise of a $13 billion budget in 1951 under the new
Secretary of Defense Louis Johnson.

[131] Stephen E. Ambrose, 'The Armed Services and American Strategy, 1945-1953', in *Against All
Enemies - Interpretations of American Military History from Colonial Times to the Present*, ed. by
Kenneth J. Hagan and William R. Roberts (New York: Greenwood Press, 1986), pp. 305-320 (p. 308).

[132] Hewes Jr., *From Root to McNamara*, p. 214.

toward a functionally organized army staff would pave the way for a series of subsequent shifts, some of the more noticeable in the area of research and development and resource planning. Changes in other areas were more gradual and even today retain vestiges of a by-gone era.[133]

Despite the shift away from direct command, the army staff retained many of the structures and processes of an organization with direct command over field forces, rather than one optimized to plan, develop, and execute army policies. In the run-up to what would eventually become the army organization act of 1950, the comptroller's management division conducted a study that found almost 400 provisions of law governing the army had been passed since 1916.[134] In the words of the study's author 'the laws governing the organization of the army and the department of the army were in a mess.' Clarifying the statutory basis of the army would simultaneously provide the president, secretary of defence, and secretary of the army additional flexibility to 'adapt the organization to changing conditions'.[135]

The passage of the army organization act of 1950 marked the beginning of the end for the autonomy of the technical services. In all previous battles between agents of reform within the army staff and the traditionalists who supported the technical service chiefs, authority to make fundamental change rested with Congress. It was for this reason that the technical services held to the 1916 national defence act as their *Magna Carta* and fought any attempt to weaken their position.[136] The army organization act passed and, most significantly, authorized the secretary of the army to

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[133] Ambrose, 'The Armed Services and American Strategy' (p. 318). Some habits of culture die hard regardless of the level of staff or statutory purpose of the organization. In 1958 the Army established a 24-hour 'War Room' to 'provide a focal point for Army Staff efforts during emergencies [...] maintain general situation maps and other information about current trouble areas [...] keep current combat readiness data, and give situational briefings for key officials.' Terrence J. Gough Jr., James E. Hewes, Edgar F. Rains, *Establishment and Evolution of the Office of the Deputy Chief of Staff for Operations and Plans, 1903-1983* (Washington DC: U.S. Army Center of Military History, 1983), p. 20.

[134] The National Defense Act of 1916, the First War Powers Act of 1941, the National Security Act of 1947, and the Officer Personnel Act of 1947. See G. Emery Baya, 'Army Reorganization Act of 1950', *Army Information Digest*, 5 (1950), 28-37.

[135] Hewes Jr., *From Root to McNamara*, pp. 208-209.

[136] 'The National Defense Act - Approved 3 June 1916', As Amended by 30 June 1921 (Washington DC, 1921), p. 10. The act restricted the General Staff from engaging in work 'of an administrative nature that pertains to the established bureaus or offices of the War Department' or that would 'involve impairment of the responsibility or initiative of such bureaus or offices, or would cause injurious or unnecessary duplication of or delay in the work thereof.'

exercise executive authority to reassign duties of the technical services — something specifically forbidden by the 1916 act.

Combat Developments and the Victory of the Functionalists

The Korean War saw the Army expand from fewer than 600,000 troops in June 1950 to more than 1.5 million by June 1953. Appropriations for the army tripled during that same period. The particular nature of Korea provided fodder for both sides of the institutional argument over funtionalization. The technical services argued that the requirement to ramp-up and supply the expanding army justified the efficiency of the commodity approach. Those who argued for funtionalization were equally convinced improved that readiness and modernization of the existing force was the real lesson. As one official history noted 'technological innovation [...] offered a way to capture the public imagination and possibly, a large portion of the defence budget while at the same time carrying on needed modernization in a force still dominated by Second World War doctrine, organization, and equipment'. [137]

Requirements, research, and elements of combat developments were still divided and largely unsynchronized. One solution to bridge the gap between traditionalists and functionalists was to have key staff officers wear many hats. For example in 1948, the assistant deputy chief of staff, G-3 (atomic energy) was simultaneously the chief, armed forces special weapons project, and the senior member of the military liaison committee to the atomic energy commission. While a common focus on nuclear weapons might have justified the cross organization responsibilities, this logic was not always apparent. In 1951 the deputy assistant chief of staff (guided missiles) was simultaneously designated the deputy assistant chief of staff, G-4 (special weapons). [138]

The split loyalties and often-conflict of interest between the army's various tribes did not disappear under the management concept of 'multiple hats'. Even as the army increasingly embraced new technologies and actively sought new concepts to

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[137] Gough Jr., *Establishment and Evolution* p. 16.

[138] Gough Jr., *Establishment and Evolution* p. 16.

resolve its readiness and budget problems, it still lacked an approach for making institutional, vice arm or service, choices between alternatives. This basic disconnect between civilian research, military procurement, and the actual needs of the field seemed to defy an institutional solution. Dr. Lawrence R. Hafstad, Director of Research of the Reactor Development Division, Atomic Energy Commission (AEC) and a long serving member of the department of defence's research and development board, lamented in late 1950 that the department still lacked an adequate solution to the 'evaluation problem'. Evaluating a new weapon after it has been designed and is essentially complete 'is a relatively easy thing'. However, 'getting a preview of how valuable a thing would be if it could be made [...] this is a much more subtle problem'. Hafstad argued, as had Marshall earlier, that the services need to 'evaluate these things before they are completed, [then] we would save ourselves a lot of money and save our laboratories a lot of wasted effort [...] this is the direction in which we must struggle'.[139]

The secretary of the army was briefed on the findings of Project VISTA in February 1952. The report covered topics ranging from strategic policy, military concepts, doctrine, to organizations and materiel. But most important for the army, the report provided a clear description of the institutional context, which had to be addressed before requirements determination could occur. The report 'noted that America no longer enjoyed the long reaction time provided by her relative isolation between two great oceans and that the Army devoted too much time and effort to current operations and was thus unable to forecast the future and plan for it properly'.[140] The Project VISTA report recommended the army create a 'Combat Developments Group' to 'forge and develop new tactics, techniques, and tools of this new type of warfare'. Such a group, the report continued, would need to: 'be of sufficient size to include all elements of a working combat team [...and] a permanent staff that includes civilian scientists; it must have access to specialists in all relevant

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[139] Lawrence R. Hafstad, 'Coordination of Research and Development in Government Agencies (3 October 1950)', Presentation to the Industrial College of the Armed Forces (Washington DC: Industrai College of the Armed Forces, 1950), p. 7 <https://digitalndulibrary.ndu.edu/u?/icafarchive,36026>.

[140] U.S. Continental Army Command, *Report by USCONARC ad Hoc Committee on Evaluation of the US Army Combat Development Experimentation Center* (HQ CONARC, Fort Monroe, VA: 1958), p.12. Cited in Charles R. Shrader, 'History of Operations Research in the United States Army: 1942-1962', I (Washington DC: United States Army, 2006), p. 135.

fields; and it must work in close coordination with Operations Research Office of the Army.'[141]

Project VISTA's recommendations sharpened the debate over the role of nuclear weapons in land warfare. From the army's perspective, it offered insights into five critical questions:

- How to prepare for the battlefield of tomorrow?
- How best to organize combat forces to meet these requirements?
- What tactics and techniques should be employed?
- What equipment is required?
- What logistics system will best support such a battlefield?[142]

The challenge was to create an institution capable of answering such questions. The authors recommended, among other things, that the army consolidate the traditional patchwork of functions and responsibilities for developing new battlefield capabilities into a single organization. As the concept matured, the functions of a combat developments organization should include 'preparing detailed military specifications for new weapons and equipment, for developing new organizational and operational concepts and doctrines, for testing these ideas experimentally in war games and in field manoeuvres, for conducting combat operations research studies, and for analyzing the results in terms of cost-effectiveness'.[143] A complete institutional concept for 'combat developments' had now appeared.

Secretary of the Army Pace approved the modified version of Project VISTA's recommendations in July 1952. It called for an independent combat development group (CDG) that would combine conceptual, laboratory, and testing work on new weapons with the development of doctrines and organizations envisioned for their employment. The authors hoped that such an organization would 'forge and develop new tactics, techniques and tools of this new type of warfare [...and] bring to an operational state the newest tactics, ideas, and inventions having application to the

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[141] Jean R. Keith, Howard K. Butler, 'United States Army Combat Developments Command: Origins and Formation' (Fort Monroe: US Army Combat Development Command, 1972), pp. 6-7.

[142] Don K. Price, *Government and Science: Their Dynamic Relation in American Democracy* (New York: New York University Press, 1954), p. 60.

[143] Hewes Jr., *From Root to McNamara*, p. 330. Consolidating these functions into a single command was a major recommendation of several high level boards and studies during the 1950s (Project VISTA in 1952, the Haworth Committee in 1954, and the Armour Research Foundation Report in 1959).

kind of warfare envisaged for Western Europe'.[144] The concept behind the CDG recommendation was generally well received by the army staff, since there was already movement underway to consolidate many of these functions. In March 1951, a senior level army conference reported on an 'urgent requirement for an immediate study of the impact of atomic weapons developments upon Army organization, doctrine, tactics, and logistics'.[145] Discussions were underway between the army G3 and the AFF during summer 1952 to establish a 'Special Weapons Command' to accelerate a disparate collection of activities associated with atomic weapons.[146]

While the chief of the army field forces, General John R. Hodge, concurred with general recommendation of Project VISTA, he voiced two major objections. First, since most of the technical developmental functions envisioned by for the new CDG were already assigned to AFF, he deemed a wholly new organization unnecessary. Second, the existing Army schools already assigned to AFF could easily accomplish the doctrinal work of the CDG. Collins compromised and ordered establishment of a CDG in the AFF. In the establishing directive for the CDG, the responsibility for the major functions recommended by Project VISTA was clear, but as would be the case in another decade, authority and resources to control them were less so:

> The Chief of Army Field Forces is charged with responsibility for evaluating the effect on our tactical doctrine of new scientific developments. He likewise has the responsibility of developing requirements for new weapons, where necessary, to meet the demands of new tactical concepts. This dual responsibility calls for the application of the methods of science to the overall problems of ground warfare.[147]

In September 1952, Secretary of the Army Pace approved the AFF implementation plan and initiated the army's Combat Development System (CDS).

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[144] Cited in Shrader, 'History of Operations Research in the United States Army', p. 153.

[145] 'Probable Effects of Atomic Weapons Developments Upon the Structure of Army Operations,' (20 March), p. 3.

[146] Letter, G-3 384 (23 April 1952), DA, Subject: Plan for the Establishment of an Army Special Weapons Command," and Endorsement, ATTNG-61 322 (C), OCAFF, 16 May 1952. Cited in 'U.S. Army Combat Development System' (Fort Monroe: Headquarters, United States Army Continential Army Command, 1960), p. 5.

[147] Letter, The Chief of Staff, US Army, 13 June 1952, subject 'Establishment of Combat Development Agency,' cited in 'U.S. Army Combat Development System', p. 5. The Project VISTA report also recommended that the newly created CDG work closely with the Army's Operations Research Organization (ORO). (See Appendix 4).

This was a significant step in the evolution of army's ability to prepare for the future. The AFF plan provided an organizational focus for the 'existing AFF system of centres, schools, and boards, including long-established liaison with the technical services.'[148] The new combat development division, embedded within the existing AFF G-3 staff, would be overseen by the newly created position of deputy chief, AFF.[149] Moreover, to strengthen the coordination of doctrine development, combat development activities were created at the CGSC and each of the four major combat arms schools.

The CDG wasted little time in trying to corral the various activities constituting the CDS. In early 1953, AFF in coordination with the army staff published the 'Combat Developments Planning Guide'. This document was the first of what would become annual combat development guidance aimed at orienting the entire institution toward an integrated view of the mid-to-far time horizon. Published guidance is one thing, reorienting the existing institution is another. In the end the CDS was 'superimposed upon an existing Army structure whose role was more of influence than control'.[150]

In October 1952 the department of the army published, but never fully adopted, a proposal for the complete funtionalization of the army from the 'bottom-up'. The author of the proposal, Karl R. Bendetsen, argued that previous attempts to fix the army's organizational challenges 'treated the symptoms instead of attacking the basic issue'. The existing system, as Bendetsen described it, consisted of 'fragmented field organization(s) where seven major commands were each involved in buying, mechanizing, warehousing, distribution, and even research and development'.[151] Despite significant agreement with his assessment of the problem, Bendetsen's proposed solution, essentially the elimination of the technical services, was too radical a step. The tone of the proposal did, however, reflect widely held

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[148] 'U.S. Army Combat Development System', p. 5.

[149] The original proposal to establish a Special Weapons Command subordinate to the army staff was reconsidered in light of the new AFF CDS. In December 1952, the Office of the Director of Special Weapons Development, under the 'supervision' of the deputy chief of staff AFF, was created as the first combat developments field agency at Fort Bliss, Texas.

[150] Leonard W. Hoelscher, 'The U.S. Continental Army Command and Related Agencies (Part III)', Study of the Functions, Organization, and Procedures of the Department of the Army - OSD Project 80 (Army) (Washington DC: Department of the Army, 1961), p. 30.

[151] Hewes Jr., *From Root to McNamara*, pp. 218-219.

frustration inside and outside the department of the army that the institution had learned nothing from the Second World War. A contemporary staff history of the period noted three general weaknesses in the status quo:

- Equipment was sometimes developed without full consideration of the operational and organizational context in which it would be employed.

- Technology was moving faster that operational and organizational concepts were being modified to take advantage of new material developments.

- The development of future doctrine and organization were left to agencies responsible for current doctrinal and operational activities. These agencies could not give adequate attention to future developments.[152]

The organizational changes ushered in by Marshall in 1942 continued their sometimes-halting march in the immediate aftermath of the Korean War. Former Secretary of Defense Robert A. Lovett complained in early 1953 that the enduring power of the army's technical services with their overlapping functions added 'substantial complication to the difficult problem of administration and control'. Many functions, such as those associated with the concept of combat developments, were hopelessly stove-piped in the 'particular' requirements of the technical services. Lovett recommended that despite the fact that 'a reorganization of the technical services would be no more painful than backing into a buzz saw', it was worth the effort and long overdue.[153] A reorganization proposal by Lovett (implementing parts of the Bendetsen Plan) in the closing months of the Truman administration made a bold attempt to break 'resistance of the technical services and the army staff'. It recommended a dramatic shift way from what was called the 'Pershing Model' of a general staff organized like a field command to one with no significant field army responsibilities, but instead one providing strategic direction to seven functional commands.[154] This was in keeping with his larger view that 'we should not

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[152] 'U.S. Army Combat Development System', p. 4.

[153] Robert A. Lovett, *Army, Navy, Air Force Journal*, vol. 90, 10 January 1953, pp. 542-543. Cited in Hewes, p. 218. Despite the fact that Somervell aggregated some of the common staff functions of the technical services under the ASF during Second World War, he never successfully challenged their underlying independence. Much to the chagrin of Somervell the technical services boldly reasserted themselves following the dissolution of the ASF in 1946.

[154] The so-called Bendetsen Reorganization Plan was submitted on 22 October 1952. Bendetsen described the Army technical services as a dysfunctional set of self-contained 'professional groupings' lacking any functional pattern at a time when integration was identified as an organizational

deliberately maintain a department of defence organization which in several parts would require drastic reorganization to fight a war'.[155] The proposal also went nowhere, but it did set the tone for later reorganizations, which would actually reshape the army along functional lines.

The arrival of President Dwight D. Eisenhower's administration in January 1953 brought new energy to arguments over how best to organize the army in a time of change. The new president had long been clear in his own mind on what the nation need to do to rationalize a peacetime national defence system with the nation's economy. In a long diary entry from October 1951, Eisenhower wrote:

> We should institute a basic study at home to examine into the economics of [national] security [...] the most economical & efficient methods should be evolved. (The Services) should be ruthlessly pulled apart & examined in order to get down to the country's requirements [....] If we don't have the objective, industry-government-professional examination that will show us where & how to proceed in this armament business we will go broke and still have inefficient defences. We can have security without paying the price of national bankruptcy, if we will put brains in the balance. We cannot afford prejudice, preconceived notions, fallacies, duplications, luxuries, fancied political advantages, etc., etc. Our country is at stake. Many will give her lip service; few will give her self-sacrifice, sweat and brains!!! (Emphasis in the original)[156]

In February 1953, the new Secretary of Defense Charlie E. Wilson charged an ad hoc committee led by Nelson Rockefeller with recommending changes to the defence establishment.[157] Wilson, one of the titans of industry brought into government by Eisenhower, was clearly seeking to make the department conform to the well-established business principles of 'staff-and-line, centralization-

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imperative. See Karl R. Bendetsen, 'A Plan for Army Reorganization', *Military Review*, 33 (1954), 39-60. See also Hewes Jr., *From Root to McNamara*, pp. 218-222.

[155] 'Charles E. Wilson: Trained in Big Business, Now He Runs Public's Biggest Business', *Life*, 13 April 1953, pp. 81-82, 85 (p. 85).

[156] Eisenhower Diaries entry, 18 October 1951. *The Papers of Dwight D. Eisenhower, NATO and the Campaign of 1952*, ed. by Louis Galambos, XII (Baltimore: The Johns Hopkins University Press, 1989), p. 651. In this entry Eisenhower described the need to establish a distinguished panel of experts from across America's professions to address this challenge.

[157] Among the membership were Nelson A. Rockefeller, General of the Army Omar N. Bradley, Dr. Vannevar Bush, Dr. Milton Eisenhower (the President's brother), and former Secretary of Defense Robert A. Lovett. Senior military consultants were General of the Army Marshall, Fleet Admiral Nimitz, and General Spaatz.

decentralization, headquarters-and-field'.[158] After small modifications by the administration, Congress accepted the Rockefeller Committee's recommendations, redubbed Reorganization Plan No. 6, in June of 1953. The reorganization plan increased the authority of the secretary of defence over the service secretaries, and declared his authority 'complete and supreme' as opposed to the more benign 'direction, authority, and control' of the 1949 amendment to the 1947 national security act. As one observer noted, 'the last shadow of federation was exorcised'.[159] The secretary, to exercise his increasingly centralized powers, was supported by six new functional assistant secretaries (in addition to the existing three) as well as a general counsel.

The most significant effect on an emerging combat developments capability came from both the centralization of executive authority and the dissolution of the munitions board and the research and development board. These compromise creatures of the National Security Act of 1947 were unwieldy. By early 1950, the research and development board had become a maze of committees and panels with its membership exceeding 1500, overseen by a permanent staff of more than 300 administrators.[160] These collective bodies were eliminated and their responsibilities vested in three new assistant secretaries for supply and logistics, research and development, and applications engineering.

The reorganization plan also increased the authority of the chairman of the joint chiefs of staff (CJCS) by transferring to his office responsibility for the joint staff and its director. The reorganization also made the civilian service secretaries the 'executive agents' for the overseas commands ending a practice dating to the Second World War where a military service chief fulfilled that role. The service secretary would then use the military chief of the department to 'receive and transmit orders'

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[158] Wilson wrote a seven-page 'analysis of the organization problem for the members of the Rockefeller Committee', which all but directed them to help the him 'organize the set up the way he is accustomed to function.' Richard M. Leighton, *Strategy, Money, and the New Look, 1953-1956*, History of the Office of the Secretary of Defense, III (Washington DC: Historical Office, Office of the Secretary of Defense, 2001), p. 23.

[159] Eugene S. Duffield, 'Organizing for Defense', *Harvard Business Review*, 31 (1953), 29-42 (p. 35). The trend in department of defence reorganization from the original 1947 national security act through the two major revisions of the law in 1949 and 1958 was to increase the power of the defence secretary at the expense of the service secretaries.

[160] Wilbur D. Jones Jr., *Arming the Eagle: A History of U.S. Weapons Acquisition since 1775* (Fort Belvoir Defense Systems Management College Press, 1999), p. 325.

including 'strategic direction in peace and war of the unified commands assigned [...] and operational direction of the commands in war or emergencies'.[161]

In his transmittal of the plan to Congress, Eisenhower made clear his desire to use this opportunity to initiate 'badly needed' improvements. He directed that additional studies be undertaken to make 'secretaries truly responsible administrators, thereby obtaining greater effectiveness and attaining economies wherever possible.'[162]

The press for reorganization was in keeping with the new administration's desires to reorient defence in its business processes and a new basic strategy. In July, Eisenhower directed his Secretary of Defence to have the newly appointed chiefs of staff provide a 'summarized statement of these officers' own views on [...] our strategic concepts and implementing plans, the roles and missions of the services, the composition and readiness of our present forces, the development of new weapons and weapons systems, and resulting new advances in military tactics, and our military assistance programs'. The new chiefs were expected to provide 'a fresh view', which accounted for 'existing circumstances'.[163]

Eisenhower was briefed on a concept paper drafted by the new JCS during their enforced sabbatical in August, which included a pull back of ground troops from overseas bases, the preparation of a strong continental defence, an increase retaliatory nuclear and long-range air power capability, support for the development of Allied defence capabilities, and 'comprehensive' mobilization plan for projecting force if needed. When first briefed on the concept in September, Eisenhower was enthusiastic, but General Matthew B. Ridgway, the new Army Chief of Staff, and others worried

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[161] Edgar F. Raines, David R. Campbell, *The Army and the Joint Chiefs of Staff: Evolution of Army Ideas on the Command, Control, and Coordination of the U.S. Armed Forces, 1942-1985*, Historical Analysis Series (Washington DC: U.S. Army Center of Military History, 1986), p. 78. Reorganization Plan No. 6 was implemented by the Department of Defense in March 1954 in accordance with DoD Directive No. 5100.1, 16 March 1954.

[162] Paul L. Davies, 'Report of the Advisory Committee on Army Organization (the Davies Report)' (Washington DC: Department of the Army, 1953), p. 1 <http://www.whs.mil/library/Dig/Rpt.%209-18-53.pdf> [accessed 1 March 2011]. The navy and air force each conducted a similar review.

[163] Eisenhower, Dwight D. (Top secret) To Charles Erwin Wilson, 1 July 1953. In *The Papers of Dwight David Eisenhower*, eds., L. Galambos and D. van Ee, doc. 291. World Wide Web facsimile by The Dwight D. Eisenhower Memorial Commission of the print edition; Baltimore, MD: The Johns Hopkins University Press, 1996, http://www.eisenhowermemorial.org/presidential-papers/first-term/documents/291.cfm

that the 'proposed cure might be worse than the disease' he was trying to treat.[164] However, the concept did reflect many aspects of Eisenhower's strategic prejudices. It represented the first step towards the administration 'New Look' (National Security Council document 162/2), a policy that emphasized the 'capacity of inflicting massive retaliatory damage by offensive striking power.'[165] From the beginning of this process, Ridgway, pressed the national security council to reject any policy that called for the withdrawal of forces, or assumed 'that you could prevent war through the deterrent effect of any single arm'.[166] Ridgway's early and growing opposition to the evolution of Eisenhower's 'Massive Retaliation' strategy did not interrupt the process of institutional changes underway in how the army prepared for future war.[167]

In September 1953, Secretary of the Army Robert Ten Broeck Stevens created the advisory committee on army organization in accordance with a President's directive.[168] The committee was charged with a broad mandate to 'consider all elements of the Army' in order to provide the secretary advice on 'ways and means to strengthen and improve the organization' as well as any other 'organizational problems of significance that the Committee may encounter'.[169] The advisory committee was soon dubbed 'The Davies Committee' after its director, Paul L. Davies. Davies, a corporate chief executive, was also an expert on military procurement and the serving director of the American Ordnance Association. Those looking for recommendations that might go to the heart of the army's organizational problems might have been disheartened, given that when assembled the committee

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[164] Gerard Clarfield, *Security with Solvency - Dwight D. Eisenhower and the Shaping of the American Military Establishment* (Wesport: Praeger, 1999), p. 128.

[165] For the presidents reaction to the JCS concept see, Memorandum by the Special Assistant to the President for National Security Affairs (Cutler) to the Secretary of State, 3 September 1953 in *Foreign Relations of the United States, 1952-1954. National Security Affairs (in Two Parts)*, ed. by Lisle A. Rose, Neal H. Pertersen, II (Part 1) (Washington DC: US Government Printing Office, 1984), pp. 455-457. For NSC 162/2 see Statement of Policy by the National Security Council (undated) in *Foreign Relations of the United States, 1952-1954. National Security Affairs (in Two Parts)*, ed. by Rose, p. 582.

[166] Memorandum of Discussions at the 160th meeting of the national Security Council, Thursday, August 27, 1953 in *Foreign Relations of the United States, 1952-1954. National Security Affairs (in Two Parts)*, ed. by Rose, p. 447.

[167] The phrase 'massive retaliation' emerged from a speech by Eisenhower's Secretary of State John Foster Dulles in early 1954 and soon became synonymous with the Eisenhower defence strategy.

[168] Hewes Jr., *From Root to McNamara*, p. 223. Stevens is best remembered for his confrontation with Senator Joseph McCarthy in the Army-McCarthy Hearings of 1954.

[169] Davies, 'Davies Report', pp. Transmittal letter, 1.

'looked like a gathering of Ordnance Alumni'.[170] The composition was deliberate. Stevens wanted the committee to create a 'business-like approach' to the operation and supervision of the army.

After interviewing 129 witnesses from across the army, the Davies committee made four major recommendations designed to reorient the department on 'men, money, and materiel.'[171] Two of the recommendations — to strength civilian control by adding an assistant secretary position for financial management and to clarify the role of the chief of staff as the 'operating manager' of the army establishment, 'fully accountable' to the Secretary — were in line with the larger changes directed under Reorganization Plan No. 6.[172] Three other recommendations were significant in the final process of creating an institutional combat development capability.

First, the committee recommended that the General Staff 'be divested of their major responsibilities for operating activities' through the creation of two major commands; U.S. Continental Army Command (CONARC) and a supply command.[173] The commander, CONARC would assume control over the six continental armies and the Military District of Washington as well as take over the functions of the AFF. This return to a semblance of the AGF model was significant because it tried to eliminate the 'diffuse direction' that came from a system of supervision by staff sections. In addition to tradition command oversight and accountability of subordinate organizations, CONARC would specifically;

- Develop plans for and supervise training of individuals and combined units and integrate this training with [...] the technical services;
- Maintain the testing boards to insure reflection of the user's views in development of material and equipment;
- Develop long-term plans for increasing the efficiency and effectiveness of the Armies; and

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[170] Hewes Jr., *From Root to McNamara*, p. 223. Other members included captains of industry and veteran managers of the Second World War's industrial mobilization programme. The senior military advisor was Lieutenant General Lyman L. Lemnitzer, Deputy Chief of Staff for Plans and Research.

[171] Davies, 'Davies Report', p. 10.

[172] Davies, 'Davies Report', pp. 10-11.

[173] Davies, 'Davies Report', p. 11.

- Evaluate the performance of the activities for which each army is responsible regularly.[174]

The second major organizational recommendation was another attempt to settle once and for all, the argument over the technical services and their role in an increasingly centralized and functionalized army. The Davies Committee noted that because the direction and control of the technical services was diluted through the G-4, G-1, and comptroller staffs 'much of the momentum gained in improving supply management, organization, procedures, and operations during World War II appears to have been lost'.[175] The Davies Committee found that:

> In the event of another war, there is little likelihood that the army would have the chance to reorganize and develop its supply organization after the start of hostilities. The possibility of slow-paced conversion and a long build-up, which characterized the early stages of Worlds War I and II, disappeared in the smoke over Hiroshima on August 6, 1945.[176]

In addition to answering the question of whether the current system afforded adequate planning, direction, and control over the 'tremendous supply job a war would bring,' the Davies report went to the heart of the on-again off-again debate over the proper role of the technical services: 'Should those agencies of the Army (the technical services) that produce, procure, develop, and distribute essential weapons, materiel, and equipment be organized as at present by the type of item supplied or service rendered or is there need for change?'[177]

The committee's answer came in two significant, if still conflicted, parts. First, it recommended the creation of a vice chief of staff for supply.[178] This position would be a counterpart to a proposed vice chief of staff for operations. The primary purpose would be to ensure supply matters were properly integrated with 'other aspects of military planning' and among other logistics related tasks, resolve 'differences

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[174] Davies, 'Davies Report', p. 40.

[175] Davies, 'Davies Report', p. 48.

[176] Davies, 'Davies Report', p. 43.

[177] Davies, 'Davies Report', p. 44.

[178] The Davies committee defined supply as 'the sequence of related activities that include research and development, computation of supply requirements, procurement, production, storage, distribution, maintenance, and disposal of materiel, the rendering of logistical services such as medical, communications, engineering, transportation, and the training of specializing troops in the activities and services'. Davies, 'Davies Report', p. 43.

between those concerned with the development of new items and those concerned with procurement and other aspects of supply'.[179] Second, the committee recommended creating a supply command to provide direction and control for the functions of the technical services. The new command would take responsibilities for direction and control over the technical services from the G-4. The Davies report was careful to point out — no doubt in recognition of the significant resistance such a recommendation would engender — that 'the scope and powers of the envisioned supply command would be far less sweeping than those granted the army service forces of World War II'.[180] The Davies Committee deemed the 'immediate need' to be more effective management of the existing commodity oriented technical services vice any shift to a functional organization, a position long held by member of the ordnance community.[181]

The final major recommendation was to strengthen and consolidate the various staff functions of research and development under the existing chief of research and development in the G-3. The specific significance of this recommendation was two-fold. The first was the recognition on the part of the army that its organizational 'deficiencies have impeded the establishment of a creative atmosphere, a climate hospitable to innovation and the stimuli needed for scientific work.'[182] In the years prior to this recommendation, research and development responsibilities as well as the associated responsibility to define requirements were divided between the G-3 and G-4 and diffuse within each of these staffs. A series of deputy assistant chief of staffs for atomic energy, special weapons, guided missiles, were created. In 1952 most of the major functions were consolidated in the G-3 under the Deputy Assistant Chief of Staff for Research, Requirements, and Special Weapons. Other development initiatives, such as army aviation, found them established as third tier branches within other G-3 divisions. The response was more favourable in the G-3. The Davies Committee recommendations pushed along an already evolutionary trend. By November 1954, all research and development had

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[179] Davies, 'Davies Report', p. 47.

[180] A primary difference was the new command would not have authority over the administrative services (Adjutant, Provost, service functions of the Continental Armies), or the overseas supply activities. Davies, 'Davies Report', p. 49.

[181] Hewes Jr., *From Root to McNamara*, p. 226.

[182] See Davies, 'Davies Report', p. 15; Hewes Jr., *From Root to McNamara*, p. 224.

moved from the G-3 to an independent directorate, the chief of research and development. The emphasis of the new position became 'combat developments rather than hardware'.[183] This still did not resolve a fundamental issue and one that makes the distinction between research and development and combat developments so critical. Who determines the requirements?

When the army announced its reorganization plans in 1954, it accepted most of the Davies recommendations with the exception of the supply command. A rearguard action fought by the army's G-4, Lieutenant General Williston B. Palmer, succeeded in killing the supply command recommendation and put in place instead a deputy chief of staff for logistics with 'full authority for the provision, administration [...] direction and control of seven technical services.'[184]

The Secretary of the Army's Plan for Army Organization, better known as the Slezak Plan after the army undersecretary charged with implementation, went into effect in June 1954.[185] The first phase of the reorganization actually began a few months earlier when the AFF came to an end and in its place was the next evolution of functional organization, the CONARC. Even as the Slezak reforms were being finalized, Secretary of the Army Stevens directed the Army Scientific Advisory Panel (ASAP) to establish an Ad Hoc committee to review the current combat developments organizations and make recommendations for improvement.[186] Dr. Leland J. Haworth, Director of the Brookhaven National Laboratory and a veteran of OSRD and the MIT radiation laboratory during the Second World War, led the committee. The Haworth Report followed a well-trodden path in its three primary recommendations: the army needed to establish an 'intensive Combat Development program', the current AFF activities were 'inadequate in scope and magnitude', and the function of combat developments would best be served by 'an autonomous command.'[187]

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[183] Gough Jr., *Establishment and Evolution* p. 17.

[184] Hewes Jr., *From Root to McNamara*, p. 232.

[185] Hewes Jr., *From Root to McNamara*, p. 232.

[186] The secretary's use of his scientific advisory committee to examine 'research and development plans and operations' was a recommendation of the Davies Committee from the previous December. The report chided the army for failing to aggressively 'bring to the Army a fuller measure of the nation's civilian experience, knowledge and creative genius'. Davies, 'Davies Report', p. 63.

[187] Cited in 'U.S. Army Combat Development System', pp. 8-12.

In its more detailed recommendations, the Haworth Report made two additional recommendations that would, when added to the existing attributes of the CDS, give form to a fully evolved combat development capability. First, the technical services should be brought into the CDS. The ensuing implementation of this recommendation was the clearest sign the technical services had lost the battle over their autonomy. The second recommendation from the Haworth Report was a repeat of one first made in the Project VISTA report, to establish a field experimentation activity. The report reiterated the Project VISTA report's finding that training exercises built around current doctrine and equipment represented a poor substitute for field experiments 'directed at seeking out ways to change and improve doctrine'.[188] Although this recommendation was tabled as the AFF conversion to CONARC moved ahead, the die was cast.

Continental Army Command and Combat Developments

The establishment of CONARC was a return to the general model of the AGF. After almost ten years of 'experimentation' on alternative approaches, most of the key functions necessary for an institutional approach to combat developments were finally vested in a single functional command. In it is initial form the commander CONARC was responsible to the chief of staff for:

- Determining requirements for and military characteristics of new army weapons, equipment, and materiel.
- Preparing and approving tables of organization and equipment.
- Reviewing, developing, and recommending to the department of the army, new and revised doctrine.
- Testing of doctrine, techniques, and organizations [...] testing weapons, equipment, and materials [...] and establishing such boards and agencies as are necessary to ensure continued development.
- Preparation of instructional material.

[188] 'U.S. Army Combat Development System', pp. 10-11.

- Training within the continental United States.[189]

In practice there were several limitations to the CONARC model. The commander CONARC had three functional responsibilities: combat developments, training, and operations. Given that the command's primary focus was on combat developments, the staff position for the chief of combat developments was elevated to that of a deputy-commanding general. The deputy-commanding general, however, shared responsibility for the critical functions of combat developments with five other assistant chiefs of staff. Each staff section had to coordinate with other staff sections and agencies across the department of defence, the department of the army, and within its own headquarters. The CDS under CONARC was 'supported by eleven agencies located at various Army schools under the command of CONARC, and twenty other agencies located either at the schools, boards, headquarters or technical and administrative services, or overseas commands'.[190] Once again the problem for combat developments was the 'wide diffusion of responsibility, authority, and control over resources' creating an inevitable 'lack of integration'.[191]

While the CDS tied together the myriad activities related to combat developments already in place and placed responsibilities in the newly created CONARC, its only authority over many of the organizations involved in critical aspects was through the issuance of 'standards and guidance'. In many ways, it was back to the problem identified by then-Brigadier General Eisenhower that too many parts of the system were in the hands of organizations that could be deemed 'vitally interested-not responsible'. By the beginning of 1955, a rather eclectic collection of future oriented ideas, emerging concepts, new technologies, and increasingly complex weapon systems were piling up. In both officially sanctioned and a growing body of open literature, the attributes of a future oriented doctrine developed. Concepts of dispersion, flexibility, and mobility became the army's doctrinal watchwords in

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[189] 'Organization and Functions, Headquarters, Continental Army Command' (Fort Monroe: Continental Army Command, 1955), pp. 01.01-01.02. CONARC also had unified command responsibilities for the Zone of Interior and the ground defence of the United States.

[190] Hoelscher, 'The U.S. Continental Army Command and Related Agencies (Part III)', pp. V-11.

[191] Hoelscher, 'The U.S. Continental Army Command and Related Agencies (Part III)', pp. III-2.

development efforts at the Army War College, CGSG, and in the various parts of the CDS.[192]

Technologies, many dating back to the Stilwell Board and spurred on by an often unhealthy inter-service competition for public acceptance and budget share, matured rapidly in the middle part of the decade. Long-range surface-to-surface missiles, advanced surface-to-air missiles, tactical rockets carrying low-yield nuclear warheads, and increasingly capable helicopters, as well as ideas on how these weapons might be employed, were running along generally independent paths of development.

All of this occurred at the very time that the army's new chief of staff, General Maxwell Taylor, needed a compelling logic to maintain near-term readiness (funding as well a significant role in national security) and a long-range vision for the direction of the army. Taylor's drive for a strategy of 'flexible response' provided the final, albeit unintended, push to the creation of a combat development capability.[193] Despite the frenetic pace of activity, the army's senior leadership was frustrated with the apparent lack of substantive change emerging from CDS, especially change that delivered near-term capabilities derived from long-range concepts.

Combat Development and Experimentation Command

The CDS, by late 1955, was struggling to bring coherence to the ungainly and still overly bureaucratic process at the very time the army was entering a frenetic five years of development activity. In December of that year, the AWC completed a study, which put forth a concept for a radical redesign of the division.[194] The study argued for a small, highly mobile, high technology, nuclear capable division dubbed 'Pentomic' for its organizational emphasis on five-unit battle groups. Despite significant senior officer concern that the concept was too radical, Taylor approved

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[192] Andrew J. Bacevich notes that these terms became a mantra that 'obscured as much as they enlightened' and that 'moving from the abstract to the concrete would prove much more elusive'. A.J. Bacevich, *The Pentomic Army: The U.S. Army between Korea and Vietnam* (Washington DC: National Defense University Press, 1986), p. 70.

[193] Maxwell D. Taylor, *The Uncertain Trumpet* (New York: Harper & Brothers, 1959), p. 108.

[194] Taylor's predecessor, Ridgway, commissioned the study 'Doctrinal and Organizational Concepts for Atomic-Nonatomic Army During the Period 1960-1970,' study (PENTANA for short) in 1954.

the study in a May 1956 briefing.[195] His impatience was clear as he told his staff to 'avoid undue conservatism' and 'be progressive in its thinking' recognizing that some aspects of this concept would succeed while others would fail. Taylor agreed with the commander CONARC that the concept, with all of its identified limitations, should be 'put on the wall as an objective toward which we will progress' and directed that the Army staff 'stay out of CONARC's business.'[196] The approach, according to the CONARC commander, General Willard Wyman, was to start 'by brushing aside the man held fast by custom — the fellow who always searched the depths of the past for the key to the future. We call a permanent recess for the "stand pat" school of thought with its fatal philosophy of "wait and see"'.[197]

No matter how mature the concepts or advanced the technologies appeared on paper, there was, in early 1956, little in the away of objective data to validate them. The problem of data is both a practical and cultural one. The army had been using large-scale field exercises since the late 1930s to test modifications to organization, doctrine, and equipment. Field exercises meant to explore the emerging concepts for the Pentomic Army, with such names as FLASH BURN, FOLLOW ME, BLUE BOLT, and SAGE BRUSH, failed to provide the kind of data necessary for new concepts because they were essentially training or validation events for the current army. Small-scale experiments were conducted concurrent with the larger field exercises by the AFF and later CONARC beginning in 1954, but failed to provide data with the necessary scale or fidelity. This was the same for boards that leveraged panels of senior officers, such as the 1950 army equipment board (Hodge board). Experience and analysis of history proved to be a necessary but insufficient source of data in the combat developments process.[198]

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[195] The Chief of Engineers, Lieutenant General Samuel D. Sturgis, declared the concept 'completely unacceptable intellectually and scientifically'. Quoted in John B. Wilson, *Maneuver and Firepower: The Evolution of Divisions and Separate Brigades*, Army Lineage Series CMH Pub 60-14 (Washington DC: Center of Military History, United States Army, 1998), p. 271.

[196] Brief From Deputy Chief of Staff for Military Operations for Chief of Staff, 'Army Organization 1960-1970 (Pentana),' (15 May 1956); MHI UA 25.E32 1956. (MHI UA25.B32 1956) (See Appendix 7).

[197] General Willard G. Wyman, 'The Pentomic Division: New Weapons and New Doctrines', *Vital Speeches of the Day*, 24 (1958), 431-433 (p. 431).

[198] The practical concept for introducing 'simulated combat' into the list of acceptable sources of data along with combat records, engineering tests, user tests, map exercises, and manoeuvres was Paul F. Michelsen, from Johns Hopkins University's Operations Research Office. Paul F. Michelsen, 'Operational Experiments', First Conference on the Design of Experiments in Army Research -

In March 1956, Wyman, fulfilling the recommendations of the Project VISTA and Hayworth reports, proposed the establishment of a 'combat development test and experimentation centre' on 166,000 acres near Fort Ord, California.[199] Following Taylor's approval of the Pentomic concept, the newly designated Combat Development and Experimentation Center (CDEC) was approved and opened in November 1956. Wyman announced that the CDEC concept as the doing for the man-centric Army what facilities like Cape Canaveral and Yucca Flats were performing for rockets and nuclear weapons. The creation of the CDEC was itself an experiment. A staff of fifty officers led 3000 permanently assigned troops, under the experimental supervision of twenty-two civilian scientists.

The CDEC concept was to move away from subjective field exercises and conduct 'controlled two-sided field war games'. Standard research techniques, field manoeuvres, troop tests, materiel tests all failed 'to combine what the envisioned field experiment was expected to supply, a union of laboratory control with battlefield realism'.[200] The emphasis in the experimental approach was to distinguish between alternatives, as opposed to validating an 'optimum' solution.[201] The CDEC was, according to Wyman, 'literally [...] the battlefield of tomorrow — a place where academic theory pointing to a new doctrine can be tested and validated though realistic employment of men on the ground'.[202]

Despite the enthusiasm, the CDEC struggled in its first few years to develop the methodology, systems, and scale necessary to fully examine the Pentomic concept. Its creation did, however, mark the beginning of a major institutional change in how the army's approach to the future. A 1958 study of the CDEC validated the need by noting:

> Military organizations have continued to win battles by adapting
> weapons and methods of operation to changing conditions. Elementary

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Development and Testing, OORR 57-1 (Washington DC: Office of Ordnance Research, 1955) <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA417191&Location=U2&doc=GetTRDoc.pdf> [accessed 1 March 2011].

[199] Personal Letter from General Wyman, CONARC, to General Taylor, Chief of Staff, US Army, 5 March 1956. Cited in 'U.S. Army Combat Development System', p. 13.

[200] John L. Romjue, 'Development of Instrumentation Technology for Military Field Experiments, Usacdec 1956-1973' (Fort Monroe: US Army Training and Doctrine Command, 1974), pp. 4-5.

[201] Franklin C. Brooks, Floyd I. Hill, 'A Laboratory for Combat Operations Research', *Operations Research*, 5 (1974), 741-749 (p. 743).

[202] Wyman, 'The Pentomic Division', (p. 432).

wisdom demands that critical changes in military capability be made prior to decisive battles. In fact, the national welfare may be determined during the first days of a future war by the effectiveness of new organizations and methods of operation. Quickly shifting military requirements must be translated into new concepts now. There is little tolerance for error.[203]

Conclusion

By 1960 all of the major elements of a fully functional combat developments capability were in place — save one. In the years following the Second World War the army moved from a traditionalist- to a functionalist-based system of delivering capabilities to the combat arms; it consolidated under a single command a 'system' for creating new battlefield capabilities; and it created an experimentation centre to explore solutions to the challenge of future war in a holistic manner. Despite the nearly complete transformation of these activities, the issue of span of control and the complexity of coordination remained.

The ultimate solution was found in the creation of two commands as recommended by numerous boards, panels and studies in the previous fifteen years. In February 1961, Secretary of the Army Elvis J. Stahr, Jr., at the direction of the secretary of defence, commissioned the first major study of the department since the Davies committee and the DoD Reorganization Act of 1958. Led by the army's comptroller, Leonard W. Hoelscher, the 'Study of the Functions, Organization and Procedures of the Department of the Army Reorganization of the Department of the Army' (subsequently called OSD Project 80 or the Hoelscher Study) was unique in both quality and depth compared to previous efforts for two primary reasons.

First, Hoelscher personally selected the study team personnel and sought out people with 'inquiring, analytical minds and the kind of broad gauge training at the army war college or the command and general staff school which emphasized the Army as a whole rather than the interests of a particular arm or service.' Second, he drove a study approach that eschewed cloistered debates over organizational charts and instead collected data from the ground up. The study developed its finding after

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[203] 'Report by USCONARC Ad Hoc Committee on Evaluation of the U.S. Army Combat Development Experimentation Center' (Fort Monroe: US Army Continental Command, 1958), p. 5. (MHI U394.072 U54 1958)

pouring over almost 400 reports and conducting some 600 interviews.[204] Following the logic of previous studies, OSD Project 80's assessment of combat developments under CONARC's management noted many familiar frictions and debates. Management issues such as span of control, competing imperatives, functionalization versus commodity approaches, which plagued the department of the army and army staff were present in miniature under CONARC. In the area of developing future capabilities, CONARC for all intents and purposes had become a second Department of the Army.[205]

The solution was as simple as it was sweeping. In its October 1961 final report, OSD Project 80 recommended the creation of an independent Combat Developments Command (CDC).[206] In addition to creating a CDC, the report recommended the army create an Army Materiel Command (AMC) to manage the functions previously held by the technical services. The long and acrimonious fifteen-year battle between the technical services and the functionalists came to an inglorious end. As one historian described it, the chief of ordnance was abolished 'with a stroke of a pen'.[207] OSD Project 80 was a compelling study that supported fundamental change with a 'strong and continuing emphasis on anticipation of the nature of future military demands and on planning and action to meet them'.[208] The long and tedious process of moving the army from a decentralized, ad hoc approach to developing future capabilities finally moved to one where combat developments was an institutional priority. The creation of combat developments as the core of the institutions capacity for innovation was more than just the natural evolution of a previous processes; the change marked the beginning of a significant and still underappreciated cultural change. The creation of what would be called a combat developments process signalled a fundamental change in how the army approached the challenge of preparing for future war.

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[204] Hewes Jr., *From Root to McNamara*, pp. 319-320.

[205] Martin Blumenson, 'Reorganization of the Army, 1962' (Washington DC: U.S. Army, 1965), pp. 5-9.

[206] Leonard W. Hoelscher, 'Overall Report (Part I)', Study of the Functions, Organization, and Procedures of the Department of the Army - OSD Project 80 (Army) (Washington DC: Depatment of the Army, 1961), pp. I-xi - I-xii.

[207] Rose, *American Rifle*, p. 376.

[208] Hoelscher, 'Overall Report (Part I)', pp. I-iv.

Chapter Three - Education and Doctrine Development

This chapter explores the role the Command and General Staff College (CGSC) played in changing the way the army prepared for war in the period of the early Cold War.[1] The college served a unique function in the army through this period. It was responsible for not only the education of the next generation of senior officers, but also for the development of combined arms doctrine. This dual mission makes examining the college a useful surrogate for understanding the army's internal debates about future war. This chapter traces the debate through a succession of commandants as they attempted to reconcile their organization's proven past with an uncertain future. After providing some background on the role of military education and the college in the army, it breaks the early Cold War into four periods. The first period was the immediate post-war years. Even as the wartime success of its graduates validated the CGSC of old, the question of what to teach and even how to teach in an era of rapid change presented major challenge. The second period is characterized by attempts to incrementally apply new concepts to old without upsetting the status quo in the early 1950s. Even as combat in the Korean War appeared to validate the traditionalist view, the strategic implications of the war combined with advances in tactical atomic weapons to drive the college toward change. The third period covers the two-year tour of a single commandant, Major General Garrison Davidson. Rather than continue with the incremental approach of his predecessors, Davidson created a concept to integrate both the education and doctrine missions of the college to create a logical link between past, present, and future. The final four-year period also fell under a single commandant, Major General

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[1] The Command and General Staff College changed names several times during the period covered in this dissertation. For simplicity, the acronym CGSC will be used to refer to the schools at Fort Leavenworth. The institution began in 1881 as the School of Application for Infantry and Cavalry (referred to at the time as the School of Application). In 1886 it was renamed the U.S. Infantry and Cavalry School. In 1901, after the Spanish-American War hiatus, and as a part of Secretary Root's reforms, the school was renamed the Army Staff College (which included a School of the Line and a General Staff School). In 1922, the school's functions were realigned with the Army War College and it became the Command and General Staff School. In May 1947, the institution was designated the Command and General Staff College.

Lionel McGarr. McGarr's tour was marked by a significant emphasis on change but by little effort to reconcile the inherent tensions between the army's past and its obligations for the future.

Despite the often-circuitous path, the college between 1945–1960 transformed from an organization singularly focused on preparing officers to execute existing doctrine to one that oriented on developing future-oriented doctrine and educating officers for an unknown future.

Background and History of CGSC

For most of the army's history prior to the Second World War, it lived a distinctly cloistered, mostly peacetime existence. One commentator described army garrisons through 1904 as 'monasteries in which the soldier's father superior was a two-fisted sergeant and his abbot a company commander.'[2] America's political culture all but guaranteed that outside of occasional national emergencies, a small regular army would remain dispersed across a continent, and thus unable to threaten the republic. For this and other reasons, the United States was slow to develop the educational institutions associated with a professional military. Slowly, however, a few 'schools of application' emerged during the nineteenth century, culminating with the direct forerunner of the CGSC, the U.S. Infantry and Cavalry School at Fort Leavenworth, Kansas.

In the immediate aftermath of the Civil War, a war for which the quality of the officers depended more on luck and bloody experience than it did on any form of professional study, a post-war study argued for increased military education:

> The march of general science long since elevated the arts of national defence from the sphere of muscle to the domain of mind. While rare genesis will sometimes supply in part, even in the art of war, the results of the patient preparations of study, yet nations cannot, without fatuity, entrust their destinies to the vague changes of such miracles.[3]

However, the end of the Civil War also unleashed a strong anti-intellectual current within the army. Some veteran officers, professionals and volunteers alike, discouraged the academic study of war as a distraction from the experienced based learning of 'real war'.[4] The confederate general John Bell Hood wrote that:

> [T]he highest perfection in the education of troops, well drilled and disciplined, can only be attained through continual appeals to their pride, and through incitement to make known their prowess by the

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[2] Colonel Ernest Dupuy quoted in John W. Masland, Laurence I. Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton: Princeton University Press, 1957), p. 4.

[3] Major Joseph H. Whittlesey, 'Report on National Military Education with the Plan of a System for the United States' (Washington DC: War Department, 1867), p. 7.

[4] Timothy K. Nenninger, *The Leavenworth Schools and the Old Army: Education, Professionalism, and the Officer Corps of the United States Army, 1881-1918* (Westport: Greenwood Press, 1978), p. 16.

substantial test of guns and colours, captured upon the field of battle. Soldiers thus educated will ever prove a terror to the foe.[5]

Nostalgia for the educational value of the battlefield waned as a new generation emerged and wars in Europe pointed to the possibility of more bloody war to come. In 1875, Brigadier General Emory Upton embarked on a round-the-world mission to 'examine and report upon the organizations, tactics, discipline, and manoeuvres of the armies along the route mentioned, and in Germany the special examination of the schools for the instruction of officer'.[6] Upton's detailed report emphasized the need to expand professional military education in the United States by contrasting its current state with that of the rest of the world where 'most governments have established post-graduate institutions for nearly all arms of service, where meritorious officers, from whatever sphere they may enter the army, may study strategy, grand tactics, and all the sciences connected with modern war'.[7] Upton saw a 'war academy' as the essential antidote to 'how ignorant our generals were, during the war, of all principles of generalship'.[8]

In 1881, General William T. Sherman, acting in part on recommendations from the Upton report, founded the School for the Application of Cavalry and Infantry at Fort Leavenworth, Kansas. This early predecessor to the CGSC began a trend where responsibility to develop professional officers transitioned from an informal one to a formalized education system. Sherman, in a 25 October 1882 address to the School of Application, reminded the officers that:

> The object of the Army is the same today as it was in 1792 – to maintain peace on our extensive frontier; to prepare the way for the coming immigrant; to sustain the civil powers in maintaining order among our adventurous and somewhat irregular classes; to preserve a nucleus for a larger army, should it be needed; and finally and most important of all, *to preserve and keep alive the knowledge and habits, the tone and spirit, the peculiar devotion and patriotism of the soldier,*

[5] J. B. Hood, *Advance and Retreat: Personal Experiences in the United States and Confederate States Armies* (New Orleans: Beauregard, 1880), p. 132. Hood went on to lionize the educational benefits of the 'heroic attempt to scale the rugged heights of Gettysburg' and the 'gallant charge over the breastworks at Gaines's Mill.'

[6] Order from Secretary of War William W. Belknap, reproduced in Emory Upton, *The Armies of Europe & Asia* (London: Griffin & Co, 1878), p. iv.

[7] Upton, *The Armies of Europe & Asia*, pp. 362-363.

[8] Letter from Upton to Colonel Henry A. Du Pont, 1 April 1877. Cited in Peter S. Michie, *The Life and Letters of Emory Upton* (New York: D. Appleton and Company, 1884), p. 418.

so that these qualities may be forthcoming, should the nation's honor demand them, at the shortest notice. (Emphasis added)

Sherman noted that merely 'preserving' the knowledge and usage might not be enough.

> All real knowledge is of use; but in war, as in science, art, and literature, for the higher branches we must look to books — the recorded knowledge of the past [...] *But you must not stop there. Your country expects you to go on, to keep pace with the general knowledge of the world, especially of those branches of knowledge, which have been and ever must be characteristics of the successful military officer.*[9] (Emphasis added)

In the decades that followed, this institution, in all of its incarnations, became the intellectual engine of a professional army. Post-graduate education and the emergence of an intellectual framework through which the army could adapt to the context of war made rapid progress from 1881–1898, but the context in which Americans would fight wars was changing faster than the curriculum.

In 1898, the army suspended the school as it mobilized for the Spanish-American War and the subsequent Philippine Insurrection. Wholesale failures in the planning, preparation, and support of military operations in the war led to major top-down reforms, which would have a major impact on education in the army. In his 1901 annual report, Secretary of War Elihu Root made the case to reopen the school at Fort Leavenworth, but with an eye toward moving beyond the tactical application of infantry and cavalry. The redesigned school opened its doors in September 1902 as the General Service and Staff College. Over the next fifteen years, the college moved through several organizational and name changes. Eventually there were three schools at Leavenworth under the title the General Service Schools: the School of the Line, the General Staff School, and the Signal Corps School. The curriculum in the early twentieth century reflected a mix of the traditional emphasis on the application of

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[9] General W.T. Sherman, 'Address to School of Application, Fort Leavenworth KS,' (23 October 1882), pp. 5,7; CARLDL, <http://cgsc.cdmhost.com/u?/p4013coll4,352 > [accessed 1 December 2010]. Combined Arms Research Library Digital Library, Fort Leavenworth KS (Hereafter CARLDL). Sherman later wrote in his memoirs, the phrase that has become associated with his thoughts on the army's schools when he said that professional soldiers of the regular army should seek to be organized and governed along 'true military principles' that will 'preserve the habits and usages of war'. William T. Sherman, *Memoirs of General W. T. Sherman* (New York: Charles L. Webster & Co., 1891), p. 406.

combined arms tactics, but moved increasingly toward large unit operations and even educational subjects more applicable to a graduate school.[10]

In 1916, as the army oriented itself on a potential war in Europe, the schools at Fort Leavenworth closed once again. Graduates of the General Staff School were in high demand during the First World War. After the war, the former AEF commander, General John J. Pershing, noted that 'had it not been for the able and loyal assistance of the officers trained at these schools, the tremendous problems of combat, supply, and transportation could not have been solved'.[11] Having an educated cadre of staff officers capable of organizing the mobilization, training, and deployment of large numbers of troops was the payoff of the Root reforms and became the focus of the education immediately after the First World War.

The General Service Schools reopened after the war and soon went through additional changes in form and focus. Beginning with the post-war classes, most students attended both the School of the Line and the General Staff School as a single two-year program. The major distinction between the two was increasingly one of echelon. Upon the recommendation of a board of officers, the two schools combined to form the Command and General Staff School. The curriculum was adapted to a one-year program The board also recommended that the higher-level staff functions, at the level of army and above, become part of the AWC curriculum. The two-year program resumed between 1928 and 1935, but an increased demand for graduates returned the program to a one-year model where it has remained.

Between 1919 and 1940, the veterans of the AEF and the institutions they created 'expected to return to Europe to finish the unfinished business of the world war'. They also injected an institutional bias into the curriculum that anticipated the repeat of tactical and operational challenges of the Meuse-Argonne offensives in the next Great War.[12] It would be too simplistic to ascribe the motivation behind this view

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[10] The Army School of the Line (as it was then called) managed its curriculum through four departments: Military Art, Engineering, Law, and Languages. For details on the specific changes during this period, see *The Army Service Schools*, (Fort Leavenworth: Press of the Army Service Schools, 1916). A copy can be found at CARLDL http://cgsc.contentdm.oclc.org/u?/p4013coll4,71 [Assessed 5 January 2011].

[11] Pershing's 1924 quote cited in Elvid Hunt, *History of Fort Leavenworth 1827-1937* (Fort Leavenworth: The Command and General Staff College Press, 1937), p. 155.

[12] Peter J. Schifferele, *America's School for War: Fort Leavenworth, Officer Education and Victory in World War II* (Lawrence: University of Kansas Press, 2010), p. 189.

to the well-worn cliché that generals always prepare to fight the last war. For many veterans of the AEF, the particular tactical American lessons of the war were well documented and adaptable to the defence needs of the continental United States.[13] Despite reaffirmations of the continued superiority of the infantry, the war sparked a vigorous debate on the value and balance of combined arms.[14] In some areas, armour and aviation in particular, 'the war provided the catalyst for internal reform that ultimately resulted in new organizations and doctrine.'[15] At the operational and strategic level, the frustration and scandals resulting from mobilization were well documented. Both the AWC and the CGSC dedicated much of their curricula to mobilization — related issues.[16] But at the same time, debates over fundamental U.S. military policy, powerful and entrenched parochial interests among within the institution, and twenty years of chronic underfunding conspired to keep the orientation on perfecting what was and much less on imagining what might be.

A military's education curriculum is a pointer to where the institution believes its future lies. Prior to the Second World War, a major emphasis of instruction at the CGSC was on 'tactical principles and decisions, consist[ing] of increasingly complex tactical problems involving increasingly large combined arms formations'. The imagined application of such knowledge was immaterial. It was enough to create staff officers and commanders of sufficient quality that they could operate the organizations they were also being taught how to mobilize and train. Despite some criticisms of the interwar curriculum for being narrow, unimaginative, and conservative, its influence both before and after World War II is undeniable.[17] Of the thirty-four officers who commanded at the corps level during the war only one, James A. Van Fleet, did not either attend or attend and also teach at CGSC.

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[13] Dennis J. Vetock, 'Lessons Learned: A History of US Army Lesson Learning' (Carlisle Barracks: US Army Military History Institute, 1988), pp. 47-51.

[14] Mark Ethan Grotelueschen, *The AEF Way of War: The American Army and Combat in World War I* (New York: Cambridge University Press, 2007), pp. 343-364.

[15] William O. Odom, *After the Trenches: The Transformation of U.S. Army Doctrine, 1918-1939* (College Station: Texas A&M University Press, 2008), p. 77.

[16] The Army Industrial College opened in 1924 under the Office of the Assistant Secretary of War to specifically educate officer to work with industry in support of national mobilization in the future.

[17] For a detailed recitation and refutation of the critics, see Timothy K. Nenninger, 'Leavenworth and Its Critics: The U.S. Army Command and General Staff School, 1920-1940', *The Journal of Military History*, 58 (1994), 199-231 (p. 203).

The basic doctrine of the army, which also formed the heart of Leavenworth curriculum during the interwar period, was remarkably stable.[18] The basis of all but higher level, or combined arms, doctrine during this period was the Field Service Regulations (FSR). A board of officers at the General Staff School received the charge from the WDGS to revise the 1914 FSR with the express purpose of creating 'an authoritative reference book for officers in the field.'[19] In a process that would become an institutional pattern for doctrinal development in later years, a committee of experienced officers at Leavenworth drafted an expansive document. According to the committee's covering letter the draft gave 'a comprehensive and correct idea of the responsibilities and functions of the various government agencies in the preparation for war and the conduct of war, as well as the doctrines thereof'.[20]

The Leavenworth committee, and the subsequent reviews, drew heavily on the experience of the AEF in the development of FSR 1923. A common intellectual theme ran throughout the army during this period — the fundamentals of the American way-of-war were sound and the AEF experience validated that notion.[21] One should not be surprised that existing notions of doctrine carry significant weight, especially with those also charged with teaching it take part in any rewrite. Doctrine rarely, if ever, begins with a blank page. Doctrine is, as one commentator would later define it, 'a generalization based on sufficient evidence to suggest a given pattern of behaviour will probably lead to a desired result.'[22] In the case of the FSR, recent experience in Europe provided all of the 'sufficient evidence' needed to validate the status quo. As

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[18] The Field Service Regulation of 1923 remained in effect until a new version was finally published in May 1941 under the title Field Manual 100-5. The term 'doctrine' was not an official one within the U.S. Army until after the Second World War. Regulations served the purpose, as articulated in the first official definition of doctrine, of providing a 'compilation of principles and policies [...] which have been developed through experience or by theory, that represent the best available thought and indicate and guide but do not bind in practice.' Special Regualtion 320-5-1, Dictionary of United States Army Terms (Washington, DC, 1950) (78).

[19] Odom, After the Trenches, p. 30.

[20] Cited in Odom, After the Trenches, p. 33.

[21] Between December 1918 and June 1919, some twenty different boards met to provide input to the AEF's Superior Board for Organization and Tactics. The boards included branch-specific combat arms like infantry, cavalry, and artillery, as well as technical services such as transportation, medical and ordnance. The heroic notions of an infantry-centric army, imbued with 'offensive spirit' while executing what was loosely termed as 'open warfare,' were seen as the primary legacies of the AEF experience. See Grotelueschen, The AEF Way of War, pp. 252-264; Brian McAllister Linn, The Echo of Battle - the Army's Way of War (Cambridge: Harvard University Press, 2007), pp. 116-150.

[22] I. B. Holley Jr., 'Concepts, Doctrines, Principles: Are You Sure You Understand These Terms', Air University Review, 35 (1984), 90-93 (p. 92).

the director of Fort Leavenworth's School of the Line wrote in his 1919–1920 annual report:

> Our experiences in the European War have been sufficient and the results so creditable that we have little or no need to borrow tactical doctrines from a foreign country. The tactical principles and doctrines heretofore recognized and taught at the Leavenworth Schools have been tested in the European War and have been found to be as sound today as heretofore.[23]

The dynamics for doctrinal innovation for the remainder of the interwar period were established in the middle 1920s. The FSR provided a framework of infantry-centric combined arms, under or around which the other arms developed specific tactical and technical innovations. The 1920 National Defense Act, combined with the unwillingness of Congress to fund even its own legislation, all but forced the small professional army to perfect the past. The army's institutional focus until 1939 was not on the nature of the next war or even the optimal capabilities needed, but on its ability to mobilize and train a citizen army to fight. As one historian described the army's dilemma:

> By 1930, technological developments clearly demonstrated the need for revised doctrine. But without a battlefield to test the new ideas generated by those developments, one person's conceptions are as good as another's. Economic constraints prevented large-scale unit exercises. The resulting inability to test new weapons, equipment, organization, and tactics stagnated doctrine development.[24]

This is not to say that interest in the changing character of war during the interwar period did not exist at Fort Leavenworth; quite the contrary. The impact on existing doctrine and concepts of innovations like mechanization and aviation did receive attention, especially in the mid to late 1930s. As one historian noted, 'CGSS instructors tested new ideas on employment of mechanized and tank forces, beyond what then-current policy and doctrine required'.[25] Tentative steps to move beyond the current and approved doctrine and conceptualize a potential future were reflected in

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[23] Memorandum From Lt. Col. H. A. Drum, Director, The School of the Line to Assistant Commandant, The General Service Schools. Subject: Annual Report, 1919-1920, in 'Annual Report of Major General Charles H. Muir, Commandant, the General Services Schools, 1920' (Fort Leavenworth: The General Services School, 1920), p. 19. Annual reports from the schools at Fort Leavenworth between 1882-1936 are available at CARLDL http://www.cgsc.edu/carl/resources/archival/annualreports.asp [5 December 2010].

[24] Odom, *After the Trenches*, p. 78.

[25] Nenninger, 'Leavenworth and Its Critics', (p. 220).

such student texts as *Tactical Employment of the Mechanized Division (Tentative)* (1937). This document, while not official doctrine and written about a force that did not yet exist, did sow 'the theoretical seeds from which grew the World War II armored divisions'.[26] This kind of institutionalized intellectual innovation was limited, however. To place it in context, consider that during the 1938–1939 class, the school dedicated almost 200 hours of instruction to teaching the 'square' division, a First World War-era formation, which would disappear only a few months later. At the same time, the school allocated only twenty-nine hours to the study of mechanized units and a mere thirteen hours to aviation subjects.[27] The future, as far as doctrine was concerned, had a short horizon.

Finally, although to a lesser degree than other professional journals of the day, the college's journal, *Military Review*, provided a forum for new ideas or a place to defend old ones. Begun in the early 1920s as a supplemental source of instruction intended to keep officers up to date, the early versions of *Military Review* were limited itself to book reviews and summaries of published articles. Beginning with an article in 1933 by a future chief of staff, then Major, J. Lawton Collins, *Military Review* began to publish more original and 'unofficial' works. By the late 1930s, it was regularly publishing articles on the new tactics and technology being demonstrated in Europe and Asia and occasionally new capabilities being developed in the United States.[28] *Military Review* played an important role in stimulating interwar interest on subjects outside the curriculum. However, it was hampered by two traits. First, content was often command-directed or of a semi-official nature. This often limited interest and quality because it merely served to reinforce, not

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[26] Nenninger, 'Leavenworth and Its Critics', (p. 221).

[27] David E. Johnson, *Fast Tanks and Heavy Bombers: Innovation in the U.S. Army, 1917-1945* (Ithaca: Cornell University Press, 1998), p. 224. During this last pre-war class, the curriculum did manage to squeeze in 31 hours of equitation to the curriculum. A sizable minority of the students thought the curriculum inadequately addressed recent innovations. In a survey of the 1939 CGSS Regular Class, the subjects that students thought inadequately covered were aviation and mechanized units. See Questionnaire, Regular Class in Command and General Staff School, 'Annual Report, Command and General Staff School, 1938-39 ' (Fort Leavenworth: Command and General Staff School, 1939), p. 8. CARLDL.

[28] Between 1922 and 1943, the publication underwent numerous name changes *Instructors' Summary of Military Articles, Review of Current Military Writings, Review of Current Military Literature, Quarterly Review of Military Literature, The Command and General Staff School Military Review*, and finally just *Military Review*. Forrest R. Blackburn, 'Military Review, 1922-1972', *Military Review, 52* (1972), 52-62.

challenge, the status quo. The second limitation no doubt owes much to the first. Until 1972, *Military Review* did not include a reader's forum that would allow for the exchange of ideas and a continuing dialogue. [29]

Despite the efforts of innovative instructors and a sometime lively discourse in the professional journals, graduates of the Leavenworth programme during the interwar period were 'intended to become problem solvers rather than visionaries and motivators'.[30] For many, the Leavenworth interwar curriculum's focus on handling large units and mastering staff skills for a force that was not yet mobilized was overly narrow. For others, especially those focused on the war clouds in the immediate future, it was not narrow enough.

On 4 March 1939, General George C. Marshall wrote to the new CGSC commandant, Brigadier General Leslie J. McNair, to express concern over the 'state of affairs' at Fort Leavenworth. Noting that the current staffs were 'too close to the trees to see the woods,' he admonished McNair to make swift progress in modernizing the curriculum, with special emphasis on the air component and the National Guard. Marshall was particular concerned with the relevance of the education programme to the near-term training requirement, describing how he was 'horrified by the methods taken by [r]egular officers in handling these partially trained troops', and 'depressed by the laborious [...] command post technique and procedure displayed'. Marshall wanted a programme that could prepare the army for the 'first three or four months' of the next war. Whereas the pre-war curriculum had concentrated on serving a fully mobilized force along the lines of existing mobilization plans, Marshall deemed it fundamental that officers address the

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[29] These limitations, when taken together, help to explain why the content of Military Review through the period 1945-1960 more closely reflects the priorities of the Leavenworth commandants than they do the interests of the readership. A survey of *Military Review* between 1945-1959 found that 72 percent of the 172 articles published addressed the subject of tactical atomic or nuclear warfare. Between 1960-1965, the number of articles on this subject dropped to twenty-two, reflecting the waning official interest. See John P. Rose, *The Evolution of U.S. Nuclear Doctrine: 1945-1980* (Boulder: Westview Press, 1980), pp. 57, 72.

[30] Harold R. Winton, 'Toward an American Philosophy of Command', *The Journal of Military History*, 64 (2000), 1035-1050 (p. 1044).

problems associated with a partially trained and equipped force rather than the 'Leavenworth fourth-year-of-a-war type'.[31]

In accordance with the Protective Mobilization Plan of 1939, the army modified its school system's mission significantly to satisfy the skyrocketing requirements for even-minimally trained staff officers. In 1940, the army's war college closed for the duration, followed in 1941 by the Industrial College.[32] The senior student body and the highly experience teaching staffs of these institutions were just too critical to the rapidly expanding WDGS. The school at Leavnworth, did remain open, but with major modifications.

Beginning in November 1940, CGSC taught a shortened ten-week wartime version of the traditional nine-month curriculum termed the general staff course.[33] The aim of the special course was to train and not educate. The curriculum focused on preparing staff officers for the increasingly complex staffs of armies, army groups, and combined (i.e., multinational) headquarters. A total of twenty-seven special classes graduated more than 20,000 staff officers by the time the wartime programme ended in May 1946.

Throughout the war, the college was heavily involved in drafting, reviewing, and teaching revised doctrine. Doctrine development in the interwar years had been an evolutionary effort meant to keep the army relevant to the requirements of mobilization planning. During the war it shifted to an even shorter time horizon. Changes occurred as a result of lessons and insights brought back from overseas battlefields, or in an attempt to update existing doctrine based on new organizational changes and materiel developments.

Leavenworth was also no longer the exclusive source of combined arms work.[34] The post-1942 WDGS reorganizations and the creation of AGF, AAF, and ASF staffs all added to doctrine development. Moreover, new organizations and staff

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[31] Marshall to Brigadier General Lesley J. McNair, Washington D.C., 4 March 1939. *The Papers of George Catlett Marshall, "the Soldierly Spirit," December 1880-June 1939*, ed. by Larry L. Bland and Sharon Ritenour Stevens, 1 (Baltimore: The Johns Hopkins University Press, 1981), pp. 707-708.

[32] The Army War College was closed in the summer of 1940 and did not reopen until 1950. The Army Industrial College ran a shortened course in 1940, closed in 1941, and reopened in 1944.

[33] Marvin A. Kreidberg and Merton G. Henry, *History of Military Mobilization in the United States Army 1775-1945* (Washington DC: Department of the Army, 1955), pp. 611-612.

[34] For most of the war, the CGSC was under the command of the ASF while its curriculum and its role in the drafting of doctrine fell under the G-3.

activities focusing on the explosion of new technology, such as the OSRD, emerged as surprising sources of doctrinal inputs.

Determining the form of future army education in the post-war era began a year before the war ended. In July 1944, the War Department's lead planner for a post-war army, Brigadier General W.F. Tompkins, solicited the commandant of CGSC's views on the 'scope of the post-war Command and General Staff College.'[35] Major General Karl Truesdell, commandant since 1942, replied with a staff study in September which recommended that the war department continue with a wartime training program of ten to sixteen-week courses designed to produce air, ground and service force qualified staff officers at the division level. In addition, Truesdell recommended the creation of a twenty-week-long long advanced general staff course called the command class. This course would serve to fill the gap created by the closure of the AWC at the start of the war and recreate the dual-track nature of the Leavenworth program. While Truesdell's proposal was not well received by the WDGS, which anticipated a return to the traditional yearlong program, it did serve as the basis for an interim solution until a more comprehensive military education plan could be designed.[36]

The first command class began in October 1945. The attendees were a select group primarily of lieutenant colonels, with extensive senior staff and command experience in combat. Truesdell had high hopes for this experiment, noting that it would be a 'proving ground to test adequately the high caliber of the students and that most of them will be among out future generals as the present ones fade out of the picture...'[37] A graduate of the command class experiment, and future four-star general, Hamilton H. Howze recalled that the concept did not, in the eyes of its students at least, live up to its promise;

> The students, almost all colonels, had extensive war experience and
> were high quality people – full of beans and glad to be still alive. None
> was inclined to take the course very seriously, but every one had a

[35] W.F. Thompkins to Commandant, Command and General Staff School, 7 July 1944. Cited in David E. Johnson, 'The United States Command and General Staff School During World War II: Transition to Necessity' (unpublished Masters of Military Art and Science thesis, Command and General Staff College, 1985), p. 96.

[36] Orville Z. Tyler Jr., 'The History of Fort Leavenworth 1937-1951' (Fort Leavenworth: The Command and General Staff College, 1951), p. 23.

[37] Major General Karl Truesdell, 'Command Class, Command and General Staff School', *Military Review*, 25 (1945), 3-5 (p. 5).

happy (and instructive) time because of the company [...] there was lots of battle-induced know-how among us.[38]

Despite such feedback, the seminar style, small group, collaborative problem-solving format was a radical departure from the production-line methods of the recent past and was, as one historian would later describe it, 'perhaps the most sophisticated course ever presented at the college'.[39]

A Post-War College: Education, Doctrine, and the Bomb

In his September 1945 biennial report to the secretary of war, Marshall declared that for the 'common defense' a critical mission of the army was to 'furnish the overhead, the higher headquarters which must keep the machine and the plans up to date', including 'the War College, the service schools.'[40] Marshall, already beginning to transition major decisions on the post-war army to his successor, told Eisenhower on 7 September that 'if we have a Joint War College properly organized and directed, neither an Army nor a Navy War College would appear to be necessary'.[41] This position, based on numerous unstated assumptions about the final post-war form of the War Department, became Eisenhower's during the subsequent debates over the future of the AWC and had a significant impact on the development of the CGSC.

Given the generally conservative nature of education in a traditionally conservative profession, one might reasonably have expected the army's school system to simply revert back to its pre-war composition and focus or, as proposed by

[38] Hamilton H. Howze, *A Cavalryman's Story - Memoirs of a Twentieth Century Army General* (Washington DC: Smithsonian Institute Press, 1996), p. 146.

[39] Robert A. Doughty, 'The Command and General Staff College in Transition, 1946-1976' (Fort Leavenworth: Command and General Staff College, 1976), p. 9, in Defense Technical Information Center (DTIC) <<http://handle.dtic.mil/100.2/ADA030436>> [accessed 1 December 2010]. This was true up until the opening of a select second-year programme, The School of Advanced Military Studies, in 1986.

[40] George C. Marshall, 'Biennial Report of the Chief of Staff of the United States Army (July 1, 1943 to June 30, 1945) ', in *The War Reports of General of the Army George C. Marshall, General of the Army H.H. Arnold, and Fleet Admiral King* (Philadelphia: J.B. Lippincott Company, 1947), pp. 141-300 (p. 295).

[41] Marshall to Eisenhower, Radio No. WAR-60819, September 7, 1945, in Larry L. Bland and Sharon Ritenour Stevens, *The Papers of George Catlett Marshall, "the Finest Soldier," January 1, 1945 - January 7, 1947*, 5 (Baltimore: The Johns Hopkins University Press, 2003), pp. 295-297.

Truesdell, continue along on a modified version of the wartime programme. The fact that a high percentage of the army's senior leaders in 1945 were not only graduates of Leavenworth but also former faculty instructions, might seem to have worked in favour of either proven model. However, the experiences of war caused many to reflect on both the good and bad of the conservative model. Lieutenant General Troy Middleton's view serves as a useful example. Middleton, a highly regarded corps commander in the Second World War, was an instructor at Leavenworth from 1924–1928 where he taught most of the division and corps commanders who would later serve as his peers and superiors during the war. Middleton, not surprisingly, praised the pre-war programme as one where the emphasis was placed on thinking, adding, 'I cannot think of any great military leaders who did not go through the Command and General Staff School.'[42] However, nostalgia for the Leavenworth experience did not over-ride the recognition of the danger of repeating the institutional mistakes of the interwar period. In 1956, Middleton observed that despite its performance in the Second World War, the interwar generation of officers possessed 'a woeful lack of imagination and a disposition to relive the days of Meuse-Argonne.'[43]

On 23 November 1945, the Secretary of War directed that a board of officers designated the War Department Military Education Board, convene to prepare a plan for the post-war educational system of the army. The board of four general officers, presided over by Lieutenant General Leonard T. 'Gee' Gerow, was to deliver a plan, to include the general scope of instruction, for schools operated by the army's major commands and the War Department.[44] Gerow possessed two qualifications that made him superbly qualified for this assignment; he was one of the best-qualified soldier-scholars of his generation, and he was a close friend of the incoming army chief of staff.

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[42] Quoted in Frank J. Price, *Troy H. Middleton: A Biography* (Baton Rouge: Louisiana State University Press 1999), p. 91.

[43] Annex D: Letters to General Officers Regarding Effectiveness of CGSC Graduates and Replies Thereto, 'Report of the Educational Survey Commission - Command and General Staff College' (Fort Leavenworth: Command and General Staff College, 1956), p. 64. Found in Combined Arms Research Library Archives and Special Collections, Fort Leavenworth, KS (Hereafter CARLA) N-13423.90-A.

[44] War Department Memorandum, Subject: War Department Education Board, AG334 (23 November 1945), reproduced in Annex 1, 'Report of the War Department Military Education Board on Educational System for Officers of the Army' (Washington DC: War Department, 1946). (Hereafter known as the Gerow Board) CARLA N13423.1-2. Other members of the board, representing the ground, service, and air components of the army were Major Generals William G. Livesay, Donald Wilson, and Stanley L. Scott.

Gerow's career, a widely varying mix of operational and academic assignments, seemed tailor made for the challenge of preparing the next generation.[45] His record of academic excellence began at the Virginia Military Institute, where he graduated near the top of his class in 1911. His early career was a mix of infantry and signal corps assignments including deployments to Mexico and later France with the AEF. He was honour graduate of the of the Advanced Course of the Infantry School in 1925 and followed that schooling with a stint at the Command and General Staff School where he was also the honour graduate of the class of 1926. It was at Leavenworth that Gerow developed a lifelong friendship with Major Dwight D. Eisenhower, with whom he spent many hours in their study or 'command post' as they called it, preparing for the tactical problems of the day.[46] Additional educational assignments in schools for chemical warfare and armour were capped off with attendance at the AWC in 1931.

After a series of tactical assignments overseas and senior level staff positions including service in the war department and infantry school, Gerow became the acting chief of war plans from 1940–1942.[47] Gerow once again renewed his close friendship with Eisenhower, this time serving as his immediate supervisor.[48] His wartime commands included the 29th Infantry Division, V Corps, and finally the Fifteenth Army in operations spanning D-Day to the end of the war in Europe. His fellow officers considered him both an intellectual and a fighting general that given his 'tendency in combat to put his headquarters too close to the front,' one not alien to the true nature of his profession.[49] Gerow was selected to lead the European Theater of

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[45] Not everyone was enamoured with Gerow's selection. While pensively waiting to know his post-war assignment, General George S. Patton lamented that Gerow was selected for an assignment he coveted and wrote, 'he (Gerow) was one of the leading mediocre corps commanders in Europe and only got the Fifteenth Army because he was general Eisenhower's friend.' George S. Patton, Jr., diary entry dated 18 August 18 1945 cited in Stanley P. Hirshson, *General Patton: A Soldier's Life* (New York: Harper Collins Publishers, Inc., 2002), p. 651.

[46] Carlo D'Este, *Eisenhower: A Soldier's Life* (New York: Henry Holt and Co., 2002), p. 178.

[47] Biographical details of Leonard T. Gerow cited in Appendix 1, 'History of the Fifteenth United States Army, 21 August 1944 to 11 July 1945' (Fort Leavenworth: United States Army, 1946), pp. 81-83. CARLA 940.5412.

[48] Gerow's promotion out of war plans division was both based on merit and the fact that Marshall knew he 'had grown stale from over-work'. Eisenhower later recalled Gerow's wry sense of humour with his parting words in 1942 as 'Well, I got Pearl Harbor on the book, lost the Philippine Islands, [and] Sumatra. Let's see what you can do.' Quoted in D'Este, *Eisenhower: A Soldier's Life*, p. 291.

[49] Forrest C. Pogue, *Pogue's War - Diaries of a WWII Combat Historian* (Lexington: University Press of Kentucky, 2001), p. 24.

Operations (ETO) General Board because, according to Eisenhower, he was the 'most experienced and at the same time most progressive officer we could find.'[50] The assignment turned out to be was short-lived. In August, General George S. Patton was tapped to take over the General Board so that Gerow could return to the United States to take charge of a more significant project, the study and leadership of the army's post-war educational programme.

Upon his return to the United States, Gerow assumed his post as the commandant of the CGSC, a position that included command of Fort Leavenworth. However, his primary duty for the first few months was overseeing the Military Education Board, which simply became known as the Gerow Board. The board received the task to assess the current officer education programme and develop a plan that accounted for the needs of the army as well as those schools 'operated on the War Department level' that naturally impacted on the army.[51]

This early post-war board, despite its high visibility, was only one of several studies looking at proposals for post-war education. In many ways, all of these studies were part of the larger ongoing public debates and bureaucratic manoeuvering over the issues of unification.[52] To formulate their recommendations and meet the tight

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[50] Dwight D. Eisenhower, *Crusade in Europe* (Garden City: Doubleday, 1948), p. 452. The General Board was established in the European Theatre of Operations, which produced 131 separate reports. While this board examined doctrine, organization, and equipment in great detail its utility to conceptualizing the next war was limited. As one volume of the General Board report explained, it did 'not consider or conjure with the potentials of atomic energy, rocket propulsion, guided missiles, or the field of radar or infrared. With the effects of these latter on the concept and conduct of future warfare eliminated from consideration, the study is admittedly not completely comprehensive'. 'Study of Types of Divisions - Post War Army', The General Board, 17 (APO 408: United States Forces, European Theater, 1945), p. 2. Center of Military History, Fort McNair, Washington, DC (Hereafter CMH) UA25.U586.

[51] Memorandum from R. H. Christie, Adjutant General, WDGS, Subject: War Department Military Education Board, 23 November 1945. Reproduced in Annex 1, 'Gerow Board', p. 14.

[52] For example: The Joint Chiefs of Staff Special Committee for Reorganization of National Defense (Richardson Committee) Report (11 April 1945), recommended, although not unanimously, that a single department of the armed forces be created comprising the Army, Navy, and Air Force. As a result the Joint Staff directed General John DeWitt, commandant of the Army-Navy Staff College, to draw up a plan for joint post-war military education. The resulting 'General Plan for Post-war Joint Education of the Armed Forces' (22 June 1945) recommended an education system that would produce a 'common indoctrination.' DeWitt recommended a program where up to thirty percent of officers would attend schools outside their service. At the highest level, officers would attend an Army-Navy College, obviating the need for separate service War Colleges. Neither the DeWitt Plan, nor the Richardson Plan was acted upon, but both shaped the debates. See Harry P. Ball, *Of Responsible Command - A History of the U.S. Army War College*, Revised (Carlisle: Army War College Alumni Association, 1994), pp. 258-260; Masland, *Soldiers and Scholars*, pp. 132-133. For an overview of the lager unification debate in this period, see Paul Y. Hammond, *Organizing for Defense: The American*

three- month deadline, Gerow and his fellow board members surveyed all the existing post-war organizational and educational plans, considered the draft recommendations for unification emerging from the Patch-Simpson Board, and interviewed some seventy-seven witnesses, primarily commanders and staff officers charged with educational responsibilities.[53]

The Gerow Board issued its report in early February 1946. Its specific recommendations were overcome by events and went largely unimplemented. However, the Board's report was far reaching in its influence on post-war military education philosophy through its propagation of a 'systematic, hierarchic approach to officer education'. In the words of one official historian, the Gerow Board 'set the pattern of the education system for officers of the entire armed forces'.[54]

Gerow recognized, and made clear from the beginning, that it would be a mistake to return to the conservative comfort of the pre-war era. In his welcoming address as commandant to the command class in March 1946, he captured the tension inherent in educating highly experienced students in an environment of rapid technological change within the context and traditions of the Command and Staff School. In many ways, Gerow's admonition to the class defined the institutional challenge in the early years of the Cold War:[55]

> We do not expect universal agreement with all of our teachings. Many of you have been successful commanders and staff officers by following methods appropriate to your particular theatres. There are many ways of winning battles and any officer who leaves this School with the idea that it can be done by one method only has wasted his time. Follow accepted procedures as a general rule but do not hesitate to abandon them when conditions warrant. Be flexible in your thinking. *Study the trends of future warfare. Adapt your thinking to the next war, not what you did in the last one.*[56] (Emphasis added)

Military Establishment in the Twentieth Century (Princeton: Princeton University Press, 1961), pp. 186-226.

[53] Annex 1, 'Gerow Board', p. 14. For a list of the seventeen post-war military education plans reviewed and personnel interviewed see p. 20-21.

[54] Robert T. Davis II, 'The Challenge of Adaptation: The US Army in the Aftermath of Conflict, 1953-2000', The Long War Series Occasional Paper (Fort Leavenworth: Combat Studies Institute, 2008), p. 12; Tyler Jr., 'The History of Fort Leavenworth 1937-1951', p. 25.

[55] The Command Class was an extension of the shortened wartime program. There were only two session of the five-month program, the final of which graduated on 31 July 1946. The first post-war 'regular' ten-month class began in September.

[56] Opening address, Second Command Class, 1 March 1946, by LTG Leonard T. Gerow, Commandant, The Command and General Staff School, Fort Leavenworth Kansas. (CARL) A

Despite words to the contrary, getting men with several years of recent combat experience to internalize concepts not grounded in those experiences would prove to be a more difficult educational and leadership challenge. William E. DePuy, a CGSC student during one of the first post-war courses and a future four-star general, recalled that the instructors had a difficult time managing classes full of combat veterans — each of whom 'considered himself an expert'. DePuy was appreciative, however, of the chance to expand his understanding of the profession and 'learn the grammar for one's own native language'.[57]

Before the Command and Staff School could complete the transition from its wartime mobilization course to its peacetime curriculum, it required a clearly stated answer to the question: education for what? The answer to that question would orient the school even as the larger debates over the army's role in the nation's security and even the specific scope of the curriculum were being hotly debated. The Gerow Board defined the overall mission of the army education system with a clear orientation on the future:

> The mission of the educational system for officers of the Army is to provide instruction which *stimulates progress in the art of war*, and which together with actual duty in command and staff positions, will ensure the development of personnel capable of efficient leadership in the preparation for war, the prosecution of war, and the execution of responsibilities of the Armed forces after the cessation of hostilities.[58] (Emphasis added)

The emphasis on 'progress in the art of war' stands in stark contrast to the formal mission statement and guidance in the wake of the First World War, which with minor exceptions dominated the curriculum until Second World War. The War Department in 1919 stated that the objective of the school system for officers was to 'provide systematic and progressive courses of instruction and training that will prepare each officer to perform the highest duties of command and staff

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commandant just after the First World War also 'cautioned against a predilection to base tactical studies and conclusions solely on the peculiarities of the World War' Memorandum from Director, School of the Line, to Assistant Commandant, The General Services School, Subject: Annual Report 1920-1921, in Appendix E, 'Annual Report of Colonel H.A. Drum, Commandant, the General Service Schools 1921' (Fort Leavenworth: General Service Schools, 1921). CARLDL.

[57] Henry G. Gole, *General William E. Depuy: Preparing the Army for Modern War* (Lexington: The University Press of Kentucky, 2008), p. 69.

[58] 'Gerow Board', p. 5.

commensurate with his ability'.[59] More specifically, repeated emphasis in annual reports from 1920 through 1940 was to 'educate students in the practical skills required for effective command and control of divisions, corps, and armies.'[60] These practical skills manifested themselves in a tendency to train and not educate students.

To guide the development of the new curriculum the Gerow Board proposed a set of eight objectives. Most of these objectives were derived from the existing CGSC model, such as ensuring a balanced system; preparing officers for command and staff assignments at multiple echelons; and developing professional traits of initiative, resourcefulness, mutual confidence, and respect. In combination, they were intended to promote understanding and coordination between the army, navy, other government agencies, and civil authorities. Two new objectives, however, supported a new goal for military education — innovation for an uncertain future. The Gerow Board declared that going forward, army education would need to:

> [S]timulate constructive thought to ensure constant appreciation of, and adjustment to, the trends, which may affect warfare of the future; and point the way to improvement in the organization, equipment and employment of the Army.[61]

To some degree the idea that Leavenworth would be on the leading edge of doctrinal development is not far removed from policy of the late 1930s where school texts attempted to anticipate doctrinal and technological trends. The new context demanded that Leavenwrth go well beyond keeping doctrine current with new technology but that it was to anticipate change. Or as General Sherman charged the Class of 1882, it was not enough just to preserve the habits of war, but to push beyond them 'keeping pace with the general knowledge of the world'.[62]

Leveraging his experience on the board, Gerow set about creating an organization and curriculum development process in preparation for the upcoming

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[59] *General Orders No. 112, Military Education in the Army, 25 September 1919* (Washington DC: War Department, 1919) (1). The term 'progressive' in the objective statement refers to an emphasis on improving the 'art of how to teach others,' and not the art of war. See *Memorandum, Subject: Explanation of Course and Other Pertinent Comments, 12 August 1919* (Fort Leavenworth: The Army Service Schools, 1919). CARLDL http://cgsc.cdmhost.com/u?/p4013coll4,333 [Assessed 1 December 2010].

[60] For a discussion of the interwar mission see Schifferele, *America's School for War: Fort Leavenworth, Officer Education and Victory in World War II*, pp. 63-85.

[61] 'Gerow Board', p. 5.

[62] Address to School of Application, pp. 7-8.

1946–1947 academic year. In late May, the WDGS issued an education guidance memorandum, largely based on Gerow Board concepts. Specifically, the WDGS directed that the college look to the future for at least a portion of its curriculum and build a curriculum that could more rapidly adapt to the changing character of modern war. According to the WDGS's interim guidance:

> The mission of the Command and Staff College is to provide instruction in the *light of war lessons and modern developments* to insure:
> (1) *Research and study designed to improve* methods of administration, intelligence, tactical, and logistical procedures.
> (2) Efficient administrative, intelligence, and logistical support of the fighting force.
> (3) *Effective development* and employment of the combined ground arms within the framework of the army.
> (4) Coordinated employment of divisions and corps units with Air and Naval forces. (Emphasis added)

In language mirroring that of the Gerow Board, the WDGS directed that in addition to preparing officers 'for duty as commanders and staff' at the division and higher levels, the college was to:

> [K]eep aware of all developments in the means of warfare, to study their effects upon methods and doctrine of the army, and to recommend changes indicated by these developments.[63]

Organizationally, the interim guidance established a new CGSC and four subordinate schools: Combined Arms, Administration, Intelligence, and Logistics.[64] Each school focused on a functional staff specialty and would be directed by the corresponding staff element of the WDGS. The curriculum would use three-quarters of the prescribed 10-month school year to teach the core subjects necessary to qualify officers as commanders and staff 'at division and higher levels'. The remaining one-

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[63] Memorandum for Commandant, Command and General Staff School, from Brigadier General G.L. Ederle, Acting Assistant Chief of Staff, G-3, WDGS, Subject: Command and Staff College, 27 May 1946, attached to 'Gerow Board'. General Order No 25, 11 June, 1946 announced the name as Command and Staff College (CSC) effective May 29, 1946. General Order No. 16, 8 May 1947 changed name to the Command and General Staff College (CGSC), effective 25 April, 1947.

[64] Until this change, the post-war organizations reflected the organizational pattern of the War Department with a Staff Division (covering personnel, intelligence, operations, and logistics) and a Command Division (Covering the air, ground, and service arms).

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quarter of the curriculum would be controlled by one of the four functional schools and be 'devoted to specialization above the corps level.'[65]

In effect, and as a direct consequence of the failure to reopen the AWC, CGSC was being asked to cover in less than one year material that was previously covered by, at times, a two-year course plus all of the army-specific subjects included in the pre-war AWC curriculum.[66] Despite the otherwise progressive tone of the guidance, the combined effect of having to educate officers for command and staff duties from the division through the national level — all within a ten-month course — left little time for serious thought of the future of war.

In July 1946 the War Department published its final guidance to Gerow in the form of *War Department Circular 202*. In this document, the War Department confirmed most of the interim guidance, added specific personnel qualifications for students, and made two substantive modifications. First, the circular specified the scope of operational education as relating to the 'effective development and employment of all field forces within the framework of the army group'. Second, it made explicit that 'doctrine taught at the college will be as prescribed by the War Department'. With the first addition, the scope of education was now locked-in as ranging from tactical through strategic. The second addition would seem to inhibit execution of the mission and objective statements contained in the same directive, which encouraged research and study based on 'war lessons and modern developments'.[67] These contradictions were a reflection of ongoing tensions between the newly defined roles of Eisenhower's post-war general staff and the shifting nature and authority of the wartime commands — the ground, air, and recently disbanded service forces.[68]

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[65] Memorandum for Commandant, Command and General Staff School, from Brigadier General G.L. Ederle, Acting Assistant Chief of Staff, G-3, WDGS, Subject: Command and Staff College, 27 May 1946, with Annex: Modifications of the WD 'Gerow Board'. The breakdown of schools and sponsoring WDGS directorates was that the School of Combined Arms would be overseen by the G-3, the School of Administration by the G-1, School of Intelligence by the G-2, and the School of Logistics by the G-4.

[66] Doughty, 'The Command and General Staff College in Transition', pp. 10-12.

[67] War Department Circular No. 202, Washington D.C., 9 July 1946, reproduced as Appendix C, 'Survey of the Educational Program, the Command and General Staff College' (Fort Leavenworth: The Adjutant General's Office, Personnel Research and Procedures Branch, 1947), pp. 1-2. (Hereafter Cited as Henry Commission) CARLA R-13423.7-3.

[68] The Army Service Force was disbanded effective 11 June 1946. The reorganization directive, War Department Circular 138 (14 May 1946) also stated the general staffs will 'plan, direct, coordinate, and

With the first regular course due to begin in September 1947, Gerow had little time in which 'to prepare a new curriculum, plan the instruction, and get a new programme underway'. This meant that the new curriculum would be substantially 'based on the conduct and lessons of World War II'.[69] New instructors flooded into Leavenworth in summer 1946, creating what could be argued was 'the most experienced military faculty the school would enjoy for decades'.[70] Before students filled Leavenworth in September, Gerow put his cadre through an intensive three-week instructor-training programme. A civilian academic study group noted that the positive impact of this programme was commendable and 'probably unique in the annals of higher education'.[71]

While still preparing for the first class, Gerow initiated the first of what would be a near continuous stream of external studies, boards, and commissions designed to examine some portion of the school's purpose, mission, curriculum, organization, method, or administration. Referencing Eisenhower's 30 April memorandum, 'Scientific and Technological Resources as Military Assets', Gerow requested that Dr. Edwin R. Henry from the Adjutant General's Personnel Research Section visit CGSC to 'assist materially [...] in the organization, formulation and conduct of instruction; modernization of testing and research methods; and the establishment and operation of a statistical system'. Gerow also requested assistance in determining the 'expert civilian personnel' requirements of the college.[72] Henry and a group of 'educational consultants', or the Henry Commission as the group became known, visited Leavenworth between August and December 1946 and in February 1947 delivered a

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supervise.' See James E. Hewes Jr., *From Root to McNamara: Army Organization and Administration* (Washington DC: United States Army, Center for Military History, 1975), p. 158.

[69] E. A. Salet, 'Reorganization of the Command and General Staff College', *Military Review*, 28 (1948), 3-12 (p. 3).

[70] Michael David Stewart, 'Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College 1946-1986' (unpublished PhD thesis, University of Kansas, 2010), p. 28.

[71] 'Henry Commission (1947)', p. 49. The new instructor orientation program is explicated in Benjamin F. Boyer, 'Training Staff Trainers', *Military Review*, 26 (1946), 53-56.

[72] Memorandum to ACofS G-3, WDGS from Gerow, Commandant Command and General Staff College, subject: Use of Scientific and Technological Experts at the Command and Staff College, 4 June 1946. Reproduced in Annex A, 'Henry Commission (1947)', p. 109. Henry was the Chief of Personnel Research in the War Department and a psychologist; Dr. Mitchell Dreese was a professor of educational psychology at Columbia University; Dr. Harold A. Edgerton, a professor of psychology at Ohio State University; and Dr. Jacob S. Orleans, an education professor at the City College of New York.

report. The commission made several recommendations that over time either shaped the direction of the college or correctly identified its path.

The first was that Leavenworth should follow best educational practices and ensure the college was organized around the curriculum — not the other way around. The current situation, with four specialized schools, 'did not provide the integration of the content that the mission of the college would seem to require'.[73] The commission noted that this was not surprising given that, in accordance with *War Department Circular 202*, 'the organization of the college preceded the development of the curriculum'. Since it did not directly flow from the educational objectives, the organization of the college 'had considerable influence in determining the nature of the curriculum'. The solution was to split the college by echelon, where one college would focus on division, corps, and army level related material and a new four-school 'university' would focus on general staff training above army level.[74]

The second commission recommendation was that in the future, curriculum planning should rest under the control of the assistant commandant, members of the department of analysis and research, and a representative of the other departments.[75] This was necessary given the 'directive nature' of the WDGS sections charged with an oversight role in the education of staff officers, and was the best way to ensure the curriculum determined the organizational character of the college.

Finally, the commission observed that, although the college promoted a philosophy of 'applicatory and experimental' teaching methods, the students spent considerable time engaged in what was described as 'passive learning'. While much of this failing was ascribed to lack of preparation time for this first class, it was made worse by a tendency to teach core subjects to the entire student body in an auditorium.[76] The commission found such teaching techniques 'of questionable validity', joking that 'it is for good cause that the college professor had been

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[73] 'Henry Commission (1947)', p. 5.

[74] This recommendation was the first of many which pointed to the need for a War College to adequately meet the army's education requirement. See Ball, *Of Responsible Command* pp. 267-280

[75] 'Henry Commission (1947)', pp. 15-27.

[76] Gerow estimated that for every hour of platform instruction, his instructors must put in some sixty hours of research. 'Conference on the AGF School System (3-4 March 1947)' (Fort Leavenworth: Command and Staff College, 1947), p. 23. CARLA N-13423.18.

characterized as a man who talks in somebody else's sleep'.[77] By contrast the use of discussion groups, although too often narrowly focused on existing doctrine, often provoked a 'vigorous debate' between students and their instructors. The commission recommended that by leveraging the 'varied backgrounds and special knowledge' of the small discussion groups, 'proposed solutions to military problems [...] could be consolidated and brought to bear upon official doctrine.'[78]

One final legacy of the Henry Commission was the retention of one of its members, Dr. Jacob S. Orleans, as a permanent consultant to the commandant with the title of Psycho-Educational Advisor.[79] Although Orleans would not remain on the college staff for long, he enjoyed a long association with the institution. More importantly, he opened the door for the continuous influence of the civilian academic community in the college's development.

The army in this period had no formal concept development process. Its doctrine development process was diffuse and while it was clear that the WDGS must approve formal doctrine, there was no systemic path to that approval. In the immediate aftermath of the war, development came in the form of lessons-learned studies. Boards of officers were assembled under various commands and staffs to consider recent experience and record its lessons. The most forward-looking of these, because it dealt with both the content and process of development, was the War Department Equipment Board, known popularly as the Stilwell Board. The Stilwell Board met in the winter 1945 'for the purpose of reviewing types of equipment required for the Army Ground Forces in the post-war Army [...] and such other matters as the board deems pertinent and necessary for guidance in developing equipment for the post-war Army.'[80] The board's description of the emerging strategic

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[77] 'Henry Commission (1947)', p. 33.

[78] 'Henry Commission (1947)', p. 36.

[79] Orleans would go on to serve on numerous military education advisory boards, panels and commissions. Between 1947 and 1950, in addition to CGSC, Orleans assisted the Adjutant Generals School, Air Command and Staff School, Air University, the Military Police School, and the Officer Candidate School. See biography in Jacob S. Orleans, Karl R. Douglass, M.S. Eddy, H.F. Harding, Geoffrey Keyes, Troy Middleton,, 'Report of the Educational Survey Commission - Command and General Staff College' (Fort Leavenworth: Command and General Staff College, 1956), p. 131, in CARLA N13423.90A

[80] War Department, Adjacent Generals Office, Subject: Appointment of War Department Equipment Board, 8 October 1945. Reproduced in 'Report of War Department Equipment Board (Stilwell Board)' (Washington DC: War Department, Office of the Chief of Staff, 1946).

environment emphasized the impact of 'greatly improved means of warfare' in the form of 'atomic explosive[s], nuclear radiological materials, biological agents, and chemical gases.' In comparison, and perhaps because of the rapid advances in the war years, the board opined that 'conventional weapons can only be slightly improved.' This vision of future war, the board argued, necessitated the creation of a new combat developments process that would assure the 'step-by-step change-over from the discarded material [of war] to the new'.[81]

The Stilwell Board identified three components to a combat development process: an experimental 'combined arms force under selected [...] progressive commanders', the ability to conduct 'extensive service tests of new weapons and equipment', and a process that would continuously review the 'concepts of warfare [...] in accordance with anticipated developments in weapons and other agents of warfare' that would lead to the formulation of 'tactical doctrine for [their] employment'.[82] Although a fully institutionalized combat developments process would not exist for more than a decade, two of its three components, combined arms forces and materiel development boards, already existed.[83]

The final component of the Stilwell Board's recommendation, the one examined in this chapter, was a mechanism to review the 'concepts of warfare [...and] formulate tactical doctrine'. Before proceeding, it is worth examining the use of the terms 'concept' and 'doctrine'. Given the context of new weapons and potentially transformational changes in the character of war, the Stilwell Board's use of terms is close to the definition of those terms described by a scholar of military change. One historian argues that 'where a concept is a hypothesis — an inference

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[81] 'Stilwell Board', pp. 1-2.

[82] 'Stilwell Board', pp. 7-8.

[83] A dedicated 'experimental' force, as called for by the Stilwell Board, would wait until the introduction of the Combat Development Experimentation Command (CDEC) in 1956. However, ad hoc combined arms units were available if tasked. While the War Department reorganization of 1942 gave the existing board system a more combined arms view, overall the process was still hobbled by the same parochial, bottom-up, incremental, technology centric challenges of the interwar version. In 1946, AGF, Development Section, oversaw three combined arms boards at Fort Bragg, Fort Benning, and Fort Knox which were responsible for the 'evaluation of all recommendations for the development of new or improvement of existing equipment [...] the study of foreign equipment [...] preparation of military characteristics [...] performance of user tests [...] recommending a basis of issue [...] and review of [...] performance'. 'Army Ground Forces Board No. 3, Lecture by BG H.H. Hartness', The Infantry Conference (Fort Benning: The Infantry School, 1946), p. 1., CARLDL http://cgsc.cdmhost.com/u?/p4013coll8,469 [Accessed 1 December 2010].

that suggests that a proposed pattern of behavior *may possibly* lead to a desired result; a doctrine is a generalization based on sufficient evidence to suggest that a given pattern of behavior *will probably* lead to the desired result'.[84] (Emphasis added).

Formally, the CGSC played a pivotal role as the combined arms integrator of doctrine coming up from the service schools and boards of the AGF. Moreover, through liaison relationships and coordination by the responsible offices of the WDGS, the CGSC also served to integrate the administrative and technical services, as well as AGF and occasionally, navy inputs.

During the period 1945–1947, internal reorganizations and the impending unification of defence created a period of significant organizational confusion. On paper, the commandant had control of the primary sources for concept and doctrinal development guidance. The first was the R&D Division of the WDGS. As a result of Eisenhower's 1946 WDGS reorganization, research and development became a staff co-equal to operations. The Director R&D was charged with 'supervising testing of new weapons and equipment and [...] the *development of tactical doctrines governing their employment in the field.*'[85] (Emphasis added). Despite the stated intent, issues concerning consolidating the science and technology aspects of R&D consumed the new department, and it addressed the concepts or doctrines of employment only tangentially.[86]

The second source was the director for organization and training, who had the responsibility for, among other things, direction of the army's schools. In the era of sharply decreasing budgets, rapid demobilization, and the support of large overseas occupation forces, there was not much in the way of direction for other than the most routine and evolutionary development tasks. Interest in thinking about future concepts from outside CGSC itself would have to wait until early 1947, when responsibility for the combined arms portion of the army school system shifted out of the army staff and came to the commander AGF.[87]

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[84] I.B. Holley Jr., *Technology and Doctrine: Essays on a Challenging Relationship* (Maxwell AFB: Air University Press, 2004), p. 21. Holley has modified an argument first raised by Dale O. Smith, *U.S. Doctrine: A Study and Appraisal* (New York: Duell, Sloan, and Pearce, 1955), pp. 3-11.

[85] War Department Circular 138 (14 May 1946) cited in Hewes Jr., *From Root to McNamara*, p. 157.

[86] Charles R. Shrader, 'History of Operations Research in the United States Army: 1942-1962', I (Washington DC: United States Army, 2006), pp. 171-172.

[87] Hewes Jr., *From Root to McNamara*, p. 168.

Shifting responsibility out of the WDGS did not, in the end, solve the problem. As of late 1947, even as some in the army's senior leadership began to call for new concepts for future war, there was no clear or consistent guidance to Fort Leavenworth for such developments.[88] In late 1947, a study by the army's civilian deputy director of R&D recommended the creation of a command where the army could consolidate the functions of requirements determination, doctrine development, and user materiel testing.[89] This first high-level articulation of the need for a combat developments capability was, however, still ahead of its time.

The first major post-war change that would impact on CGSC's role occurred as a result of the Cook Report. Major General Gilbert R. Cook recommended that the AGF be converted from a command to a special staff agency. The result was the creation of the AFF with broad integrating responsibilities for 'schools, combat arms boards, organization and training of units and individuals, and combat doctrine'. Under the new organization, the commandant CGSC took on a greater role in the coordination and review of doctrine from the branch schools and as a participant in the development activities of the boards as well. The development of army combined arms doctrine was for the first time consolidated in the hands of the commandant of CGSC.[90]

In the introductory section of its 1946 report, the Stilwell Board observed that creating capabilities for a force within the context of an uncertain future presented a series of 'chicken or the egg' dilemmas:

> Changes in tactics and organization affect the development of weapons and equipment, since from proposed new tactical uses or organizational groupings, demands are created for new equipment. At the same time, research and development may be capable of supplying a new article but lack the demand to create it due to the failure of the tactical user to visualize and request what to him is unknown. The concepts of future tactics, organization and equipment should be

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[88] The most prominent public call for new concepts, which accounted for the dramatic changes in the character of war, was Major General James M. Gavin, 'The Future of Airborne Operations', *Military Review*, 27 (1947), 3-8 (pp. 3-6).

[89] Memorandum, Dr. Cloyd H. Marvin to the Secretary of the Army, Washington, 26 Nov 1947, sub: Army Research and Development. Reproduced as tab 40 in Lowell R. Eklund, 'Science and the Soldier: The Organization for Research and Development in the Army, Past Present, and Future' (unpublished MS Thesis thesis, Syracuse University, 1947). Copy found at The Military History Institute, Carlisle Barracks, PA (Hereafter MHI) U383.E44.

[90] The changes were promulgated as Department of the Army Circular 64 (10 March 1948).

examined and stated clearly in order that research and development can be directed intelligently.[91]

To one degree or another this challenge, 'to state clearly concepts of future tactics, organization and equipment,' confounds all military developments programmes during peacetime. For the army of the early Cold War this 'problem' was a unique one. For most of the army's recent experience, developing a view of requirements for the immediate threat was an inherent part of the mobilization process. As the Second World War demonstrated, even where concepts, doctrines, and technologies fell short, and not withstanding the sometimes-painful cost of learning, these failures were correctable. More importantly, given the advantageous geo-strategic position of the United States, failures of foresight in this regard were not considered strategically fatal.[92] In the post-war strategic environment, the rules changed. The strategic, institutional, and operational costs of getting things wrong were never higher.

This tension between the technology 'chicken' and the conceptual 'egg' came into the sharpest focus when considering the role of atomic weapons in future war. Atomics, as some called research into this new class of weapons, were not the only area of conceptual debate in the army. The mid-1940s were full of discussion and debate in the branch journals and in conferences associated with the various equipment boards on subjects such as tactical air-ground integration, the next generation of tanks, and the balance and relationship between artillery and missiles. But in terms of institutional impact, not to mention operational effects, atomic weapons were in a class by themselves. While the full range of the contemporary strategic debate over the proper role of atomic weapons in national security is beyond the scope of this dissertation, it is worth identifying the broad outlines.

The start of the atomic age fundamentally challenged the army's traditional conceptual and related institutional framework. The widely accepted belief that atomic weapons and not soldiers would soon be the decisive force in war was deeply unsettling and a difficult proposition to refute. Closely related to the conceptual justification for an army was the resulting loss of institutional position. If the decisive

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[91] 'Stilwell Board', p. 5.

[92] In many cases the example and experience of adversaries and allies provided the corrective to initial conceptual errors. This was obviously not an option with nuclear weapons.

force was to be an atomic strike, then the army's self-perception as the indispensible service — that of being the first among equals — was in jeopardy.

The possibility of long-range strategic attacks on a country's heartland, coupled with the use of atomic bombs to destroy its industry and associated populations, was instantly terrifying and beguiling. Journalist and commentator Walter Lippmann satirized the populist view in 1946, writing that atomic weapons were:

> [T]he perfect fulfilment of all wishful thinking on military matters: here is war that requires no national effort, no draft, no training, no discipline, but only money and engineering know-how of which we have plenty. Here is the panacea which enables us to be the greatest military power on earth without investing time, energy, sweat, blood and tears, and — as compared with the cost of a great army, navy, air force — not even much money.[93]

The successful use of the atomic bomb as strategic weapon to end the war with Japan, combined with the public's fascination with the idea of an 'absolute weapon', effectively overwhelmed initial thinking about the weapon's potential role in land warfare.[94] As one historian noted, within months of the opening of the atomic age, 'all the major elements of [America's] contemporary engagement with the nuclear reality took shape'.[95] The essential role of the atomic bomb remained fixed

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[93] Walter Lippmann quoted in Lawrence Freedman, *The Evolution of Nuclear Strategy* (New York: St. Martin's Press, 1983), p. 48. Lippmann's essay was an appeal against unilateral disarmament.

[94] Early public reporting was exemplified by popular descriptions of 'push-button wars' of the future from famed military journalist Hanson Baldwin, who wrote a few weeks after the dawn of the atomic era that 'surface forces and piloted air fleets seem relegated [...] to supporting and secondary roles.' Hanson W. Baldwin, 'The Atom Bomb and Future War: There May Be Devastating 'Push-Button' Battles', *Life*, 20 August 1945, pp. 17-20 (pp. 17-20). Soon after the first, more scholarly but not less strategic centric, efforts like the those by William L. Borden, *There Will Be No Time: The Revolution in Strategy* (New York: The Macmillan Company, 1945); Bernard Brodie, *The Absolute Weapon: Atomic Power and World Order* (New York: Harcourt, Brace and Company, 1945). Both of these books framed much of the strategic debate and general perceptions of atomic weapons for a decade. Another public voice, based strongly on moral concerns and a desire for international and scientific control of atomic energy, found voice among the very scientists who brought the bomb into the world. For example, see essays by such scientific luminaries as Oppenheimer, Condon, Bethe, Szilard, and Einstein in *One World or None: A Report on the Full Meaning of the Atomic Bomb*, ed. by Dexter Masters, Katharine Way (New York: McGraw-Hill Book Company, 1946). Many of these authors were members of the newly formed Federation of Atomic Scientists (later renamed to the Federation of American Scientists) who would contribute to one of the only regularly published non-government outlets of information of atomic weapons and their potential in the *Bulletin of Atomic Scientists* beginning in December 1945.

[95] Paul Boyer, *By the Bombs Early Light: American Thought and Culture at the Dawn of the Atomic Age*, 2nd (Chapel Hill: University of North Carolina Press, 1994), p. xxi. One area, not entirely clear to the public at the time, was the degree to which owing to practical problems of cost, fragility, and

through late 1949 as chairman of the Joint Chiefs of Staff Omar N. Bradley noted in October that the bomb would be our 'principal offensive weapon in any future war'.[96]

When the army discussed the potential impact of atomic weapons on land war in the immediate aftermath of the bombings in Japan, it was generally uninformed, non-technical, and without any significant impact. Early analysis of military utility focused almost exclusively on the strategic implications or in public musings. For example, in late 1945 the JCS undertook a study of the effects of the atomic bomb on 'warfare and military organization'. It found that the atomic bomb would 'be primarily a strategic weapon of destruction against concentrated industrial areas' and that it was 'difficult to imagine specific circumstances in which the present bomb could justifiably and profitably be employed in support of the conventional land or sea battle'. The JCS went on to say that 'at this time' the atomic bomb did not 'justify elimination of conventional armaments or major modifications to the services that employ them'.[97] The qualifier was a classic joint staff compromise, where those who foresaw a military dominated by atomic considerations could claim equal support as those arguing for the timelessness of boots-on-the-ground.

Against this background, the army's conceptual outlook on atomic weapons was hardly promising. In January 1947, General Leslie R. Groves, arguably the most knowledgeable army officer on atomic weapons, drafted the language Eisenhower would later use to comment on the aforementioned JCS study. In a wide ranging memorandum, Groves argued that the new weapons were 'not an all-purpose weapon', but rather ones of 'rapid attrition' that, if used in sufficient numbers, would make war between 'two disciplined nations [...] unendurable [...] unthinkable'. Nevertheless, Groves made the point that the atomic bomb could not 'stand alone in the nation's arsenal' and did not obviate the need for a 'well-rounded military force'. The army of the future, he argued, would be 'markedly affected by the impact of the

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scarcity of materials, any discussion of the general use of atomic bombs, outside of narrowest of strategic scenarios, was largely theoretical.

[96] General Omar N. Bradley, 'This Way Lies Peace', *Saturday Evening Post*, 15 October 1949, pp. 32-170 (p. 169).

[97] Joint Strategic Survey Committee, 'Overall Effect of Atomic Bomb on Warfare and Military Organization, JCS 1477/, (30 October 1945), CCS 471.6 (8-15-45),' p. 4; Records of the Joint Chiefs of Staff, RG 218 National Archives and Records Administration, College Park, MD (Hereafter NARA). The development of contingency war plan concepts (the Pincher series) by the JCS in 1946 implied but did not explicitly call for the use of atomic weapons in a global war against the USSR. Steven T. Ross, *American War Plans: 1945-1950* (London: Drank Cass, 1996), pp. 25-49, 56.

atomic bomb' but in ways yet to be understood. While debates over the potential for international control or the most effective means of delivery unfolded, Groves argued that 'study, experiment[ation], invention, development, and training' were required to determine 'the best army to build around the all-powerful atomic weapon'.[98]

For his part, Eisenhower cautiously approached the question of atomic weapons and tried to withhold any judgments or positions that would preclude institutional options in the future. As Army Chief of Staff, Eisenhower argued that the United States should avoid excessive reliance on atomic weapons. It was clear that even under the most atomic-centric scenarios, many traditional missions, such as seizing bases for atomic bombers, would still require conventional forces. Eisenhower's position, one the army would hold for most of the 1940s, was that no irreversible decisions should be made until the implications of these weapons were fully unerstood. Of course, any understanding would include the role of land power operating with, or in the presence of, atomic weapons.[99]

Overcoming what Lieutenant General James M. Gavin later described as 'hysterical views' about atomic weapons as wonder weapons required a clear, coherent, and feasible counter-argument.[100] Lacking a coherent conceptual basis or any empirical data to counter the 'absolute weapon' belief led many in the army to simply ignore the issue or discount the impact of atomic weapons. Between the

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[98] Major General Groves, Leslie R., 'Memorandum by the Commanding General, Manhattan Engineer District (Groves), Sub: Our Army of the Future – as Influenced by Atomic Weapons (2 January 1946). ', in *Foreign Relations of the United States (FRUS) 1946, General; the United Nations* ed. by Bureau of Public Affairs Historical Office, 1 (Washington DC: Government Printing Office, 1972) (pp. 1199-1200). Groves' memorandum formed the basis of the Army's position.

[99] John J. Midgley Jr., *Deadly Illusions: Army Policy for the Nuclear Battlefield* (Boulder: Westview Press, Inc., 1986), pp. 7-8. One can see Eisenhower's recommendations play out during the often-contentious policy battles with the air force over access to and control over atomic weapons and information. For example both the army and the navy strongly resisted air force attempts to gain exclusive control over the Armed Forces Special Weapons Project in 1948, and in 1949 opposed changes to the strategic targeting process which would have limited their direct planning role in strategic warfare. See Kenneth W. Condit, *The Joint Chiefs of Staff and National Policy, 1947-1949*, History of the Joint Chiefs of Staff, II (Washington DC: Office of Joint History, 1996), pp. 97-98, 159-171.

[100] Gavin noted that a number of concepts which existed before the Second World War, like 'airborne assault, large-scale amphibious operations, strategic air operations, and far-reaching carrier task force operations,' were 'brought to full fruition' as a direct result of the cooperation between the military and science and industry. He implied that similar efforts should be made with something as profound at atomic weapons. James M. Gavin, *War and Peace in the Space Age* (New York: Harper & Brothers, 1958), pp. 100-101.

extremes there was a pragmatic middle ground slowly being carved out within the existing development bureaucracy.

In early 1947, the War Department made the first tentative steps toward developing a concept of operations for tactical weapons, when it described the need for a 'balanced force' approach to atomic weapons. While acknowledging the 'decision in a package' role of the atomic bomb when directed at a 'major target', a war department paper argued;

> Until it has been demonstrated that the atomic bomb can achieve a decision by itself (any certainty that it can has yet to be demonstrated), conventional military operations will continue to be employed, using, for some time to come, substantially the tactics of the end of World War II.

The paper then noted that the risks of nuclear weapons would necessitate the development of tactics 'to evolve methods of quickly massing for offensive action, then quickly dispersing'.[101]

A few months later, the joint chiefs delivered a report to President Truman entitled, *The Evaluation of the Atomic Bomb as a Military Weapon*. The main point of the study reiterated the strategic argument that 'if used in numbers, atomic bombs not only can nullify any nation's military effort, but can demolish its social and economic structure'. They presented, the report continued 'a threat to mankind and civilization.' However, based on data gathered during nuclear test Operation CROSSROADS, the chiefs recommended 'the coordinated development of atomic weapons and weapon carriers and their integration into a series of devices, each with a tactical or strategic purpose'. In an obvious nod to the army and navy positions, the reported added that, 'the advent of the atomic bomb has not eliminated the need for ground, sea and air forces, although it may affect their composition in sizeable degrees'.[102]

Amidst the strategic and policy debate over nuclear weapons, the school at Fort Leavenworth embarked on its own debate. Some students agreed with the proposition that atomic weapons represented 'a revolutionary development which

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[101] War Department, Report to Congress, 'The Effects of the Atomic Bomb on National Security (An Expression of War Department Thinking),' March 1947. Reprinted as 'War Department Thinking on the Atomic Bomb', *Bulletin of Atomic Scientists*, 3 (1947), 149-155, 168 (p. 168).

[102] Joint Chiefs of Staff Evaluation Board for Operation Crossroads, 'Enclosure 'A' the Evaluation of the Atomic Bomb as a Military Weapon in the Final Report (30 June 1947),' Harry S. Truman Library President's Secretary File - Truman Papers, <www.trumanlibrary.org/whistlestop/study_collections/bomb/> [accessed 1 December 2010].

altered the basic character of war itself'.[103] A 1946 student research paper from the GCSC's second command class summarized the impact of atomic weapons thus:

- The military, economic, and political structures of the U.S. will be completely altered by the advent of atomic weapons and atomic power.
- Present concepts of waging war, offensively, defensively, and logistically, will, in general, no longer be applicable.
- Offensive operations will be essentially strategical and technological in nature...
- The objective of invading armies will be to occupy the defeated power and eliminate isolated, fanatical resistance.
- The basic requirement for the conduct of a successful defence will be an efficient offence.
- The only logical and total defence against atomic warfare and destruction of civilization as we now know it, is world peace, enforced by a world government or by a single dominant power.[104]

While it is not possible to know how representative this paper was of the larger student body, the fact that it was prepared by a group of Second World War veteran officers lends credence to the idea that the so-called conservative view was not exclusive.

At the other end of the spectrum were the voices that argued the atomic bomb was 'just a bigger high explosive.' This position was first publically articulated in a reprint of a British Naval officer's article in the February 1946 issue of the college's professional journal, *Military Review*. The author argued that atomic bombs represented a change in the scale and range of explosives and nothing else.[105] In 1946, after witnessing the Operation CROSSROADS atomic test, Major General A. C. McAuliffe, the future head of army research and development and sponsor of the ORO, noted that while every facet of 'this new atomic business' needed study, in his opinion the only defence against atomic weapons was to 'capture and destroy the

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[103] This position was best publically articulated at the time in Frederick S. Dunn, 'The Common Problem', in *The Absolute Weapon: Atomic Power and World Order*, ed. by Bernard Brodie (New York: Harcourt, Brace, and Co., 1945) (p. 4).

[104] H.P. Harris L.S. Moseley, E.H.F. Svensson, and D.R. Ostrander, 'Analytical Study of Atomic Warfare - Committee No. 13 (Command Class)', (Fort Leavenworth: Command and General Staff School, 1946), p. 2. CARLA N-13756.

[105] Oliver Stewart, 'Atoms and Air Forces', *Military Review*, 25 (1946), 90-92 (p. 90). Originally published in *The Navy*, (Great Britain) in September 1945.

source [...] before [atomic weapons] can be launched against us.'[106] The debate was a significant topic of interest in Leavenworth's first post-war regular class. One paper, entitled *Logistical Support of Amphibious Operations in Atomic and Guided Missile Warfare,* found that increasing the dispersion of logistic units and improving the speed of logistics activity in general could overcome the implications of the enemy's use of atomic bombs. Interestingly, the report suggested the army explore through experimentation the delivery of logistics through the use of helicopters.[107] A similar report, *Logistical Support in Atomic and Guided Missile Warfare,* using the best reference material available on the actual effects of atomic weapons, concluded that, other than the requirements for dispersion, the construction of hardened command and control shelters, and the need for more field army logistics, the impact of atomic weapons would be minimal.[108]

Early formal instruction on atomic weapons took the form of poorly informed conceptual lectures, some of which must have sounded silly when contrasted with the general public perception. In the 1947–1948 course, atomic weapons were introduced as a part of a general class entitled 'Trends in Warfare'. In 1948 two specific courses were offered, 'Nuclear Physics and the Atom Bomb', and 'Military Effects of Atomic Weapons'. The material for one course deemed the risks to attacking troops from atomic bombs as limited because such formations will 'make a poor atomic target.' The risks were not zero, however. The instructors at Leavenworth warned that there would be dangers, and therefore troops should learn to 'respect [the atomic bomb] — but do not fear it [...] this danger is more in the open and less deadly than many booby traps'.[109] Despite the simplicity of these early efforts, the benefit was that they started a discussion, however crudely, for exploring the tactical use of atomic weapons.[110]

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[106] Sidney Shalett, 'McAuliffe Says "Nuts!" To the Atom', *Saturday Evening Post*, 29 June 1946, pp. 20-96.

[107] C.W. Chaney, 'Logistical Support of Amphibious Operations in Atomic and Guided Missile Warfare (Regular Course - CGSS 1947-48)' (Fort Leavenworth: Command and General Staff School, 1947). CARLA 2128.158.

[108] Paul A. Anderson, 'Logistical Support in Atomic and Guided Missile Warfare ', Regular Course 1947-48 (Fort Leavenworth: Command and General Staff School, 1947). CARLA 2128.157.

[109] Cited in Rose, *The Evolution of U.S. Nuclear Doctrine: 1945-1980,* p. 84.

[110] Official sources of information for the initial army development of atomic concepts were limited to U.S. Naval Technical Mission to Japan, 'Atomic Bombs, Hiroshima and Nagasaki, Article I, Medical

Leavenworth's Tentative Turn Toward the Future

Lieutenant General Manton Sprague Eddy became commandant of CGSC in January 1948. Like his predecessor, Eddy was a highly respected and well-liked former corps commander. Bradley said of his former subordinate 'none was better balanced nor more cooperative than Manton Eddy [...] though not timid, neither was he bold; Manton liked to count his steps carefully before he took them'.[111] Another attribute Eddy shared with Gerow was that he had spent a significant percentage of his career as a student or instructor of war. By the time assumed command of Leavenworth, Eddy had been on active duty for thirty-two years — a full twelve of which were in educational assignments of one form or another.[112]

Eddy, once described by a commander as 'an average officer', began his career in 1916 as a platoon commander after a short enlistment.[113] He served with the AEF in France and rose from platoon to battalion command by war's end. Like many officers of his generation, and despite his later commands, 1918 France was the defining experience of his career. While attending the Infantry Advanced Course in the late 1920s, Eddy wrote a scathing monograph about the failure of machine gun company tactics and the fact that after 'three years of war [...] no such thing as a machine gun doctrine seems to have existed.' Worse, the young Eddy wrote, the military bureaucracies were indifferent to the realities of new developments.[114]

Effects', (December 1945) and a short study focusing on the physical effects by the Manhattan Engineer District entitled 'The Atomic Bombings of Hiroshima and Nagasaki' (1945).

[111] Quoted in 'The Personal Story of General of the Army, Omar N. Bradley', *Life*, 9 April 1951, pp. 83-86, 89-90, 92,95-96, 98, 101 (p. 90).

[112] Eddy's twelve years of educational assignments include attending the Infantry Company Commanders Course, teaching ROTC instructor at a small military college, completing the Infantry Advanced Course, graduating from the 1934 two-year class of CGSS, culminating with a four-year Fort Leavenworth teaching assignment.

[113] Harold R. Winton, *Corps Commanders of the Bulge: Six American Generals and Victory in the Ardennes* (Lawrence: University Press of Kansas, 2007), p. 49.

[114] Major M.S. Eddy, 'Machine Gun Company, 39th Infantry (4th Division) in the Aisne-Marne Offensive (July 18--August 5, 1918)', The Infantry School - Advanced Course 1929-30, 1929), p. 1. Eddy's honesty and ability to be self-critical caught the attention of the school's assistant commandant, Lieutenant Colonel George C. Marshall. Eddy's monograph and others were assembled at the direction of the Infantry School commandant and eventually published in 1937. In then-Colonel George C. Marshall's foreword, he cautioned against what he saw as a failing of interwar military education. 'Battlefield experience,' he noted, must 'check the ideas acquired in peacetime' because 'peacetime

Eddy's first encounter with Leavenworth was as a member of the Class of 1932. After completing the two-year program, Eddy became an instructor. Over the next four years, he would teach and master 'the discipline of higher-level tactics' and develop a solid reputation as a dependable officer and man with a 'common touch'.[115]

During the Second World War, Eddy led the 9th Infantry Division through operations in North Africa, Sicily, and the landings in Normandy. In late August 1944, he took command of XII Corps, known as the 'Spearhead' of Patton's Third Army, in the assault across France and eventually into Southern Germany. In April 1945, with only weeks remaining in the war, high blood pressure and a suspected heart attack forced to him give up his command and sent him back to the United States to recover.

In December 1947, after Eddy's short and unhappy stint as the army's chief of information, the new chief of staff, Bradley, asked him if he would accept a third star and duty as the commandant of CGSC. Bradley told Eddy that he believed the army's education system was failing in its vital and traditional mission and was now arguably the 'most backward part of the army'. After conversations with both Eisenhower and Marshall, Bradley said the primary cause of the failure was the inability of the military to unify its education programs as proposed by the Gerow Board. Echoing the findings of the Henry Commission, Bradley said that the lack of a war college meant the staff college was trying to educate staff officers on everything from division-level operations through the army staff - all within ten months. Under such conditions, Leavenworth graduates risked becoming increasingly irrelevant to the challenges confronting the post-war army.[116]

In January 1947, now a lieutenant general, Eddy became the second post-war commandant of CGSC. For Bradley, sending Eddy to Leavenworth to fix and energize the education system represented an important appointment. The condition of the army by late 1947 brought obvious and uncomfortable comparisons to the dark days of the interwar years. Bradley would later describe the army of 1948 as having

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training in tactics tends to become increasingly theoretical'. *Infantry in Battle*, 2nd (Washington DC: The Infantry Journal Incorporated, 1939), p. vii.

[115] Winton, *Corps Commanders of the Bulge*, pp. 50-51. Eddy was considered too old for the War College when first considered. He was eventually selected but never attended after the college closed in the summer 1940.

[116] Henry Gerard Phillips, *The Making of a Professional - Manton S. Eddy, USA* (Westport: Greenwood Press, 2000), p. 196.

'almost no combat effectiveness' and not able to 'fight its way out of a paper bag'.[117] Eddy's own assessment at the time was that the rapid demobilization, budget cuts, and the 'extra-curricular chores' associated with overseas occupation had devastated the army. The nation's war power had become a 'fist without an arm' because, Eddy warned, the country had 'no ready [a]rmy forces [...] perhaps three divisions could be put in the field in an emergency'.[118] As Leavenworth had preserved the army as an institution in the 1930s, Eddy's task was now to ensure that it would do so again.

Bradley's guidance to the new commandant was clear. Eddy was to establish more central direction over army schools, to shift the curriculum away from the traditional and toward more contemporary problems. Specific issues Bradley wanted addressed included 'universal military training, the employment and effects of tactical nuclear weapons, application of modern management techniques, joint operations, and racial integration.'[119] Taking command at the mid-point of an academic year limited how rapidly Eddy could implement this guidance. Instead, he carefully studied the problem and began to build a team.

Two key assistants joined Eddy early in his tour, and both were critical to setting instruction on a new course. The first to arrive was a young academic with a PhD in Psychology. Ivan J. Birrer was planning to teach in a small college psychology department when he accepted an offer from Dr. Orleans to join the college's new Department of Research and Analysis as a statistical consultant in January. By July 1949 Birrer would replace Orleans as the commandant's 'educational advisor,' a position he would hold until his retirement thirty years later.[120]

The second was the new deputy commandant, Brigadier General Harlan N. Hartness. Hartness, a West Point graduate and infantry officer, was approaching thirty

[117] Omar N. Bradley, Clay Blair, *A General's Life: An Autobiography by the General of the Army* (New York: Simon and Schuster, 1983), p. 474.

[118] Manton S. Eddy, 'National Security: The Army's Part in the Unified Land-Sea-Air Team', *Vital Speeches,* 15 (1949), 563-567 (p. 566).

[119] Phillips, *The Making of a Professional*, p. 196.

[120] Birrer was familiar with the army having served as a Captain in the Adjutant general Corps during the War. He graduated from one of the wartime 13-week CGSC programs in early 1945. Biographical details of Dr. Birrer taken from Robert A. Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College, Fort Leavenworth, Kansas, 20 January 1948 to 30 June 1978' (unpublished thesis, Command and General Staff College, 1978). Given his influence and many accomplishments during his association with CGSS, Doughty accords Birrer co-equal status with John F. Morrison, Arthur Wagner, and Eben Swift as the army's most influential educators.

years on active duty when he arrived at Leavenworth. His time as a student or instructor in a military school exceeded even his boss's impressive record. He had spent nearly eighteen years of his career studying or teaching his profession. Significantly, in addition to a two-year stint as a CGSS student (1933–1935) and then instructor (1937–1940), Hartness had attended the yearlong *Kriegsakademie* in Berlin beginning in 1935.[121] During the war, Hartness served on the War Department and AGF staffs. His operational assignment was as the assistant division commander of the 26th Infantry Division from September 1944 to the war's end. Post-war experiences included service as part of the ETO's General Board and then, after returning to the United States, as president of the AGF Board No. 3 (Fort Benning). Both positions, one examining lessons of the past and the other examining possibilities for the future, would serve Hartness well as he worked to develop CGSC's curriculum.[122] Together, these three men 'would nudge the [c]ollege towards the future of modern warfare, while adopting a structure and instructional methods more conducive to the education of military professionals.'[123]

As Bradley had suggested, Eddy found the college 'still focused on World War II combat experience, and not upon new or improved technology and where a greatly expanded U.S. role in world affairs indicated they should be'.[124] One of Eddy's first actions as commandant was to establish a board under the direction of Colonel Stuart Wood to recommend how the school should address several outstanding issues identified by both the Henry Commission and Eddy's initial observations.[125]

The Wood Board made two major recommendations, both of which Eddy approved and implemented prior to the beginning of the next year's class. First, the

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[121] From 1937-39, Hartness translated several German monographs on tactics for CGSS's *Quarterly Review of Military Literature*. These included selections out of *Die Kraftfahrkampftruppe* on such topics as cooperation between mechanized troops and the air corps, German views on mechanization, German operations in the First World War, and German analyses of French tactical concepts. On Hartness' service in Germany, see Thomas G. Mahnken, *Uncovering Ways of War: U.S. Intelligence and Foreign Military Innovation, 1918-1941* (Ithaca: Cornell University Press, 2002), p. 102. See also Nenninger, 'Leavenworth and Its Critics', (pp. 213-217).

[122] Biographical details on General Hartness are from General Officer Biographic files, Center for Military History.

[123] Michael D. Stewart, 'Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College 1946-1986' (unpublished PhD thesis, University of Kansas, 2010), p. 46.

[124] Phillips, *The Making of a Professional*, p. 199.

[125] Dr. Orleans, a member of the Henry Commission, was designated a consultant to the Wood Board. Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', pp. 15-16.

current lecture-hall format, in some cases encompassing most of the class, minimized student participation. To remedy the situation, the Wood Board recommended that the school break the students into twelve groups of approximately forty officers each for all but guest lectures and demonstrations. [126]

The second major recommendation the Wood Board provided, not surprisingly, was the organizational structure of the college itself. As currently structured, the specialization courses (primarily staff functions oriented toward echelons above army) served as the hub of the academic department and the primary instruction came through fusing together their inputs. The staff specialization orientation was also the last vestige of its Second World War training focus. The Wood Board solution was to make the organizational heart of the college a new school with its own permanent staff cadre. The focus of the staff shifted to the core thirty-week curriculum (centred on the division, corps, army, and comparable levels in the communications zone). Moreover, because the instructional staffs were consolidated, the new school would teach according to a centrally designed curriculum. The use of a new curriculum board to issue annual guidance 'in terms of what is desired the students learn, rather than what is to be taught' became the standard at CGSC.[127]

Eddy's first opportunity to affect the upcoming academic year came through the March planning meetings of the 1948–1949 Curriculum Board. While not making any radical shifts in the proportion of material presented compared to the previous year, Eddy directed additional emphasis on joint operations and considerations of future warfare across the curriculum. The next year's course would be broken into six phases, covering the scope of material required of a commander and general staff officer:

- Phase I: Orientation and General Principles (12 days)
- Phase II: The Combat Zone (97 days)
- Phase III: The Communications Zone (25 days)
- Phase IV: Department of the Army and Zone of the Interior (6 days)
- Phase V: Specialized Instruction (50 days)

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[126] Wood Board report cited in Salet, 'Reorganization of the Command and General Staff College', (p. 7).

[127] Salet, 'Reorganization of the Command and General Staff College', (p. 9).

- Phase VI: Joint Operations and Future Warfare (12 days)[128]

In the initial post-war courses, the curriculum had encouraged instructors to include 'new developments', especially in the combat zone phase of instruction. However, the lack of any particular expertise in the staff or even among the student body in dealing with topics like atomic weapons and missiles limited discussions of the future. Not everyone was impressed with the nature or quality of material being presented as a 'new development'. Even Gerow referred to the future warfare courses, somewhat sarcastically, as the 'Buck Rogers phase'.[129]

Determined to increase the visibility of emerging technologies, Eddy directed that the 1948–1949 curriculum guidance include explicit language that instructors were to address the impact of 'new developments' in almost every class. For example, the approved fifteen hour plan for instruction on the infantry division in the defence directed that instructors 'toward the close of the problem develop student discussion of the effect of [...the] threat of atomic bombardment on defensive positions' as well the 'impact upon logistical and personnel plans'.[130] The addition of future trends, including discussion of atomic weapons, was becoming more than just an afterthought — but not much more. The implications of atomic weapons for existing army doctrine were essentially unknown as Eddy and his staff prepared the 1948–1949 curriculum.[131]

A year into his tour, Eddy followed in his predecessor's footsteps by serving as the president of the Department of the Army Board on Educational System for

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[128] Memorandum from Colonel John H. Van Vliet to The Faculty Command and General Staff (9 March 1948), found in Assistant Commandant's File, 'Directive for 1948-1949 Regular Course - Curriculum Board Reports,' (March-November 1948); CARLA N-13423.31.

[129] 'Conference on AGF Schools (1947)', p. 6. 'Buck Rogers' referred to the futuristic comic strip of the 1920 and later a series of campy movies featuring fantastic weapons.

[130] Curriculum Sheet, Subject No. 6005 Infantry in the Defense (12 May 1948), Found in Directive for 1948-1949 Regular Course.

[131] The army, thanks in part to very strict security rules instituted by the Atomic Energy Commission, still lacked basic technical information about atomic weapons. The first official and unclassified technical material of any value to the non-scientific community was not published until June 1950 through the collaboration of the Department of Defense and the Atomic Energy Commission. *The Effects of Atomic Weapons*, ed. by Samuel Glasstone (Los Alamos: US Government Printing Office, 1950).

Officers for Officers.[132] The Eddy Board's mandate was to conduct a wide-ranging examination of officer education including its adequacy, scope, and efficiency. It would also determine 'whether a restored AWC or other institution (at a level comparable to the Naval and Air War Colleges) should be included in the Army School System.'[133] As Birrer later recalled, 'it was clear from the directive that the answer to the [...] question was supposed to be yes'.[134]

The board delivered its report in June, after visiting the major schools and staffs and conducting detailed interviews with seventy-five senior officers. It framed its recommendations by reiterating that the objective of the army school system was to prepare an officer for duties 'to which he may reasonably expect to be assigned in war, with an emphasis on the art of command'. As a baseline for its recommendations, the board made two observations about the current system. First, the pre-war system was 'splendidly organized and withstood in an outstanding manner the severe test of the recent war.' Second, the present system was specifically designed to 'take advantage of lessons learned in World War II'. In addition to these generally positive but noticeably rearward-looking attributes, the board suggested that the context of military education had changed and the army needed to give significant weight to lessons from the past three years.[135]

Not surprisingly, the board endorsed the Gerow philosophy of a progressive officer school system. The biggest change was a recommendation to divide the current CGSC into two distinct levels. The first would be the regular course, corresponding roughly to the existing thirty-week core curriculum. The second would be the advanced course and would encompass the material in the ten-week specialty phase. While curiously avoiding the term war college, the recommendation was a call for the return of the pre-war division between two distinct officer post-graduate programmes. Other recommendations included an emphasis, in all classes and at all

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[132] The Eddy Board was constituted on 4 February 1949. Other members of the board included the commandants of the infantry, armoured, and artillery schools as well as members of the army and Leavenworth staffs.

[133] 'Report of the Department of the Army Board on Educational System for Officers' (Washington DC: Department of the Army, 1949), pp. 12-13, in CARLA U408 A5 PBAU. (Hereafter cited as the Eddy Board).

[134] Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', p. 21.

[135] 'Eddy Board (1949)', p. 1.

levels, on the 'joint aspects of all military operations' and 'new fields of learning' including 'business management, atomic energy, and future aspects of warfare'.[136]

The Eddy Board recommendations, most of which the army's chief of staff quickly accepted, reflected a widely held assessment of CGSC. The lack of a war college was crowding out its time and energy to address 'the increased number of problems which confront the army as a result of new developments in warfare'.[137] A decade after closing its door in accordance with Second World War mobilization plans, the AWC reopened at Leavenworth in September 1950.[138] Leavenworth proved too small for two colleges and two commandants, and in 1951 the AWC moved to its permanent location at Carlisle Barracks, Pennsylvania. Leavenworth had finally returned to it two-fold mission of officer education focused at the tactical level of war as well as the study and development of relevant doctrines.

One prominent historian has described the army of the late 1940s as 'very much a post-war army, shaped less by military doctrine looking to a future war, to which this army so often seemed irrelevant, than by the past, by the last war, of whose massive armies it was but a remnant'.[139] As a practical matter, the gap between army resources and the demands of continuing overseas commitments left the army few options but to accept that, for the time being at least, 'air power occupies a dominant position in modern warfare'.[140] For most of the period 1947–1949, the army's senior leaders found themselves on the horns of a dilemma between current readiness and innovation for future war. If they argued aggressively for resources to pursue innovation for future wars, presumably heavily influenced by 'new developments' such as atomic weapons, they then undercut their arguments for increased resources for current readiness. They would also undercut the logic that success in future war required universal military training.

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[136] 'Eddy Board (1949)', pp. 6-9.

[137] 'Eddy Board (1949)', p. 37.

[138] The AWC's original home at Fort McNair, Washington DC was taken over by the National War College in 1945 and not avaialbe.

[139] Russell F. Weigley, *History of the United States Army* (New York: Macmillan Publishing Co., Inc., 1967), p. 502.

[140] General Dwight D. Eisenhower, 'Final Report of the Chief of Staff, United States Army, to the Secretary of the Army (7 Februrary 1948)' (Washington DC, 1948), p. 13.

Of course, if the army argued against the defence implications of new developments, it would not only be undercutting stated U.S. policy, but would be accused of undue conservatism. What is more, such an argument would only further isolate the army in the ongoing battles over strategy and budget share in a military establishment increasingly oriented on new developments.

The solution was to split the difference. Senior army leaders began speaking out publically for improving current readiness, while at the same time increasing the army's involvement and understanding of new developments. One of those speaking out was the Army's Chief of Information, Lieutenant General Raymond S. McLain. He argued that national security planning could not afford to become one dimensional, because, while 'another war will be different from the last [...] it would not be entirely different, for no war breaks entirely with the past'. Thus, despite the tremendous technical improvements in war, 'the same relationship will exist between the weapons of World War II and the theoretical next war as existed between the weapons of World War I and World War II'.[141] A March 1950 report of a board of officers charged with orienting the army's research and development priorities in light of 'current peacetime budgets' emphasized the materiel relationship between the last war and the next war. Led by a former Second World War corps commander, Lieutenant General John R. Hodge, the Hodge Board stated that, at some point in the future the army 'must be prepared to employ atomic weapons.' However, that future was more distant than many claimed because equipment requirements for an atomic-capable army still lacked 'sound concepts.' In the meantime, the board's final report listed among the army's 'urgent' materiel needs as: infantry antitank weapons, tanks, anti-aircraft equipment, mine detection equipment, and target location devices.[142]

The argument about current readiness grew louder after Collins became Army Chief of Staff in August 1949. Collins told an audience in November that 'much you have heard of late — from me as well as from other military men — may have given you the impression that our national security is exclusively a function of allocating

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[141] Lieutenant General Raymond S. McLain, 'The Army's Role: A 1949 Perspective', *Military Review*, 28 (1949), 3-18 (p. 8).

[142] Office Chief Army Field Forces, 'Report of the Army Equipment Board' (Fort Monroe U.S. Army, 1950), pp. 1,7,10. (Cited hereafter as the Hodge Board.)

dollars, or specifying numbers of planes, and ships and tanks'. 'There is' he continued 'a grave fallacy in such assumptions'.[143]

While army leaders tried to spotlight conventional readiness for non-atomic warfare, small groups in the army were beginning to explore the conceptual, technological, and doctrinal implications of atomic weapons on a tactical battlefield. In summer 1949, Eddy directed a small CGSC staff group to 'study the army's problems in atomic conflict'. Their objective was to produce a draft field manual for the 'tactical use of atomic weapons' as well as to inject 'pertinent instruction on combat employment of the new weapon' into the CGSC curriculum.[144] Two of the instructors participating in the study group, George C. Reinhardt and William R. Kintner, were talented conceptual thinkers and prolific writers. Over the next decade their names would become closely associated with the army's efforts first to understand and then to exploit atomic weapons. Reinhardt and Kintner, working from the most basic understanding of atomic effects and within a simple conceptual framework of how such weapons might affect a field army, began to define what terms like 'dispersion' might actually look like in an atomic setting.

Creative talent would not be sufficient however. Eddy's team lacked answers to the most fundamental questions about tactical effects or any reasonable estimate about how the technology of atomic weapons might develop over the next five-to-ten years. Information already in the public domain, mostly focused on strategic application or civil defence, was hardly a sufficient basis to begin research, to say nothing of building a graduate-level curriculum.[145] To augment Leavenworth's meagre supply of atomic expertise and gain access to the most up-to-date and operationally relevant research, Eddy initiated a partnership with the newly formed ORO. The timing was perfect. The CGSC had reached a point where it needed to test its ideas against realistic data, and the civilian scientists at the ORO needed an operational context through which they could better evaluate science and technology.

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[143] J. Lawton Collins, 'The Importance of the Individual', *Vital Speeches of the Day*, 16 (1949), 140-142 (p. 141).

[144] G.C. Reinhardt, 'Nuclear Weapons and Limited Warfare - A Sketchbook History' (Santa Monica: The RAND Corporation, 1964), p. 3; Rose, *The Evolution of U.S. Nuclear Doctrine: 1945-1980*, p. 84.

[145] A bibliography of publicly available information at the time includes government reports with titles such as 'Medical Aspects of Atomic Weapons,' 'What to Do in an Atomic Attack,' 'The City of Washington and an Atomic Attack.' See S.A. Anthony, 'Selected Bibliography of the Literature on Civil Defense', *Bulletin of the Atomic Scientists*, 6 (1950) (pp. 272-275).

The result of the CGSC-ORO collaboration became annexes to an ORO study entitled Project MAID. [146] The titles of the studies (published as classified annexes to the Project MAID report) show a progression from developing basic knowledge of tactical sized weapons, to testing predicated effects against a known standard, to conceptual explorations against generic doctrine, and finally, application to realistic tactical scenarios:

- The Effect of Variation of Energy on Atomic Weapons Characteristics
- World War II Tactical Situations Analyzed with Respect to Atomic Weapons
- Atomic Weapons in Army Operations
- Atomic Weapons in Western Europe[147]

The Project MAID report acknowledged its limitations by noting that 'such analyses as the one presented here leave much to be desired in the character of the evidence which can be brought to bear on the subject.'[148] In spite of the fact that the conclusions were 'subject to revision in the light of rapidly increasing evidence,' the army, had for the first time, an evidence-based analysis of the tactical use of atomic weapons in land combat.[149] The classified Project MAID report was delivered in January 1950. A few months later, CGSC completed a classified student text *Tactical Use of Atomic Weapons* that the army adopted in November 1951 as its first atomic field manual, *Field Manual 100-31*, with the same name. For army concept developers like Reinhardt and Kintner, this unique collaboration demystified the study

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[146] Project MAID's primary purpose was to 'study of the pros and cons of providing military assistance to foreign countries, and thus it focused on questions of international relations and economics.' Shrader, 'History of Operations Research in the United States Army', p. 72.

[147] W.L. Witson, K.D. Bartimo, D.K. Clark, A.D. Coox, and W.B. Cottrell,, 'Report on Project MAID - Part III, Appendix B (Atomic Warfare)' (Washington, DC: Operations Research Office, 1950).

[148] Data collected during atomic tests in 1946 (Operation CROSSROADS) and 1948 (Operation Sandstone) were primarily of a scientific and technical nature. Test designs that included a significant effort understand potential tactical effects did not occur until 1951. Much of the technical data made available through Project MAID, especially concerning radiation effects, were considered out of date by early 1952.

[149] Witson, 'Report on Project MAID', p. foreword. The report was released as a Secret document and not declassified until 1959.

of atomic weapons and provided the foundation for much of what the army would promulgate on the subject for the remainder of the decade.[150]

In June 1950, the North Koreans invaded South Korea in a massive conventional assault. For the army, as well as advocates of a more aggressive strategic containment strategy, Korea was a validation of both the nature of the threat and the need for a larger army as a force-in-being.[151] As McLain and others had argued, atomic weapons were an adjunct to, and not a substitute for, traditional forms of military power. Strategically, the Truman administration's response was a partial mobilization to stem the tide on the Korean Peninsula and an expansion of the regular army to facilitate a build-up of forces in Europe.[152] By November 1950 the army reactivated an army headquarters at Stuttgart as the leading element of what would be a two corps headquarters and four-division build-up.

Eddy, having partially completed his mission to reinvigorate CGSC, received orders to Europe to become the Deputy Commander, US Army Europe with a mission to re-establish and take command of Seventh Army.[153] His deputy, Brigadier General Hartness, would assume command until Eddy's relief arrived.

The start of the Korean War, unlike that of World War II, did not disrupt the army's education programme.[154] The opening of the AWC and the continuation of

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[150] In 1953 an unclassified version of much of the CGSC's conceptual research was published which influenced a flood of professional literature and debate. See George C. Reinhardt and William R. Kintner, *Atomic Weapons in Land Combat* (Harrisburg: Military Service Publishing Company, 1953).

[151] At the time of the North Korean invasion debate was underway in Washington DC on a more muscular response to communist aggression around the world. The strategy document known as NSC 68, 'served as a critical catalyst' for implementation and empowered the army's 'balanced-forces' argument in the short term. See David T. Fautua, 'The "Long Pull" Army: NSC 68, the Korean War, and the Creation of the Cold War Army', *The Journal of Military History*, 61 (1997), 93-120 (pp. 95-96).

[152] Between 30 June 1950 and 30 June 1951 the army's end-strength grew from 591,487 to 1,592,902. During the same period, force levels went from 10 divisions and 12 separate regiments to 18 divisions and 18 separate regiments. See Table 3, Development of FY 51 Strength and Force Levels in Doris M. Condit, *The Test of War 1950-1953*, History of the Office of the Secretary of Defense, II (Washington DC: Historical Office, Office of the Secretary of Defense, 1988), p. 238.

[153] The connection between Leavenworth and the senior army leadership charged with the ground defence of Europe would grow throughout the decade. Eddy would command Seventh Army from August 1950 through August 1952. Henry I. Hodes commanded Seventh Army from 1955-56 and then U.S. Army Europe from 1956-59.

[154] The course was already programmed to grow. Class size (US students) grew steadily from 251 in the 1946-47 Class to 440 in the 1949-50 Class. After a small dip in the class fall 1950 to 351, CGSC classes ramped up to more than 500 US students per class for the remainder of the decade. See Table 4, Regular Course Graduates in Doughty, 'The Command and General Staff College in Transition', p. 138.

CGSC's peacetime mission during war was precedent-setting and would reflect a subtle shift in the army's institutional attitude toward the fighting of 'limited wars', while continuing to prepare for what could be a different 'next war.' One historian has noted that the Korean War 'had less impact on the operations of Leavenworth than any previous war'.[155] During a December 1950 address to the inaugural AWC class, then still located at Leavenworth, the army chief of staff assured everyone that despite rumours to the contrary, the year of study at the AWC was more important to the future of the army than any contribution they might make in Korea.[156]

Major General Horace Logan McBride took command of CGSC on 6 October 1950.[157] In his thirty-four years of service prior to becoming commandant, McBride had spent an astonishing sixteen years in an army classroom as a student or instructor.[158] McBride was a 1916 graduate of West Point who saw combat early in his career, including a short stint as an artillery battalion commander during the Meuse-Argonne Offensive of 1918. His teaching experience included four years instructing reserve officer training at Yale University, four years as a tactics instructor at the Artillery School, and four year teaching at CGSS.

During the war, McBride commanded the 80th Infantry Division and had the distinction of being the only man to command that unit during its entire wartime existence. Under 'Hairless Horace,' as his troops referred to him, the 80th fought primarily as part of the II Corps and participated in operations from Normandy through the surrender of the German Sixth Army in Austria. Immediately prior to taking command of CGSC, McBride was overseeing the military component of the

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[155] Boyd L. Dastrup, *The US Army Command and General Staff College: A Centennial History* (Manhattan: Sunflower University Press, 1982), p. 97.

[156] Ball, *Of Responsible Command* p. 283. The existing mobilization guidance for the AWC stated it would close 'in the event of full mobilization'. 'Staff Study - College Mission' (Fort Leavenworth: Command and General Staff College, 1951), p. IX. CARLA N-13423.5-A.

[157] As the senior officer, Major General Joe Swing, newly assigned Commandant of the Army War College, was the commander of Fort Leavenworth until the War College moved to Carlisle Barracks Pennsylvania in 1951. On the personal and professional tension between the two commandants see Stewart, 'Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College 1946-1986', p. 62.

[158] Biographical details from General Officer files, MHI. His West Point Obituary noted '[o]f all the men who graduated in the Class of 1916, none established a more brilliant military career than Horace McBride.' 'Horace L. Mcbride', *Assembly - Association of Graduates, U.S.M.A.,* 22 (1963), 107 (p. 106). McBride was a 1927 graduate of the CGSS and a 1936 graduate of the Army War College.

Truman Doctrine in Turkey as the first chief of the U.S. Army Group in the American Mission.[159]

Three major events marked McBride's tenure as commandant of CGSC. The first was sorting out the relationship and curriculum between his charge and that of the commandant of the newly established AWC. The Eddy Board had envisioned the AWC as the 'second-year' of the CGSC curriculum. The two colleges' curriculums would, under this concept, mirror each other with the major distinction being delineated by command level. The alternative view, held by the new AWC commandant, Major General Joseph M. Swing, and his deputy Brigadier General Arthur G. Trudeau, was that these were two different colleges. Swing was especially passionate that the AWC would not become a 'super-Leavenworth.'[160] The students at the AWC would be graduates of CGSC but attend the senior course only after 'a break between an officer's education and what he had absorbed at Leavenworth and then, after re-selection of a smaller number, to go onto higher level schooling'[161] Swing, selected for the job in part because Collins thought he was the most non-conforming general he knew, set out to create a 'post-graduate school, contemplative in nature and mature in aspect'.[162]

McBride's second challenge was directly related to the first, and that was the question of who was ultimately responsibility for doctrine. The army had up to this point assumed that doctrine should be split by command echelon, just as the schools were. Both the army staff and the staff of the AFF assumed that the AWC, as the 'senior' school, would inherit the CGSC's overall responsibility for doctrine development and review. It quickly became clear, however, that under the concept put in place by Swing and continued by his successor, Lieutenant General Edward M. Almond, the AWC would have neither the staffing nor inclination to do the heavy lifting of combined arms doctrine. The task was not trivial. During the 1950–1951 school year, for example, the staff of the CGSC, in addition to preparing student texts,

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[159] Steven L. Rearden, *The Formative Years 1947-1950*, History of the Office of the Secretary of Defense, I (Washington DC: Historical Office, Office of the Secretary of Defense, 1984), pp. 165-166.

[160] Ball, *Of Responsible Command* p. 282. The curriculum plans prepared by the Eddy's staff in support of the newly forming AWC staff were rejected wholesale by Swing.

[161] Calvin J. Landau, 'Engineer Memoirs: Lieutenant General Arthur G. Trudeau, USA, Retired - an Oral History' (Carlisle Barracks: Corps of Engineers, 1986), pp. 176-178.

[162] Ball, *Of Responsible Command* pp. 283-288.

reviewed or initiated the development of 132 field manuals.[163] This included all combined arms doctrine above battalion level as well as several subjects, such as logistics, military assistance, and psychological operations, which crossed all echelons. In the end, the AFF determined that CGSC would continue to fulfil its role as the army's centre for combined arms doctrine and keep the AWC informed.[164]

By 1951, battlefield observations and experience gained from operations in Korea became part of the CGSC curriculum as veteran students and instructors rotated through the course. This new perspective reinvigorated doctrinal debates, since there was now a point of comparison with the Second World War baseline. Surprisingly, however, the Korean War did not lead to doctrinal innovations based directly on that war's combat experience. Rather, it was the implications of a Korean-like scenario in Europe that energized the concept development process. Curriculum studies, looking forward to academic years 1952–1953 and 1953–1954, show a significant interest by the staff in moving to a 'more practical orientation for the curriculum'. Suggestions included adapting some of the courses to future or anticipated scenarios as opposed to the standard historical and predominately Second World War based ones. Moreover, perhaps in acknowledgment of the readiness failures in 1950, the studies suggested that scenarios should include known shortfalls in U.S. capabilities against Soviet threats on likely battlefields.[165]

One instructor explicitly connected the operational lessons of Korea with the operational requirements of NATO and made it clear that 'any future conflict will find us, initially, on the defensive, pending the build-up of sufficient forces'.[166] This rather elementary observation had implications for the balance between offensive and defensive in the curriculum. A review of the 1952–1953 curriculum shows 250 hours

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[163] 'Staff Study - College Mission', p. 3. Annex III

[164] According to a history of the AWC, it 'was not a major participant in the debates over the New Look (doctrine), nor was it yet a major participant in the debates over innovations in weapons, tactics, and organization'. Ball, *Of Responsible Command* pp. 284-289, 305-311.

[165] 'Analysis of the Curricula of the Regular Course, CGSC,' 2 November 1951 (CGSC: Fort Leavenworth) and 'Study – Curriculum Review Board 1952- Analysis of the Regular Course,' 14 November 1952, (CGSC, Fort Leavenworth) in CARLA 13423.3 and 4. See also Stewart, 'Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College 1946-1986', pp. 75-76.

[166] One of the participants in the 1951 curriculum review described the doctrinal shortfall in a journal article. Lieutenant Colonel Seneca W. Foote, 'Back up Fighting', *Military Review*, 30 (1951), 42-49 (p. 42).

of map exercises dedicated to offence and only 165 hours to defensive or retrograde operations.[167] Army doctrine was also heavily weighted to the offence.[168] Much of the case study material for CGSC still came from Second World War experiences, which made it biased toward the offensive. The shift would be gradual, but significant. For the curriculum and doctrine developers at CGSC, the problem of future war was no longer seeking to improve upon the campaigns of 1944–1945, but thinking ahead to solve the challenges that NATO confronted.

If McBride's tour as commandant was relatively calm, despite the ongoing Korean War, a conference he hosted in November 1951 pointed to major changes yet to come. The event was an annual gathering of the commandants of the AFF schools to discuss curriculum issues and priorities. In an AFF presentation entitled 'Development and Testing of Doctrine for Atomic Warfare and The Related School Instruction,' Colonel V.C. Stevens acknowledged that 'army thinking has evolved slowly'. He ascribed the primary reason to uncertainty in national strategy and the fact that the 'delivery capabilities' were predominately in the air forces. That, Steven continued, was about to change. Senior leaders realized that 'atomic weapons provided the commander with the cheapest and most destructive force yet brought to the battlefield'. Acknowledging that most army schools were still emphasizing radiological defence, Stevens announced that 1952 was going to be 'a period of transition' where the army's emphasis would shift to 'the tactical employment of atomic weapons'. [169]

The conference announced a series of documents to assist the commandants ranging from the new draft *Field Manual [FM] 101-31: Tactical Use of Atomic Weapons* to an initial offering of training circulars describing the army's atomic

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[167] Stewart, 'Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College 1946-1986', pp. 76-77.

[168] In 1952 a group of former German officers, led by Franz Halder, was asked to critique the new draft of *FM 100-5 Operations*. Their comments, based on end-of-war experiences quite different from the US but more reflective of the NATO position in the 1950s, found that the army was 'overrating' the offense as a form of combat 'even in situations where this does not appear wholly justified'. The Germans argued that based on the manual's unstated presumption of 'superiority of materiel' and the desire to gain the 'psychological advantage' of the initiative, the army was in danger of elevating 'the offensive to the level of dogma'. Franz Halder, 'Analysis of US Field Service Regulations' (Heidelberg: Historical Division, HQ United States Army Europe, 1953), p. 9. CARL N-17976-4.

[169] Colonel V.C. Stevens, 'Development and Testing for Doctrine for Atomic Warfare and the Related School Instruction', Report of Conference of Commandants of Army Service Schools, II (Fort Leavenworth: Command and General Staff College, 1951), p. 29. MHI REP-30 ASS 1951.

delivery systems such as *Atomic Missile Force Support* and *Organization and Employment of the 280-mm Gun Battalion*. Moreover, the army was testing atomic doctrine in exercises like the recently competed Exercise SOUTHERN PINE, where staff procedures derived from *FM 100-31* were played, albeit in crude form, at the army level. In addition, 'operational' test results, such as those from Exercise DESERT ROCK, where tactical units were 'disposed in battlefield formation near an actual atomic explosion', were to be made available to the school staffs. Upcoming events, Stevens noted would include working atomic scenarios with the Seventh Army in Europe, an exercise at the division level to test draft defensive doctrine, a 'free manoeuvre' exercise at Fort Hood where observers could assess casualties from atomic explosions, and a logistics exercise to 'test the impact of atomic weapons in the communications zone'. While all of this activity aimed at making up for lost time, Stevens admitted the AFF still lacked a coherent process to integrate new weapons and doctrine at such a pace.[170]

Major General Henry Irving Hodes became the commandant of in March 1952.[171] A 1920 graduate of West Point, Hodes' professional career had none of the hallmarks of a soldier-scholar his predecessors had been. He was a member of the 1937 class of CGSS and the 1940 class of the AWC. Hodes spend most of Second World War on the WDGS earning a solid reputation as one of Marshall's men. He eventually served as a regimental commander in the 28th Infantry Division. After recovering from severe combat wounds, Hodes returned to the WDGS in 1945 where he worked closely with Eisenhower and Bradley as assistant deputy chief of staff. In this position, Hodes found himself heavily involved in the staff actions and decisions associated with unification. Before becoming commandant, Hodes served in Korea, with the 1st Cavalry Division, then as the assistant division commander of the 7th Infantry during actions at Chosin Reservoir in fall 1950. In late 1951, Hodes became the assistant chief of staff, Eighth Army and a member of the UN negotiations team during truce talks.

Earning the nickname 'Hammerin Hank Hodes' during his long years on senior staffs, Hodes was an interesting choice for Leavenworth. A fellow member of the Korean truce talks team described Hodes' impatience with what saw as excessive

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[170] Stevens, 'Report of Conference of Commandants', pp. 30-31.
[171] McBride's next assignment was as Commander-in-Chief of Caribbean Command, Panama.

study and analysis on the part of his fellow negotiators. Hodes, the observer noted, had a tendency to 'make quite explicit his suspicions of such intellectuality'.[172] Upon his arrival at Leavenworth, Hodes announced that unlike his predecessors he was not interested in reorganizing the college. One instructor recalled that Hodes declared 'Leavenworth has been here for years and to disturb it and upset it with reorganization takes a year to do and then a year before it settles down [...] whatever you guys are doing is right'.[173] Dr. Ivan Birrer, the education advisor, concurred, noting 'nothing really much changed' under Hodes' leadership with the exception of 'a tremendous upsurge of tactics instruction'.[174] An official command history of the period generally shared this opinion; it listed Hodes' tour highlights as managing the great flood of 1952 and establishing the Leavenworth Museum.[175] Whether by background, circumstance, personality, or some combination thereof, Hodes was the antithesis of an intellectual change agent.

Despite the comparatively quiet garrison environment during Hodes' command, there was some movement in the areas of concept, doctrine, and combat developments. Perhaps reflecting on his recent assignment in Korea, the new commandant initiated quiet reviews of the curriculum and, eventually the organization of the college. The effect of the changes, however, was to place an increased emphasis on staff training and less on future concepts at a time when political and strategic changes in Washington would soon demand the opposite.[176] Where the school emphasized future concepts, such as the concept of an area defence, one can clearly

[172] Herbert Goldhamer, *The 1951 Korean Armistice Conference: A Personal Memoir* (Santa Monica: RAND, 1994), p. 8.

[173] Ted S. Chesney, 'Conversations between Lieutenant General William R. Desobry, USA (Ret) and Lieutenant Colonel Ted S. Chesney', Senior Officers Debriefing Program, I (Carlisle Barracks: U.S. Army Military History Institute, 1978), p. 11. MHI.

[174] Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', pp. 22-24. CARL. Before he departed, Hodes directed a major organizational study, which concluded that the CGSC's curriculum should strictly follow a tactical focus in accordance with the staff principles of FM 101-1. The study was thoroughly rejected by the staff as fundamentally incompatible with the school's education mission and was never acted upon. See staff study and comments in Colonel John A. Gavin, 'Study of College Organization' (Fort Leavenworth: Command and General Staff College, 1953). CARL N-13423.26-A.

[175] Talbott Barnard, 'The History of Fort Leavenworth 1952-1963' (Fort Leavenworth: Command and General Staff College, 1964), pp. 9-10.

[176] See 'Staff Study on the Adequacy, Balance, and Methodology of the 1953-54 CGSC Regular Course' (Fort Leavenworth: Command and General Staff College, 1953). CARLA N-13423.27 and Organization of the Command and General Staff College,' September 1953.

see the influence of the Korean War. Developing and modifying concepts for limited war was the primary emphasis of the school throughout this period.

The school did not ignore the implications of atomic weapons. Beginning in 1953, CGSC began teaching a dedicated special weapons course designed for students whose follow-on assignments would require 'Atomic Specialization'.[177] The specialization course was in addition to the AFF guidance at the beginning of the1952–1953 academic-year that all subjects would assume 'an enemy atomic capability' in all tactical situations.[178] Despite the directive, one study found that between 1952 and 1955, only fifteen to twenty percent of the curriculum 'integrated considerations of atomics'.[179]

By 1952 the hesitation at CGSC over fully integrating atomics into the curriculum was only partly a matter of limited expertise or natural conservatism. It was equally a reflection of the ongoing balancing act within the army itself. In May, Secretary of the Army Frank Pace Jr. gave a speech entitled 'Your Army in the Atomic Age: You Can't Engineer the Infantry Out of Business.' Citing Korea, Pace emphatically agued that the infantry remained the decisive factor in war. The majority of his talk, however, described the army's aggressive research and development agenda to 'exploit to the utmost the potential of atomic weapons'.[180] The debut of the army's 280-mm atomic cannon was the first tangible proof of the 'dramatic progress [...] in the use of new weapons and scientist developments' and its 'extensive program to adapt itself to atomic warfare'.[181]

Innovation toward an atomic army was by 1952 emerging from new organizations like the AFF's combat developments staff and research activities like the ORO. As part of that effort, CGSC, as well as the other AFF schools, were directed to open a combat developments office. The idea of becoming a supporting

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[177] This was a shortened and much simplified version of the course taught by the AEC's Armed Forces Special Weapons Project, Sandia Base, Albuquerque, New Mexico.

[178] 'Program of Instruction for Command and General Staff Course -- 1952-53' (Fort Leavenworth: Command and General Staff College, 1952), p. 3. CARLA.

[179] See 'Curriculum of the Command and General Staff College with Enclosures (1955)' (Fort Leavenworth: Command and General Staff College, 1955), p. 4. CARLA N-13423.101.

[180] Frank Pace Jr., 'Your Army in the Atomic Age', Vital Speeches of the Day, 18 (1952), 505-507 (pp. 505-507).

[181] J. Lawton Collins, 'The Army Today Requires Top-Flight Manpower', Vital Speeches of the Day, 19 (1952), 130-134 (p. 133).

activity to an external development process did not sit well with Hodes. As one staff member recalled, 'Hodes was a big believer in the idea that, if you teach it, you know it [...] he did not see the utility in a combat developments system and established the [combat developments] process against his better judgment'.[182] CGSC eventually assigned six officers to the initial combat developments activity with a priority toward the development of a mobile defence doctrine.[183] By 1954 the combat developments section had grown to twelve officers and, as Hodes had feared, their efforts were overwhelmingly directed toward external requirements.

Hodes disliked the combat developments mission for two reasons. First, it was event, or technology, driven and not the result of debate among expert practitioners. Secondly, he believe it was a part of CGSC's mission to '[i]nitiate action as necessary to formulate or revise tactics and doctrine'.[184] Hodes did not believe much would be gained by bringing engineers and technologists into an already understaffed and overworked doctrine process. A report from late 1954 noted that 'the entire effort of this section is continually involved in meeting demands of outside agencies on day-to-day doctrinal matters of essentially immediate impact [...] to the almost complete elimination of any constructive, forward thinking on our important doctrinal mission'.[185] The external tasks Hodes complained about were growing numbers of nuclear related field exercises and tests. From the point of view of the army's senior leadership, these events, and not CGSC's doctrinal efforts, were increasingly representative of the army's 'forward thinking'.

The pressure to accelerate the process of concept and doctrine development stemmed from many factors. There were doctrinal innovations and tactical improvements based on the lessons of Korea. There were also innovations emerging from technological advances in atomic weapons and surface-to-surface missiles.

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[182] Chesney, 'Conversations between Lieutenant General William R. Desobry', p. 12.

[183] Chesney, 'Conversations between Lieutenant General William R. Desobry', p. 13. The results of Hodes's doctrinal efforts were published in a December 1954 *Military Review* article entitled simply 'Mobile Concept' and credited to 'studies conducted by the college'. The article lays out Hodes' case for a broadly flexible doctrine that accommodated the impact of atomic weapons but one that barely acknowledged them. See 'Mobile Concept', *Military Review*, 34 (1954), 3-10 (pp. 3-10).

[184] Department of the Army, Special Regulation 350-5-5 'Command and General Staff College,' (Washington DC, 23 January 1953), p. 3.

[185] Extract Pertaining to Personnel for Development of Tactics and Doctrine, from Reclama to Fifth Army Manpower Survey, 22 December 1954 in 'Curriculum of the Command and General Staff College (1955)'.

However, for the most part these changes were on the margins of existing concepts and had little impact on force design or aggregate manpower.

The prime mover of concept development in this period was the arrival of the Eisenhower Administration in January 1953 and the president's determination for philosophic, political, and economic reasons to slash defence spending. The 'New Look' strategy, was developed and debated during the first summer and fall of the new administration. For the army, the familiar pattern of demobilization was once again at hand. Having lost the argument to retain the manpower mobilized during the Korean War, the Army's Chief of Staff, General Matthew B. Ridgway, was desperate to prevent the army from being forced to rely on 'skeletonized regiments', lest it invite a repeat of the Korea debacle.[186] The only alternative to hollowing was to change the number and nature of the army's missions, as it would appear the administration preferred, or change the way the army organized to accomplish its missions.

On 11 December 1953, Secretary of Defense Charles Wilson directed cuts totalling almost twenty percent of the army's manpower by June 1955.[187] In a 13 December 1953 speech by the CJCS, Admiral Arthur W. Radford, clearly spelled-out the conceptual framework in which the army would have to operate.

> We consider it imperative to improve our ratios of combat manpower to total manpower [...] to accomplish these ends we are improving greatly our combat effectiveness by the application of new weapons and new techniques, and hope ultimately to achieve far greater flexibility than heretofore-attainable [...] Atomic weapons have virtually achieved conventional status within our armed forces. Each military service is capable of putting this weapon into military use. Therefore, each service has a tremendous responsibility for living up to our expectations for a still greater and more powerful degree of combat readiness.[188]

Aside from the military and even moral arguments Ridgway made against the strategy, no one, inside the army or out, could answer a basic challenge being put

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[186] Matthew B. Ridgeway, *Soldier: The Memoirs of Matthew B. Ridgway* (New York: Harper and Brothers, 1956), pp. 286-288, 303-304.

[187] Richard M. Leighton, *Strategy, Money, and the New Look, 1953-1956*, History of the Office of the Secretary of Defense, III (Washington DC: Historical Office, Office of the Secretary of Defense, 2001), p. 178.

[188] Admiral Arthur W. Radford, 'The "New Look" Defense Plans of the Nation: Speech Delivered to the National Press Club, 14 December 1953', *Vital Speeches of the Day*, 20 (1954), 171-173 (p. 173).

forward by Radford: how many and what kinds of atomic weapons could actually replace a ground division?[189] In an effort to minimize the impact of cuts and perhaps demonstrate that, even as he resisted the logic of the strategy, Ridgway could, to the use Wilson's phrase, 'get more bang for the buck', he directed the AFF to conduct studies to 'improve the army combat-potential-to-manpower ratio'. The organizational studies would need, among other things, to improve the manpower to force and support ratios, increase mobility, improve sustainment, maximize technology, and be ready for fielding by January 1956.[190] This was a tall order under optimal conditions. Throughout 1954, the anaemic combat developments staff at Leavenworth, in collaboration with the infantry and armour schools as well as the members of staff of AFF collaborated on a series of studies culminating in 'The Atomic Field Army' or ATFA-1 report in November 1954. While the proposed organizational designs for the infantry and armoured divisions did trim 4000 and 2700 soldiers from each, it was pretty clear that most of the other objectives in Ridgway's guidance were not going to be met. The reports from initial field exercises were not encouraging, with most senior commanders panning the effort.[191]

Reconciling CGSC's traditional development of doctrine mission with the rapidly expanding activities collectively known as combat developments would have to wait for a new commander. On the specific direction of the studies emerging from Ridgway's guidance, Hodes was 'dead set against' using doctrinal concepts to reduce manpower and likely set the tone for much of the preliminary work leading up to the AFTA-1 study.[192] Hodes departed Leavenworth for command in Europe in March 1954 where, ironically, he would spend a significant portion of his time commenting on and integrating new capabilities emerging from the very combat developments

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[189] Leighton, *Strategy, Money, and the New Look*, p. 177.

[190] John B. Wilson, *Maneuver and Firepower: The Evolution of Divisions and Separate Brigades*, Army Lineage Series CMH Pub 60-14 (Washington DC: Center of Military History, United States Army, 1998), p. 265.

[191] Wilson, *Maneuver and Firepower*, pp. 265-267. An August 1954 study by Major General James Gavin, then the Assistant Chief of Staff G3, noted overall satisfaction with the CGSC's role as the 'fountainhead of military knowledge' through its 'continuous research program to study the effects of new and possible future weapons on the conduct of operations.' Office of the Assistant Chief of Staff G-3, 'A Review of the Army School System' (Washington DC: Department of the Army, 1954), pp. 29, 44. CARLA N-13423.38.

[192] Chesney, 'Conversations between Lieutenant General William R. Desobry', p. 14.

process he eschewed.[193] By early 1954 the army had reached a crossroads. During the previous five years, combat developments, operations research, and an increasingly forward looking CGSC emerged as the army adapted to new demands. However, it still lacked a coherent process or a vision of how the disparate elements might work as a whole.

The Coach and a Game Plan

Major General Garrison H. Davidson took command of CGSC in July 1954. At first glance he was a decidedly odd choice for the position. Like his predecessor, Davidson had not spent much time as a student in army schools. After graduating from West Point in 1927, he served a two-year tour as lieutenant of engineers before returning in 1929 to become a coach, rising in 1932 to the position of head coach of West Point's football team. In what has to be one of the oddest career paths to general officer, Davidson spent the next five years as one of youngest and most successful head football coaches in the school's history.[194] Coaching duties and the start of the war meant he would never attend CGSC. Davidson often joked that he was 'completely uneducated [...] militarily'.[195]

Early in the Second World War, Davidson made a name for himself working for Groves, during the frenzied building of the Pentagon. He followed this with key assignments as an engineer, planner, and administrator during operations in North Africa and Sicily. Davidson was promoted to Brigadier General in 1943 while on Patton's staff, becoming one of the army's youngest general officers. Throughout his career, Davidson credited his notoriety as the former West Point football coach for opening doors to critical assignments and even his promotion to general officer.[196]

In the opening months of the Korean War, Davidson, then serving on the Sixth Army staff in California, was rushed into theatre to assist in planning the Eighth

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[193] Ingo Wolfgang Trauschweizer, 'Creating Deterrence for Limited War: The U.S. Army and the Defense of West Germany, 1953-1982' (unpublished PhD thesis, University of Maryland, 2006), pp. 156-213.

[194] Davidson's record of forty-seven wins, thirty-five losses, and eleven ties makes him the fifth most successful West Point coach in terms of total victories and seventh in terms of winning percentage.

[195] Dr. John T. Greenwood, 'Interview with Lt. General Garrison H. Davidson' (Oakland: U.S. Department of the Army, Corps of Engineers, 1980), p. 484.

[196] Greenwood, 'Interview with Lt. General Garrison H. Davidson', pp. 281-282.

Army's increasingly desperate defence. Upon arrival and after a brief fifteen-minute meeting with the army commander, General Walton Walker, Davidson received the task to create a second line of defence if the main Pusan line were to collapse. Lacking a staff, troops, or any engineer supplies, Davidson burnished his reputation as an energetic leader and capable engineer by cobbling together supplies along with several thousand Korean labourers to create a 68-mile second line in a matter of weeks.[197] Although the 'Davidson Line', as it came to be called, was never needed, Ridgway, Walker's successor, recalled how he 'was deeply impressed with the speed and effectiveness with which the job was [...] completed.'[198] Following his special engineering assignment, Davidson remained in Korea in various capacities, including assistant division commander of the 24th Infantry, until July 1951.

Davidson credited much of his success to luck, or as he described it, having the knack to be in the 'right spots at the right time'.[199] One of those 'right time' moments came as in July 1951 when, after departing Korea, Davidson joined the WSEG. He relieved Gavin, the army's first senior representative on this secretary of defense chartered research organization. In his capacity as the senior army officer, Davidson participated in or influenced the direction of some of the most important studies conducted by the department of defense on new technologies and capabilities. Davidson could not have known it at the time, but immersion in broad studies on the nature of chemical, biological, and nuclear warfare as well as the detailed analyses of tactical atomic munitions, strategic bombing effects, and U.S. capabilities for future war was an essential prerequisite for his tasks CGSC.[200]

According to Birrer, Davidson's first impression of Leavenworth was that it had lost 'its place in the doctrinal sun' and needed to 'wrest doctrinal initiative away from the hardware merchants'. Based on observations while on the WSEG staff, Davidson believed the school was failing in its responsibility to the army to provide the push, influence, and initiative necessary to drive new doctrine. CGSC had become

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[197] Greenwood, 'Interview with Lt. General Garrison H. Davidson', pp. 436-437.

[198] Ridgway, *The Korean War*, p.93.

[199] William C. Baldwin, 'Engineer Memoirs: Lieutenant General Garrison H. Davidson, USA Retired (Oral History)', (Oakland: Office of History, Office of the Chief of Engineers, 1986), p. 34.

[200] For a list of WSEG studies and reports during this period see 'Exhibit 1 - WSEG Task and Accomplishments, 1949-1955' and 'Exhibit 2 - WSEG Reports, 1949-1955' in John Ponturo, 'Analytical Support for the Joint Chiefs of Staff: The WSEG Experience, 1948-1976' (Arlington: Institute for Defense Analyses, 1979), pp. 99, 101.

the 'retailer' of doctrine and not its source.[201] Davidson's recollection of this issue matches Birrer's, but points to a different cause. Davidson believed the problem was not so much the fault of the hardware merchants as it was the quality of the doctrinal work being produced to guide them. In other words, the hardware merchants were merely filling a vacuum. 'There wasn't sufficient true study devoted to [doctrine...] it was too much opinion and not enough reason.'

Duty with the WSEG had taught Davidson that if one thoughtfully analyzed requirements for the next war and carefully projected probable materiel developments from existing equipment, then one could reduce the size 'of the field to which opinion has to be expressed'.[202] What was lacking in 1954 was not the diagnosis of the problem, but a coherent process to go about solving it. Davidson's second major observation was that recent events had tipped CGSC's curriculum away from education and back toward training. Again, Birrer recalled that Davidson believed that CGSC 'was still too much a World War II training school for staff officers' and not the graduate professional school 'it ought to be'.[203] Students were being taught 'superbly' the 'how,' but not sufficiently the 'why' of combined arms operations.[204]

In the fall 1954 Davidson launched three wide-ranging studies to examine the school's relevance and doctrinal responsibilities, its organization for accomplishing its mission, and, with the assistance of an external survey, the validity of its educational methods. A staff committee quickly produced the first study under the awkward but descriptive title, the 'Nature of the Curriculum, Command and General Staff College in Light of Impact of Atomic Weapons, 1955-56'. Davidson tasked the 'Easterbrook Committee', so named after its leader, to ensure that the curriculum was 'modern'. His metric for 'modern' was simple — ensure the school could not be accused of 'teaching World War II tactics in preparation for World War III'. Moreover, the committee should examine whether the planned instruction was 'realistic and in consonance with fact in the sensitive critical areas of mass destruction weapons'. Finally, when considering mass destruction weapons, the committee should ensure

[201] Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', p. 34.
[202] Greenwood, 'Interview with Lt. General Garrison H. Davidson', pp. 486-487.
[203] Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', p. 34.
[204] Greenwood, 'Interview with Lt. General Garrison H. Davidson', p. 485.

that CGSC had 'the most authoritative and up-to-date data [...] particularly with regard to weapons data, intelligence, and delivery means'.[205]

While the Easterbrook Committee went to work, Davidson initiated a series of smaller studies designed to put concept and doctrine development on a firm footing. He asked for studies to examine critically what he called the 'standard clichés' of recent atomic conceptual work: mobility, dispersion, and flexibility. Without betraying his own bias, Davidson asked for historical studies to 'determine from historical fact the probable true requirements for each of these characteristics'.[206] A few weeks later he tasked another committee to examine the assumptions associated with atomic warfare and ground forces in the period 1955–1960'.[207] Davidson was clearly trying to apply WSEG-like 'scientific' rigor to the school's efforts.

The Easterbrook Committee delivered its report on 5 November. The committee found that the 1954-55 curriculum 'does not fully meet the criteria of a realistic and forward-looking approach.' However, where material covering the 'field of atomics' was present, the content was as up to date as 'security and text material' would permit. It noted that while the total amount of atomic material had increased over the past several years, it had done so 'in a piecemeal fashion' and therefore 'the significance of atomics is lost in a large variety of non-atomic subjects.'[208] The Easterbrook Committee also found the curriculum overly complex and repetitive. The 1954–1955 curriculum reflected a six phase, narrow, staff and echelon-centric approach: fundamentals, staff functions, division, corps, and army operations, and administrative support for larger units. The new approach, approved by Davidson, emphasized application across a simplified four-phased instruction: familiarization, application, advanced application, and general education.[209]

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[205] Memorandum, from Davidson to Executive for Instruction, subj: The Nature of the Curriculum, the C&GS College, 24 September 1954. Reproduced in Annex B, 'Nature of the Curriculum, Command and General Staff College in Light of Impact of Atomic Weapons' (Fort Leavenworth: Command and General Staff College, 1954).(Hereafter cited as The Easterbrook Committee Report) CARLA N-13423.50-A

[206] Memorandum from Davidson to Executive for Research and Evaluation, subj: Additional Studies, 24 September 1954 in 'The Easterbrook Committee Report (1954)'. The committee, led by Colonel Ernest F. Easterbrook, included ten other members of the CGSC senior staff.

[207] Memorandum from Davidson to Assistant Commandant, subj: Report on "Nature of the Curriculum, etc.," 15 November 1954 in 'The Easterbrook Committee Report (1954)'.

[208] 'The Easterbrook Committee Report (1954)', p. 1. (See Appendix 5).

[209] Annex C, 'The Easterbrook Committee Report (1954)'.

On the fundamental question of the relationship between atomic weapons and the curriculum, the committee split into two distinct camps. Both groups agreed that the school needed an increased emphasis on atomic weapons, but they differed markedly on the degree of emphasis and basic assumptions. The arguments made by each side were representative of the major intellectual arguments within the army. The distinction being made was between two approaches to atomic weapons and combined arms doctrine. There was a third position not being considerd and that would later be closely associated with General Maxwell Taylor. The third position was a political and bureaucratic one where doctrine was a means to position, and possiblly preserve, the army against external budgetary pressures. Despite its prominence in the history of the period, Taylor's position was not part of the working level debates.

The first group argued that atomic warfare was the 'general type of warfare,' because it was 'the more dangerous threat to national security'. There was, in this view, two types of warfare. The first type would be where both sides employed atomic weapons from the outset. The second 'and less important' type would be a limited war in which atomic weapons were not necessarily used, but where each side would possess the ability to employ them. The logic of this position required that 'instruction must have as its basis the idea that two-sided atomic warfare [...] will be the normal battlefield situation.' Warfare 'without atomic support' should be 'relegated to the role of a special operation'.[210]

The second group, on the other hand, argued that CGSC should educate officers for the 'various general conditions of combat which U.S. forces are likely to encounter'. While generally agreeing with the first group on the types of war, the second group argued that the relative probability of a particular type of warfare or the even the likelihood of atomic use 'cannot be conclusively predicted'. Therefore, the curriculum should not emphasize the atomic battlefield over any other. [211]

Davidson concurred in the approach recommended by the second group. His curriculum guidance directed instructors to revise their courses to include the general situation, when both sides had and used nuclear weapons, and a special situation where atomic weapons might be employed by either side. Regardless of the specific

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[210] 'The Easterbrook Committee Report (1954)', pp. 2-4.

[211] 'The Easterbrook Committee Report (1954)', pp. 2-4.

scenario, however, 'the impact of atomics will be considered in all aspects of the problem for both combatants.'[212] In addition, Davidson approved a 'Program of Atomic Indoctrination' for all instructors based on the existing programme of instruction for the Atomic Energy Commission (AEC) designed Special Weapons Course.

The basic outline of the second group approach matched many of the arguments put forward by Taylor when he became the Army's Chief of Staff in June 1955. In remarks to the army staff he reminded them that 'in our planning, in our allocation of means, [we must be] thinking enough about the little war, which can always occur, instead of expending everything we have for the big war, which we hope will always be deterred'.[213] However, Taylor's decisions, especially those associated with pressing ahead with the emerging atomic-capable divisions, more closely matched the logic of the first group. Davidson's rigorous approach was going to challenge this approach without embracing the conservatives. He was simply going ask that advocates of the aggressive approach demonstrate the value of their position through the use of a credible process.

While Davidson's actions were soon to be associated with the more 'conservative' of the two options, he was far from advocating a conservative approach to the curriculum. In a January 1955 conference with faculty department heads, he made the case that 'if you are just teaching a commander or staff officer current duties, techniques and tactics, are you adequately preparing him for future command ten years from now, when he will be faced with new developments in tactics and new techniques?' Although several of the staff expressed concern that the army had yet to settle on a 'firm concept' for a time frame ten years into the future, Davidson decided the 1955–1956 class would use draft doctrine, especially on subjects involving atomic warfare, as one technique to look forward toward future applications rather than

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[212] Annex F, 'Guidelines for Authors of 1955/56 Units of Instruction in 'The Easterbrook Committee Report (1954)'.

[213] General Maxwell D. Taylor, 'Remarks at His First Meeting with the Army Staff after Assuming the Duties of Chief of Staff ' (7 July 1955), p. 2; National Defense University Library, Special Collection Archives, Maxwell D. Taylor Papers, Fort McNair, Washington DC. (Hereafter NDULSCA), <https://digitalndulibrary.ndu.edu/u?/taylor,362> [accessed 5 Janurary 2011].

backwards toward historic examples.[214] He warned the staff, however, that such instruction:

> must not mislead the student. Since the influence of mass destruction weapons on the battlefield have not been defined clearly enough to establish new doctrine, it must be made clear to the student that the doctrine presented to him represents the best, tentative thinking of the college on the subject.[215]

Having examined the current curriculum, Davidson turned to the college's organization, including its organization for doctrine development. In what became known as the 'Skinner Report', a committee of senior CGSC staff received the mandate to recommend a series of reforms designed to decentralize, simplify, and bring the college up-to-date. In addition, Davidson provided specific guidance based on his experience with the WSEG. The new organization would combine 'a weapons system approach with the present general staff approach considering the six major systems of any major combat unit to be: reconnaissance and intelligence, combat arms, fire support arms, combat support arms, logistical support, and administrative support'.[216]

The most significant legacy of the Skinner Report was the recommendation to change the way the college approached its standing mission 'to initiate action as necessary to formulate or revise (tactical and logistical) doctrine'. The 1954 organization placed responsibility for doctrine under a small combat developments section within the college's Executive for Research and Evaluation. According to Davidson's assessment, this meant that doctrine 'was not receiving the attention and support it not only deserved but required'. Davidson described the doctrine effort as 'organizationally awkward with regards to current doctrine and totally inadequate with regards to future doctrine'.[217]

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[214] Transcript of Seminar 'Instruction Mission, CGSC, Grant Hall, 8 January 1955,' cited in Stewart, 'Raising a Pragmatic Army: Officer Education at the U.S. Army Command and General Staff College 1946-1986', pp. 107-108.

[215] Memorandum from Garrison H. Davidson to Assistant Commandant, 'Subj: Guidance for Planning the /6 Curriculum,' (12 January), p. 5; MHI CGSC CP 1955/56.

[216] Memorandum from Davidson thru the Assistant Commandant, subj: Organization of CGSC, undated. Found in 'Report of the Ad Hoc Committee on Orgnaization of CGSC' (Fort Leavenworth: Command and General Staff College, 1955). CARL N-13423.26-B (Hereafter known as the Skinner Report).

[217] Davidson estimated that when he accounted for the external projects only 15 percent of the college's research and development resources were being devoted to the doctrine mission. Garrison H.

The Skinner Report recommended, and Davidson accepted several staff modifications: First, that the Executive for Research and Evaluation be redesignated the Director of Research and Analysis and made co-equal with the Director of Instruction. This was significant in terms of bureaucratic influence and access to resources. Accordingly, the number of officers assigned would rise from twelve to forty-two. The elevation in status was further enhanced when Davidson personally contacted the senior officers of each service and arm to assign their best officers directly.[218] Davidson argued that it was only through improving the quality of the doctrinal efforts at Leavenworth that it could compete with the ideas of 'the hardware merchants or the commercial think-tanks'.[219]

The second innovation was to split doctrine according to both expertise and time. Responsibility for current doctrine would fall under the director for instruction. Davidson explained the logic of this approach in his command after-action report by noting '[w]hat we teach is current doctrine.'[220] The instructors responsible for teaching current doctrine and preparing educational literature on current doctrine were the experts and should be responsible for commenting on or updating it as required.

The development of future doctrine, on the other hand, required a 'weapons system approach.' To accomplish this, the director of research and analysis was organized into three time-phased entities. First, an Advanced Operations Research Department (AORD) was to look at the 'long-range' development horizon — judged to be ten-years into the future. Its mission was essentially conceptual and it would deliver a 'body of ground force tactical and logistical principles' that would act as a guide for the development of doctrine and provide weapons characteristics to materiel research and development agencies.[221] As Davidson told the CONARC commander, the army's current problem with regard to concept development was the lack of an inclusive process that took advantage of the power of 'the group.'

Davidson, 'After-Action Report by Major General Garrison H. Davidson, Commandant Command and General Staff College' (Fort Leavenworth: Command and General Staff College, 1956), pp. II-I.

[218] Garrison Davidson, 'Talk by Major General Garrison Davidson to General Wyman on Combat Developments', Addresses by Garrison H. Davidson 1954-1956 (Fort Leavenworth: Command and General Staff College, 1955), p. 96; Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', pp. 36-37.

[219] Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', p. 37.

[220] Davidson, 'After-Action Report ', pp. II-I.

[221] Davidson, 'Talk by Major General Garrision Davidson', p. 97.

For instance, some of the present concepts that we are working on, now, were originated by a group of three officers at the Army War College. Now over a period of months this project has been expanded and developed, and in my opinion has reached a stature that perhaps is not justified.

By the time guidance had flowed down from the army staff through CONARC to CGSC, Davidson complained, concepts 'have been so restricted that we have not been able to contribute very much original thought to the final product'. [222] AORD would fix this by getting out ahead of the planning and guidance timeline.

The second entity was the Combat Developments Department (CDD). Organized along the same lines as the AORD, the CDD had a shorter time horizon, five–years, and more a more realistic set of constraints. The CDD's mission was to 'provide the first recommendations leading to the formulation of current doctrine or the revision of existing doctrine.'[223] Given its shorter time horizon, it was 'largely limited to weapons and equipment currently available to troops that exist or are in prototype stage'.[224] This allowed interface with the growing combat developments efforts of the CONARC, like the CDEC. Davidson was adamant that to be effective, the CDD would need high-quality data in the form of 'concrete figures [...] so you could know the effect of one tactical organization against another'.[225]

The final part of the Skinner Committee's proposed organizational design was a Current Analysis Section (CAS). The CAS would serve 'as a buffer to absorb the shock of projects originating outside of the college.'[226] The Skinner Report noted almost 50 external projects levied onto the existing CGSC doctrine office during just part of the 1954-55 academic year. Davidson's hope was that he could use the officers assigned to the CAS to participate in such events as CONARC's development, testing,

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[222] Davidson, 'Talk by Major General Garrision Davidson', p. 100. Davidson was referring to the concept work begun in November 1954 by the Army War College entitled 'Doctrinal and Organizational Concepts for Atomic-Nonatomic Army During the Period 1960-1970' generally known by its short name PENTANA. Field experiments with the AFTA-1 concept in 1955 indicated the potential for larger divisions in order to fight both atomic and non-atomic wars. This did not sit well with the army's senior leadership and although much more conceptual in nature, by late 1955 the PENTANA became the focus of doctrinal development effort. See Wilson, *Maneuver and Firepower*, pp. 264-276.

[223] Davidson, 'Talk by Major General Garrision Davidson', p. 98.

[224] Davidson, 'After-Action Report ', pp. II-2.

[225] Davidson, 'Talk by Major General Garrision Davidson', p. 102.

[226] Davidson, 'After-Action Report ', pp. II-I - II-2.

and evaluation of the ATFA-1 concept, thereby allowing the AORD and CDD to remain focused on future doctrine.[227]

The key to Davidson's concept was a five-step process that led to what he called a 'self-perpetuating system' of doctrinal development. The five-step process would begin with a 'visualization' of the battlefield in the timeframe under consideration.
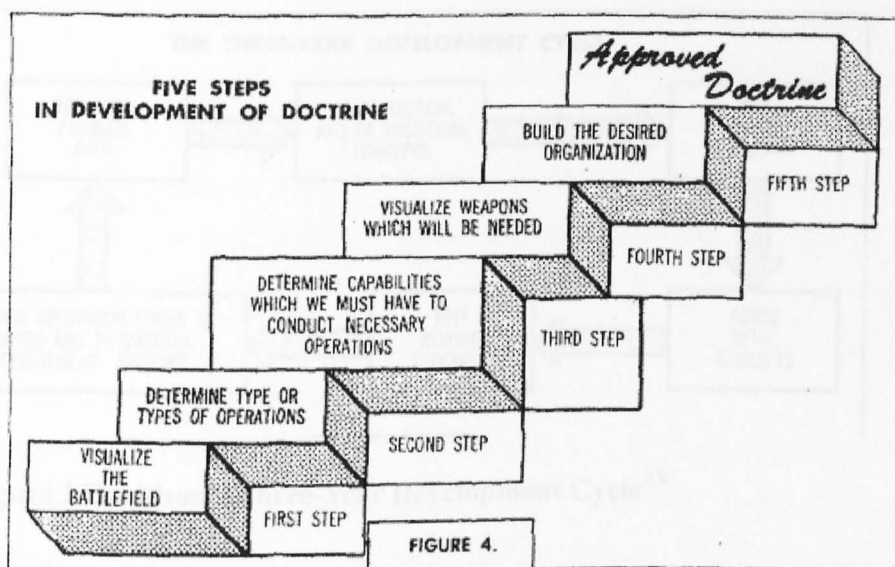

Figure 1: Davidson's Five-Step Program[228]

The image of the future would then develop with additional specificity by type of operation and then the broad capabilities necessary to accomplish the mission. The third step would be critical, since capabilities represent a combination of organization, doctrine, and weapons. Skipping this step could lead to 'weapons, pieces of equipment, various types of munitions, and features of organization' being developed 'without any particular use or need in mind'.[229] The fourth and fifth steps were to be dynamic and interactive. It is in these phases that experiment, field trials, and scientific development would take place. The concept was simple, but required an investment of time.

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[227] Davidson, 'Talk by Major General Garrision Davidson', p. 100.

[228] Robert C. Cassibry, 'Development of Doctrine', Military Review, 36 (1956), 22-34 (p. 27).

[229] Cassibry, 'Development of Doctrine', (p. 26).

Working on a three-year work cycle, the AORD would develop a set of long-range principles, which would in turn inform the material and doctrinal development efforts of the CDD and related agencies. At the end of each three-year cycle the process would begin again. Based on this concept and work already underway, Davidson told the commander CONARC that the first cycle would finish in June 1958.
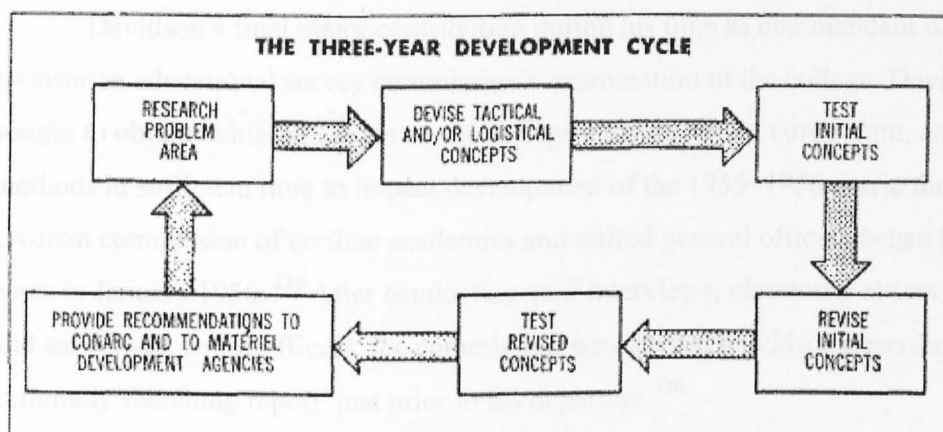
THE THREE-YEAR DEVELOPMENT CYCLE

RESEARCH PROBLEM AREA → DEVISE TACTICAL AND/OR LOGISTICAL CONCEPTS → TEST INITIAL CONCEPTS

PROVIDE RECOMMENDATIONS TO CONARC AND TO MATERIEL DEVELOPMENT AGENCIES ← TEST REVISED CONCEPTS ← REVISE INITIAL CONCEPTS

Figure 2 Davidson's Three-Year Development Cycle[230]

Davidson's vision of a process that linked long-range concept development work to combat developments in the mid-term was ground breaking.[231] It was the intellectual framework within which the more technological combat developments activity should occur. Birrer later described this institutional innovation as having a 'significant long-term impact' on how the army developed doctrine.[232] The problem was that Davidson's solution, while significant in its long-term impact, was several years too late to affect decisions already unfolding.[233]

In keeping with the general thrust of both the Easterbrook and Skinner analyses, and no doubt the influence of his own engineer background and WSEG experience, Davidson took a pragmatic approach to the 1957–1958 curriculum design.

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[230] Cassibry, 'Development of Doctrine', (p. 29).

[231] See Cassibry, 'Development of Doctrine', (pp. 22-34).

[232] According to Birrer the basic outlines established by Davidson defined the army's overall approach to doctrine and combat developments through the late 1970s. Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', pp. 36-37.

[233] In February 1956, Taylor approved a CONARC plan to reorganize the airborne division through a concept combining aspects of both the CGSC AFTA-1 and the AWC's PENTANA.

Atomic weapons would play a much larger role in the curriculum, but not at the expense of other forms of war. Davidson was concerned, based on his direct experience at the WSEG, that proponents in the army of some of the more radical organization and doctrine designs were guilty of 'very shallow' thinking. Accordingly, Davidson told the staff the 'we should resist any attempt to introduce ATFA into our [1956–1957] program of instruction, except in a minor way'.[234]

Davidson's final major contribution during his time as commandant was to sponsor an educational survey commission's examination of the college. Davidson sought to obtain unbiased advice on the college's organization, curriculum, and methods in sufficient time to impact development of the 1955–1956 curriculum. A six-man commission of civilian academics and retired general officers began their work in January 1956. [235] After conducting staff interviews, classroom observations, and surveys of senior officers, the commission issued what Davidson described as 'an extremely searching report' just prior to his departure.[236]

The overall tone of the report was positive. In fact, while the commissioners did make several substantive recommendations, they did not believe any of them required 'major changes in the basic structure of the program'.[237] This is perhaps not surprising since, as Davidson's education advisor, Birrer drafted and coordinated the report in support of the commission membership.[238] With regard to the curriculum, the commission noted that its scope was, like its pre-1950 predecessor, crowded. This forced the staff to expend their energy in a 'hopeless effort to design the perfect

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[234] 'Curriculum Plan for Regular Course C&GSC 1956-1957 - 21 December 1955' (Fort Leavenworth Command and General Staff College, 1955), p. 2. (MHI CGSC CP 1956/57)

[235] The military members were Manton Eddy, the former CGSC commandant; Geoffrey Keyes, who had been Davidson's superior on Patton's staff during operations in North Africa and Italy during the War and during most of his service in the WSEG; and Troy A. Middleton, President of Louisiana State University and a frequent advisor to the DoD on educational issues. The civilian members were; Dr. Jacob Orleans, the first CGSC civilian advisor 1948-49; Dr. Harold F. Harding, a reserve colonel who spent the summers between 1948-51 at CGSC helping to prepare curriculum; and Dr. Harl R. Douglass of the University of Colorado, the only member who appears to have had no prior relationship with the college.

[236] Memorandum from Davidson to The Chief of Staff, subj: Recommendations of Educational Survey Commission, 27 June 1956. Found in 'Report of the Educational Survey Commission (1956)'.

[237] 'Report of the Educational Survey Commission (1956)', p. 4.

[238] Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College'. Not surprisingly, one of the major findings was a call to 'energetically developed and imaginably pursue' Birrer's three-phase curriculum concept (familiarization-application-advanced application). This became the college standard for decades to come.

curriculum' in order to fit time constraints — not, as they should, educational objectives. [239]

The other major criticism of the commission was stated indirectly, but implied that the current approach to future war, as well the impact of atomic weapons, was, at best, merely adequate.

> The curriculum is geared at command and staff [...] in light of present knowledge of atomic power and other new developments. It is manifest that the conditions of warfare 10 years from now will find the present graduate less than adequately prepared [...] It is far better to improve the student's ability to solve problems of the future than to master details that will be outmoded this year or next. We live in a dynamic age. [240]

Finally, the commission also noted that the current approach was failing to 'encourage independence, initiative, resourcefulness, originality, creativeness, reasoning, judgment, and the like'. The commission encouraged the school to continue to pursue 'methods more nearly approaching those of a typical graduate school than is the usual CGSC custom'. [241]

On the eve of his departure in 1956, Davidson wrote a personal letter to the commander CONARC as a cover to his end-of-command after-action review. In it he described the college's accomplishments and challenges over the previous two years, endorsing the work of the educational survey commission that had highlighted what he described as his 'two great concerns' with regard to the college's mission. The first Davidson described as 'a serious deficiency in the knowledge and education of senior officers' with regard to current tactical concepts and weapon systems. He pointed out that the average officer attended CGSC, or the 'terminal' phase of his tactical education, at approximately the twelfth year of service. If that same officer went on to command at the division level or above, more than fifteen years would have passed since Leavenworth and 'a great deal of what they have learned will have become outmoded.' Given the accelerating pace of technological and doctrinal change, this problem was only going to get worse. Not stated, but clearly implied, was an argument that many current senior officers were tactically dated and perhaps unable to

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[239] 'Report of the Educational Survey Commission (1956)', pp. 14, 18.

[240] 'Report of the Educational Survey Commission (1956)', p. 13.

[241] 'Report of the Educational Survey Commission (1956)', p. 11.

adequately judge the real value of emerging tactical capabilities. Davidson's criticism does not appear to have been aimed at any particular group — futurists or the conservatives — but at the growing evidence gap between experience-based and intuition-based approaches to doctrine and combat developments. Davidson asked for Wyman's support for a supplemental 'Refresher or Advanced Course' in tactics for senior officers after twenty years of service.[242] While nothing came of the broader intent behind this recommendation, Davidson's successor did begin a senior officer atomic employment course designed to 'increase and enhance [...] knowledge of the effects as well as the tactics, techniques, and procedures for the employment of atomic weapons'.[243]

Davidson's second major issue was also the heart of his after-action review. His concerns reflected apparent frustration at his inability to impose some order on what he saw as the army's incoherent approach to developing capabilities for the future. Davidson's basic outline for a coherent doctrine development program proved to be ahead of its time, as his observations on the state of affairs the summer 1956 were prescient.

> [W]hile in a few days I will be out of the developmental game after spending five years in it, I will carry with me an extreme concern over the procedures for the development of tactical and logistical doctrine. The basic deficiency can best be illustrated by the fact that when recent chiefs of staff have assumed command, they did not find thoroughly analyzed and developed, new, modern concepts of tactical and logistical doctrine and organization within which they could readily incorporate their own ideas and be confident of the timely development of the best means to carry out their mission. Instead, it appears that the Department of the Army staff, on occasion, has been compelled to direct development of new concepts on a more or less arbitrary and crash basis.[244]

Davidson's critique was clearly directed, in carefully crafted language, at Taylor's recent decision to approve a modified version of the PENTANA concept. In

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[242] Letter from MG Garrison H. Davidson to General Willard G. Wyman, HQ Continental Army Command, Fort Monroe VA, 6 July 1956 appended to Davidson, 'After-Action Report '. (See Appendix 6)

[243] Lionel C. McGarr, 'Opening Remarks - Senior Officer Atomic Employment Course, 11 March 1957', Addresses by Lionel C. McGarr, Major General U.S. Army, Volume I 3 August 1956 - 2 May 1958 (Fort Leavenworth Command and General Staff College, 1957), p. 135.

[244] MG Garrison H. Davidson to General Willard G. Wyman, HQ Continental Army Command, Fort Monroe VA, 6 July 1956 appended to Davidson, 'After-Action Report '.

his assessment, 'not only do we not now have the type of answers which the Department of the Army's staff requires, but neither are we laying a sound foundation to provide those answers in the future.' Davidson questioned whether the army could avoid repeating the missteps of the recent past and gave it as 'his fixed opinion' that 'until the [a]rmy develops an adequate system for the development of future doctrine, future chiefs of staff will again find themselves in a similar position'. [245] The answer, as he saw it, was to leverage the power of 'collective thinking' and avoid the tendency, again in a thinly veiled critique of the Pentomic decision, for ideas to:

> come down from the top with such a degree of detailed guidance and with such close time limits, they tend to stifle the thought of subordinate agencies, require superficial thinking deadlines, and in general dissipate the total effort. A proper system would instead be based on feeding new ideas up from the bottom [...and] tap our vast reservoir of brainpower and experience. [246]

Davidson once asked his staff if they knew the definition of proper tactics. He assured them that if their response was 'the opinion of the senior officer present,' they were wrong because that was diametrically opposed to his philosophy. [247] At the end of his tour, Davidson had concluded that the army was preparing for the future based on a dash of senior opinion and little else. By summer 1956, it was clear that he had come too late. His successor was chosen in large measure because he would drive in a preordained future direction and not foster an intellectual process along the way.

Davidson's tenure was a point of transition. CGSC was trying to reconcile its traditional role — transferring the profession's hard-earned knowledge to a new generation — with a growing perception that even as it was being taught, that knowledge was out of date. The same dilemma squeezed the army in terms of its place in the nation's strategy and defence budget. The only way out of what Taylor would call its 'Babylonian Captivity' was by a compromise position emphasizing a flexible army that was both atomic and non-atomic capable. [248]

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[245] Letter From Davidson to General Willard G. Wyman CG Continental Army Command, 'Transmittal Letter to End of Tour AAR,' (6 July), p. 2; CARLA N-13423.92.

[246] Letter from Davidson to General Willard G, Wyman, p. 2.

[247] Garrison H. Davidson, 'Commandants Talk to the Staff and Faculty of the C&GSC, 25 August 1955' (Fort Leavenworth: Command and General Staff College, 1955), p. 2. MHI CGSC l-26.

[248] Maxwell D. Taylor, *The Uncertain Trumpet* (New York: Harper & Brothers, 1959), p. 108. There are many examples of Taylor's rhetoric on this point and much before the use of the term 'Flexible.' Beginning in late 1955, he emphasized '[b]alanced strength means flexible proportioned strength,

The Eisenhower Administration's drive to economize defence hit the army's budget particularly hard, and the promise of new technologies was increasingly competing with traditional missions for declining army resources. The long running debate with the president over the direction of national strategy, as it related to both its nature and impact on the army, which had begun under Ridgway, was heating up again under his successor. Armed with a significant advantage in eloquence and charm over his predecessor, Taylor pushed back against the president's strategy. Eisenhower told the CJCS, Admiral Radford, in April that he believed Taylor's arguments resulted from the army's 'rather hazy' role in national security, which had 'left them somewhat unsatisfied and even bewildered'. The Chairman agreed and added that 'the [a]rmy's tendency to resist basing its forces on an atomic concept tends to work in just the wrong direction'.[249]

Taylor's solution was to offer a more flexible alternative, one equally adept at atomic and non-atomic warfare. Flexibility worked at the strategic level as well by allowing Taylor to argue the need for 'tri-dimensional' deterrence of land, air, and sea-lest parity with the Soviet Union in one domain of war encourage adventurism in another. Flexibility also addressed the problem of finding a place for the army in a defence budget increasingly dominated by atomic weapons and their delivery systems. Finally, by embracing this framework, Taylor could rhetorically leverage some of the main themes of the administration's policy and secure funding for modernization, even as he continued to fight to preserve the army's traditional non-atomic capabilities.[250]

Such a strategy required Taylor to move quickly. It was unlikely that the administration would support the army's logic if its atomic capabilities were still on the drawing board and its units still perceived as being organized for the last war. In

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including military means of various forms appropriate to deter or fight small wars as well as big wars [...] wars in which atomic weapons are used, wars in which atomic weapons are not used'. General Maxwell D. Taylor, 'Speech to the Executives Club of Chicago - the Army Deterrent to War,' (7 October 1955), p. 20; NDULSCA, <http://digitalndulibrary.ndu.edu/u?/taylor,199>.

[249] Memorandum of a Conference With the President, White House, Washington, March 30, 1956, 3 p.m. and Memorandum From the Chairman of the Joint Chiefs of Staff (Radford) to the President, April 17, 1956 found in *Foreign Relations of the United States, 1955-1957. National Security Policy.*, ed. by William Klingaman, David S. Patterson, Ilana Stern, XIX (Washington DC: Government Printing Office, 1990), pp. 280, 298.

[250] For a discussion of Taylor's logic in settling on the Pentomic army as a rational compromise to what he saw as an existential threat from the administration's policies see Donald Alan Carter, 'Eisenhower Versus the Generals', *The Journal of Military History,* 71 (2007), 1169-1199.

spring 1956, while wrestling with the administration and JCS over strategy and resources, Taylor dramatically moved the army in what Radford might have considered the 'right direction.' While expressing some doubts about the army's ability to develop both atomic and non-atomic capabilities in a single organization, Taylor nevertheless acceded that it was 'increasingly difficult to visualize a general war without the use of tactical atomic weapons.' [251] On 15 May, he approved the 'broad concepts expressed in PENTANA' and directed the army staff to 'avoid undue conservatism [...] and be progressive in its thinking.' In a telling statement, Taylor said he had no doubt the army could 'put a dual-capability organization on a chart' but worried aloud that the real thing might not be 'feasible under [current] fund limitations'. [252]

Despite many questions about its feasibility, Taylor approved the PENTANA concept as a vehicle 'to provide organizational, planning and research and development guidance and to provide a basis for further experimentation, war-gaming, field-testing, and evaluation'. He directed CONARC to 'develop a detailed plan for phased transition to the PENTANA organization' as if the concept were fully developed and tested. In a gambit to preserve the institution for the future, Taylor embodied Davidson's cliché that tactics were 'the opinion of the senior officer present.' It is ironic that the doctrine and combat development processes and analytical tools just then coming into maturity were effectively sidelined even as Taylor admitted to his staff that 'we have no experience to guide our thoughts for the next 10-15 years.' [253] For Taylor, the issue at hand was a near-term institutional crisis — not necessarily determining the best capabilities for a future war. He encouraged

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[251] Brief From Deputy Chief of Staff for Military Operations for Chief of Staff, 'Army Organization 1960-1970 (Pentana),' (15 May 1956); MHI UA 25.E32 1956. Attendees to the briefing included the army G-3, Lieutenant General Eddleman and the CONARC commander.

[252] Briefing on Army Organization 1960-1970 (Pentana), pp. 3,6. (See Appendix 7).

[253] Taylor quoted in staff notes appended to Briefing on Army Organization 1960-1970 (Pentana), p. 6. Taylor, had a preference for the kind of organization and doctrine proposed under the PENTANA concept. However, from an institutional perspective the driving force behind his decision in early 1956 was the result of decision to position the army for a strategic debate about national security and budgetary calculations and not some strongly held conviction or a preference of the senior member of the so-called 'Airborne Club.' For the view that Taylor's decision was not driven by such things as budgetary considerations see A.J. Bacevich, *The Pentomic Army: The U.S. Army between Korea and Vietnam* (Washington DC: National Defense University Press, 1986), p. 106; Kalev I. Sepp, 'The Pentomic Puzzle: The Influence of Personality and Nuclear Weapons on U.S. Army Organization 1952-1958.', *Army History*, PB-20-01-1 (2001), 1-13.

those in attendance, including the CONARC commander, to 'be optimistic and farsighted in developing concepts for the future.'[254] Change, at least in the near term, was not a question of 'what kind' but rather 'how fast'.

Keeping Pace with McGarr

Major General Lionel C. McGarr was one of the longest serving (1956–1960) and most controversial commandants in the history of CGSC. However, he is probably best remembered for his controversial assignment after CGSC. From 1960-1962 McGarr served as the commander of the Military Assistance Advisory Group — Vietnam (MAAG) as the United States moved from advice to participation. However he might be remembered for his role in the Vietnam War, it was through his four-year tour as commandant of CGSC that left his most enduring legacy.[255]

McGarr was a 1928 West Point graduate who served most of the interwar years in tactical infantry units of the Regular Army and National Guard. In 1941, he joined the 3rd Infantry Division, a unit in which he would serve with distinction throughout combat operations in North Africa, Sicily, Italy, and Germany. In four years of almost continuous operations, McGarr earned a well-deserved reputation for aggressive and successful tactical leadership. The fact that he earned the second highest award for valour, the Distinguished Service Cross, a Silver Star, and five Purple Hearts, all while in command of an infantry regiment, says a great deal about his take-charge style of leadership.

After graduating from the National War College in 1947, McGarr served in his first high level staff assignment as a member of the army staff's intelligence division. Two years directing, training and serving as Chief of Staff of U.S. Forces Austria followed. In 1952, McGarr received an assignment to Korea, where he became the assistant commander of the 2nd Infantry Division and where he earned two more

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[254] Briefing on Army Organization 1960-1970 (Pentana), p. 5.

[255] During his first year in Saigon, McGarr was the energetic optimist famous for saying how he intended to 'out conventional the unconventionalists.' By his second year, he was something of a realist, if not a pessimist, who warned America could fail and the military be blamed if it did not pursue a more rational counterinsurgency strategy. On McGarr's evolution see Robert Buzzanco, *Masters of War: Military Dissent and Politics in the Vietnam Era* (New York: Cambridge University Press, 1997), pp. 90-91. It perhaps says something about how little the army was thinking about Vietnam that it would assign as its senior military advisor an officer who spent the previous four years immersed in all things Pentomic.

Purple Hearts during bitter fighting in June and July. In 1953, just as the truce took effect, McGarr took charge of the prisoner of war command and then command of the 7th Infantry Division. Early in 1954, he departed Korea to take charge of the Caribbean Command in Panama.

From the perspective of academic qualifications, McGarr was probably the least qualified of the post-war commandants. His sole encounter with post-graduate education was a year at the National War College. Moreover, as someone charged with developing the army's future staff officers, he had little senior staff experience. However, it was clear that McGarr's assignment to Fort Leavenworth rested not on his specific qualifications, but rather his leadership style. McGarr was a reflection of Taylor's need to show immediate progress toward a more flexible future, even if that progress was ephemeral.

Where Davidson had embarked on creating a deliberate process for change, McGarr was simply going to create change. Birrer believed McGarr received the simple, if simplistic mission, from Taylor to 'go out there and get Leavenworth into the present century'.[256] According to John K. Singlaub, an instructor at the time and future general officer, Taylor found just the right man for the job in McGarr; 'a crusty, sawed-off West Pointer with a brilliant combat record [...] and the type of old-school officer who believed in authoritarian command.'[257]

McGarr understood the mission — what mattered most was change. He described the context and primary task of his assignment in his 1960 end-of-tour report:

> [T]he fast-moving tempo of doctrinal change required by technological advances urgently demanded a forward-looking, properly balanced curriculum with a well-integrated supporting organization. At the same time, a number of important events occurred which pointed up both the advisability and necessity of a complete revision and reorientation of the course of study.[258]

Like most new commandants, McGarr arrived after the basic curriculum for the upcoming year was already approved. Everyone on the staff expected McGarr to

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[256] Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', p. 39.

[257] John K. Singlaub, *Hazardous Duty: An American Soldier in the Twenty First Century* (New York: Summit Books, 1991), p. 235.

[258] Lionel C. McGarr, 'Special Report of the Commandant' (Fort Leavenworth: Command and General Staff College, 1959), p. 1. CARLA 355.0071173 U56 1959. (See Appednix 8).

follow precedent by spending the first half of the year conducting an assessment of the current program with an eye toward the following year's guidance, while depending on the deputy commandant to manage the current year's execution.

McGarr's deputy for the first year was Brigadier William F. Train. Davidson brought Train to the CGSC in 1955 from the WSEG, where the two had worked closely together on army related studies. Train was very much a man in the Davidson mold and the officer most familiar with the upcoming curriculum. For McGarr however, Train was a daily reminder of what was wrong with CGSC: cautious, deliberate, and 'obviously opposed to progress and change'.[259] The friction between the two is clearly visible in oral histories of the period and in stiff staff memoranda.

McGarr's leadership style did much to alienate everyone at the college, but not his superiors. Train described his last year at Leavenworth as 'one of the most difficult years I ever had in my life.' He described McGarr as 'underhanded' and a 'very dishonest man.'[260] Even by his supporters McGarr was generously described as 'colourful and controversial' and a man who could be 'blunt, rough, humourless, and suspicious – not easy to like.'[261]

McGarr studied his new command before arriving and was thoroughly familiar with the results of the educational survey. What he needed was a specific actionable vision to create the kind of change his mission required. The answer came in the form of an unsolicited plan for reform presented by two junior members of his staff. Majors Richard 'Dick' Hallock and John H. Cushman were perhaps typical of many in the post-Second World War transitional generation.[262] Too junior to be

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[259] This is McGarr's assesment of Train, as recalled by Ivan Birrer. Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', p. 40.

[260] Reginald G. Moore, 'Oral History - William F. Train, Lieutenant General, USA Retired', II (Carlisle Barracks: US Army Military History Institute, 1983), p. 403. Train's major issue with McGarr's style was the use of junior officers as 'spies' to keep tabs on the staff, their progress, and attitudes toward his directions. McGarr was also known for directing by staff memorandum, not consulting with key staff prior to major decisions, and generally remaining aloof to a majority of his subordinates.

[261] John H. Cushman, 'Fort Leavenworth - A Memoir, Vol. I,' p. 17; U.S. Army War College Library, UB 200.C87 2001 V1;; Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', p. 39.

[262] Cushman entered service at the very end of the Second World War, trained as an engineer, his early career included service as member of the Armed Forces Special Weapons Project. Hallock was a highly decorated Second World War paratrooper, intelligence officer, and young Korean War battalion commander. Both were enthusiastic members of a group of mostly young officers pressing the army to more rapidly adopt new technologies.

wedded to the last war and frustrated over the conceptual drift of the institution, they were aggressive and impatient advocates for change. In early 1955, Cushman, then a student in the regular course, published a call-to-arms in *Military Review* entitled 'Harness the Revolution.' Cushman argued the army was in the midst of a revolution 'so vast that it will reach into every aspect' of the institution. What was needed were leaders capable of harnessing the technology and tools of analysis that currently existed, and 'the vision to see the entire problem' and the imagination 'to accept revolutionary answers'.[263] Cushman's unbounded enthusiasm for revolutionary change came to symbolize much about the McGarr period.

In summer 1956, Cushman's ideas and Hallock's willingness to work outside the normal bureaucratic boundaries came together in a collaboration to transform CGSC. In September, they presented their unsolicited plan to the new commandant. The document began;

> CGSC instruction is inadequate. It is out of date, sterile stereotyped, inflexible, [and] unimaginative [...] its doctrine is essentially ETO-World War II and its approach to atomic warfare is to superficially impose atomics on conventional doctrine.

According to Hallock and Cushman, the problem was that the current CGSC system was 'complacent, inbred, essentially negative in outlook, closes ranks against change, and stifles growth.' They proposed changing both the structure and content of the college concurrent with the execution of the current year.[264] Young, smart and impatient, Hallock and Cushman accepted without reservation the strategic and operational context underpinning the Pentomic army. Any process, such as Davidson's, or standard, such as the weight of history, that allowed for an alternative was anathema. McGarr was impressed, if not with their ideas, then with their enthusiasm, and made two immediate decisions. First, he accepted both of the young

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[263] John H. Cushman, 'Harness the Revolution', *Military Review*, 34 (1955), 13-18 (pp. 13-18).

[264] Extracts of the Hallock-Cushman proposal are reproduced in Fort Leavenworth - A Memoir, pp. 14-15. Cushman went on to retire as a Lieutenant General. His assignments included command of the Command and General Staff College from July 1973 to February 1976. Hallock retired a few years after receiving a poor student rating at the Army War College in 1962. The commander of the War College at the time was Major General Train, the very officer whose authority Hallock so blatantly undercut while working for McGarr. Hallock would go on to a career with RAND and DoD weapons research. In the early 1970s, at the request of the US Secretary of Defense, Hallock became a private weapons consultant for the Shah of Iran and was later accused playing all sides for private profit. See Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', pp. 64-64; Gary Sick, *All Fall Down: America's Fatefull Encounter in Iran* (London: I.B. Tauris & Co., 1985), pp. 15-17.

officers diagnoses of the problem and the proposed solution. Second, he assigned Hallock and Cushman to work for him as a shadow staff to ensure the plan was executed and to report on any resistance to the changes on the part of the staff.

To meet the requirements of the 1956–1957 academic-year, and in accordance with the plan of his 'Young Turks,' McGarr left in place the instructional staff organization of his predecessor. Day-to-day supervision was the mission of his deputy. Simultaneously, McGarr established a 1957–1958 coordinator position, effectively a second deputy commandant, under which the next year's staff would assemble. Slowly over the course of the year, the current staff and a slate of new instructors would matriculate into the new organization.

The new staff's primary mission during the transition year was the complete rewrite of the curriculum to reflect the new Pentomic division organization (which was still an evolving force design emerging from the ATFA and PENTANA concepts). The college would move away from the seven staff- and mission-centric functional departments of the current year to five departments organized around unit type and echelon. The new departments were: (1) armoured division, (2) infantry division, (3) airborne and army aviation, (4) larger units and administrative support, and (5) a catchall department for staff and general education. Train argued that such an organization scheme duplicated what the tactical schools already taught. Moreover, such a design would detract from CGSC's core mission of educating officers in the application of combined arms. [265] McGarr's design had little to do with combined arms education and everything to do with creating an organization suited for the rapid development and promulgation of new doctrine built around an organizational design — the Pentomic division.

It was clear to McGarr that a complete rewrite of combined arms doctrine would not allow for normal doctrine review and approval procedures. The dispensing of normal review quickly became the norm. To support the Pentomic decision, CONARC issued a directive to all of its schools to emphasize atomic warfare in the upcoming year. The commander of CONARC authorized McGarr to use draft doctrine (awaiting Department of the Army level approval) and even recommended

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[265] Moore, 'Oral History - William F. Train', p. 407.

doctrine (awaiting CONARC approval) at his own discretion where approved doctrine 'was lacking or out of date'.[266]

Taylor's decision to convert the army's airborne and infantry divisions to a Pentomic model made Davidson's process of deliberate doctrine development unworkable. McGarr elevated the role of current doctrine and severed its developmental relationship with future doctrine (including combat developments).[267] This allowed the drafting of the new curriculum and the rapid development of manuals reflecting the Pentomic organizations to occur as a single rapid process. To further accelerate the changeover, the normal curriculum 'murder board' review process was decentralized to the director level and the standards relaxed.

McGarr's philosophy, supported by the CONARC command and the chief of staff's directives, was 'modern doctrine of necessity is based more on evaluated theory, supported through field tests, than in the past'.[268] McGarr's predecessor would likely have agreed but would have subjected the field 'tests' to some degree of scientific scrutiny.[269] But, for the time being, this was neither Taylor's nor McGarr's primary concern.

Future doctrine, or combat developments as it was termed outside the college, once again became a stand-alone function within the school. The top-down nature of the Pentomic concept and the compressed timeline left little need to emphasize developments in the five-ten year timeframe. For all intents and purposes, McGarr was on a mission to implement, not develop, future doctrine. In the near-term at least, there would little value in Davidson's 'self-perpetuating' development concept.

McGarr issued his 1957–1958 curriculum guidance in early December 1956. In keeping with the general recommendation of the educational survey, the school weighted sixty percent of the more than 1200 academic hours toward the application or advanced application subjects under the infantry, armoured, airborne, and larger

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[266] McGarr, 'Special Report of the Commandant', p. 110.

[267] Unlike his predecessor and much of the army at the time, McGarr did not distinguish between Combat Developments and future doctrine. For a detailed view of the Davidson plan for doctrine development at the college see Robert C. Cassibry, 'Development of Doctrine', Military Review, 6 (1956), 22-34 (pp. 22-34).

[268] McGarr, 'Special Report of the Commandant', p. 113.

[269] For some detailed discussion on the generally negative feedback from field tests of both the AFTA and PENTANA concepts between 1954-1956 see John J. Midgely Jr., Deadly Illusions: Army Policy for the Nuclear Battlefield (Boulder: Westview Press, 1986), pp. 44-69.

unit departments. A block of instruction on future war that had begun under Davidson was expanded from sixty to eighty hours. The purpose of this section, taught by the research and analysis staff, was to prepare students to 'adjust rapidly to conditions of future war' and provide the college with a means 'of evaluating future doctrine'. Again, the definition of future under the McGarr model is telling. The future warfare instruction 'covers application of methods and procedures for developing concepts of future warfare and for evaluating concepts, and weapons systems in the midrange and the short range time periods'.[270] In other words, for the upcoming year, McGarr shortened the time horizon for 'future doctrine' to the given Pentomic concepts.

As might be expected, McGarr's enthusiasm for shifting the CGSC program to an atomic-centric one was especially evident in his first year. The rhetoric was that of a revolutionary. McGarr told a group of senior officers, early in his first year, 'that the advent of these weapons is forcing a revolutionary rather that evolutionary approach to a re-examination of the art of war'. McGarr argued that the success of the newly developed Pentomic division and doctrine was based on the *planned progress* on the potentialities of weapons and organizations'.[271] (Emphasis added).

To make his points McGarr would often use 'straw-man' comparisons. On the one hand '[w]e can feel our way slowly and cautiously forward, making certain of each hesitant step, with one hand firmly attached to the past.' On the other 'we can be guided by advanced thinking based on the results of research and analysis, combat developments, and tests [...] retaining that which is applicable but breaking clearly with the outmoded concepts of the past'.[272] All that was lacking 'for optimal application' of the new material was proper dissemination.[273]

While the language of McGarr's first year continued to cycle through his gudience, *Military Review* articles, and correspondence with his staff, the last three years of his command were much more pragmatic. In retrospect, the seeds for the rapid fall of the Pentomic concept were inherent in the dogmatic pronouncements of its enthusiasts. Doctrine and organizations approved before any major successful field

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[270] Memorandum from McGarr to Assistant Commandant, 'Subj: Decisions on /9 Curriculum, ,' (4 December 1957); CARLA. CARLA CGSC/9.

[271] McGarr, 'Opening Remarks - Senior Officer Atomic Employment Course, 11 March 1957', p. 136.

[272] Lionel C. McGarr, 'USA Command & General Staff College Keeps Pace with the Future', *Miitary Review,* 37 (1957), 3-13 (p. 4).

[273] McGarr, 'Opening Remarks - Senior Officer Atomic Employment Course, 11 March 1957', p. 136.

tests were complete, tied in many cases to essential weapons systems or supporting organizations that did not yet exist, could only be sustained by words for a limited period of time.

One area where McGarr's first-year curriculum guidance had a major long-term impact on CGSC was on the diversification of the curriculum. In keeping with Taylor's strategic argument that the army must be prepared for all types of warfare, McGarr drafted a 'strategic settings paper' to rationalize the strategy with the newly emerging doctrines. Validated by the army and CONARC at a CGSC-hosted conference in March 1957, McGarr's structure offered a logical breakdown between the forms of war, the atomic 'levels of use' within each, and the locales where such war might realistically occur.

In order to jump-start change, McGarr directed a complete break from the past by enshrining the premise that future operations were 'completely atomic, since in the future all ground operations will take place under the threat of the use of atomic weapons.' This required all fundamentals and most tactical instruction be taught under the assumption of active-use of atomic weapons. So-called 'nonactive atomic' operations (situations where atomic weapons had not been used but might be at any time) were taught to the extent necessary to ensure that 'the [student] is capable of performing with equal facility in either active or nonactive atomic conditions'.[274]

The new approach broke warfare into three categories: general, limited, and situations short of war. General war was assumed always to be an atomic war. Within general war, CGSC envisioned a small chance of the 'unrestricted' use of atomic weapons where land warfare was not possible. The second category, limited war, was generally seen as active atomic, but as Table 1 indicates, the percentage of nonactive atomic increased throughout McGarr's tenure. Finally, there were situations described as falling 'short of war.' These were by definition 'nonactive.'

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[274] 'U.S. Army Command and General Staff College: Catalog of Courses 1957-1958' (Fort Leavenworth: Command and General Staff College, 1957), p. 17. Nonactive atomic operations were only applicable to limited and situations-short-of-war scenarios.

	1956-57	1957-58	1959-60	1960-61
General War	98.8	45	35	35
Unrestricted	*	2	3	4
Intermediate	*	98	97	96
Limited War	0	48	55	55
Intermediate	*	70	50	45
Nonactive	*	30	50	55
Situations short of war (all nonactive)	1.2	7	10	10

Table 6 - Forms of War and Degree of Atomic Use
as a Percentage of Curriculum[275]

The second major and long-lasting curriculum shift was the diversification of locales (see Table 2). As noted in earlier studies, most of the applicatory material since the end of Second World War, had focused on historic European battlefields or, at the least, familiar European terrain. The growth of NATO in the 1950s only increased the army's pre-occupation on fighting the next war in Europe. By the end of McGarr's tour, however, a student was more likely to discuss the application of tactical doctrine on a map of Asia or the Middle East than he was on one of Central Germany. The logic was consistent with the assumption that future operations, including those outside of NATO, were 'completely atomic'.

	1956-57	1957-58	1959-60	1960-61
Western Europe	89	28	11	14
Eastern Europe	3	32	19	21
USSR	*	*	10	10
Middle East and Africa	5	20	33	32
Asia	3	20	27	23

Table 7 - CGSC Curriculum Locales (1956-1961)[276]

Just as the first year under McGarr's command drew to a close, a department of the army-sponsored education and training review delivered its report. The 'Officer

[275] Lionel C. McGarr, 'End of Tour Report of the Commanding General Fort Leavenworth and Commandant United States Army Command and General Staff College ' (Fort Leavenworth: Command and General Staff College, 1960), p. 100; McGarr, 'Special Report of the Commandant', p. 36.

[276] McGarr, 'End of Tour Report', p. 100; McGarr, 'Special Report of the Commandant', p. 36. The division between Eastern and Western in the locales chart is not as apparent in the course programs of instruction as these statistics portray. (*) For 1956-57 and 1957-58 the Eastern Europe locale category included the USSR.

Education and Training Review Board,' known as the Williams Board after its president Lieutenant General Edward T. Williams, met throughout the spring of 1957 and delivered its report in July. The charter of the Williams Board was to 'determine the adequacy of the present system of education and training of [a]rmy officers.' The board generally praised McGarr's efforts to institute 'the pentagonal structure, the modern concepts of the [a]rmy's missions, the implications of atomic warfare, and the impact of new weapons systems and other developments.'[277] Ironically, the one area where the board found fault was the adequacy of future doctrine.

The board did not question the quality of doctrine but its 'lack of timeliness'. The board found that Pentomic infantry units had been reorganizing for almost a year and were still using 'training texts' which were 'written and distributed on a crash basis' in lieu of approved doctrine. Cleary the board was captured by the same enthusiasm for all things Pentomic that was permeating the rest of the system. It did not find fault with the doctrine development process, or even the quality of the material provided, such as it was, but said the problem 'reflects an inability rapidly to produce training literature rather than a failure of the part of the schools or any particular segment of the system for developing doctrine'.[278]

The trauma of McGarr's first year was sufficient to make the last three years of his tenure quiet by comparison. Birrer later said of that first year that it probably 'took some kind of violent action to just move the institution and overcome all the inertia which was built into it'.[279] The basic outline of the next few years' curriculum remained the same in terms of basic themes and emphasis on the application phases of division- level instruction. Guidance for the staff for the 1958–1959 curriculum described it as a 'year of refinement.' McGarr noted that additional development of doctrine and curriculum material would be necessary since the army 'began its conversion to the Pentomic division organization.' However, an increased awareness of the arrival of nuclear parity with the Soviet Union had 'decreased likelihood of

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[277] 'Report of the Educational Survey Commission (1956)', pp. 1, 27-28. Williams was not a disinterested party. While serving ad president of the board he was also deputy commander of CONARC and directly responsible for CSGC.

[278] 'Report of the Educational Survey Commission (1956)', p. 278.

[279] Doughty, 'Dr. Ivan J. Birrer: Service at the Command and General Staff College', p. 40.

general war, nuclear war and increased the likelihood of limited war (both active and nonactive atomic) and situations short of war'.[280]

In his first year's guidance, McGarr emphasized a 'bold approach', 'an ample availability of atomic weapons', and the necessity of not letting the experience of Korea 'unduly influence our doctrine and organization'.[281] For his second year, while restating the college's continuing work on the 'Missiles-Atomic-Air-Age Army,' McGarr directed an increased emphasis on 'the important subject of Unconventional Warfare'. Describing unconventional warfare as a subject that 'assumes tremendous significance for the present and future battlefield,' McGarr directed that it be 'integrated into all other departmental courses of study'. In an echo of the same problem that existed for atomics only a few years before, McGarr noted that unconventional warfare still lacked a 'doctrinal basis for instruction'. Nevertheless, he anticipated increased emphasis in this area in the 1959–1960 curriculum.[282]

The structure for the development of doctrine established by McGarr during his first year remained throughout his tenure. As noted, the emphasis on developing and promulgating Pentomic doctrine during the first year skewed the development process begun under McGarr's predecessor. Development went from an integrated cycle beginning with long-range concepts to one focused on current concepts. By 1960, fully fifty-eight percent of the college's staff and faculty workload was dedicated to some part of the doctrine effort. A significant percentage of that work focused on current doctrine and therefore fell to the instructional department for completion. Combat developments grew in importance over McGarr's tenure and eventually evolved back into a version of Davidson's 'self-perpetuating system'. The major difference was in McGarr's inverted conception of development. The revolutionary concepts in place in the current army would drive refinement and materiel development in a future army. Accordingly, mid-range studies looking at

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[280] 'The Commandant's /9 Curriculum Guidence and Decisions on /9 Curriculum ' (Fort Leavenworth: Command and General Staff College, 1957), pp. 2-5.

[281] Brigadier General Train, 'Commandant's Policies, 18 September 1956' (Fort Leavenworth: Command and General Staff College, 1956), pp. 2,6.

[282] 'The Commandant's /9 Curriculum Guidence and Decisions on /9 Curriculum ', p. 30. Unconventional warfare was taught as a 30-hour block within the Department of Airborne, Army Aviation Department's 150-hour allocation of instruction. By comparison, the Basic Nuclear Weapons Course of Study, which provided the basic knowledge for the integrated instruction of atomic through the rest of the curriculum, was taught in a 45-hour block of instruction.

time frames out to five years were seen as 'evolutionary' and were intended to assist in transition 'rather than toward the development of revolutionary new concepts.' Long-range studies, those ranging from five-to-ten years into the future, were also evolutionary in nature and designed to 'provide guidelines for the organizational, operational, and materiel concepts that should continue to be developed as well as those on which development should cease'. Finally, McGarr's process included an area of very long-range study. These studies looked out ten to fifteen years and while less constrained than the other two groups, McGarr warned that they must not be 'cast in the framework of futuristic fantasy but are projected against a backdrop of practicability'.[283]

The irony of McGarr's inverted process was that CGSC found itself increasingly defending a status quo against new concepts being introduced by other combat development activities and commands. Formal coordination between the diversified developments activities in the army became more difficult as CGSC's comments became dismissed as 'Leavenworth Propaganda'.[284] In March 1959, McGarr complained that CONARC was submitting the results of Pentomic field exercises to the Department of the Army without first clearing them through CGSC. Any decisions could have a significant impact on the 'organization, operation, and doctrine pertaining to these divisions' and since 'the College has been active in this doctrinal area for some time', it should be consulted prior to any change.[285] McGarr had in fact run into the very problem Davidson set out to resolve, namely how to develop doctrine dynamically in a time of change.

By 1959, the reports from fielded Pentomic units were increasingly negative. Early in the year, CONARC, now under the command of General Bruce C. Clarke, was already exploring a heavier alternative, dubbed the Modern Mobile Army 1965–1970 (MOMAR I). By 1960, CGSC was directed to continue the development of the MOMAR concept based on CONARC's staff study.[286] McGarr's response was to

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[283] McGarr, 'End of Tour Report', pp. 18-22.

[284] Memordnaum From McGarr to Assitant Commandant and Chief of Staff, 'Subj: Letter to General Clarke (SASFA),' CARLA N-13423.232.

[285] Letter from McGarr to Major General A. S. 'Red' Newman Chief of Staff CONARC, 'Re: General Clark's Visit ' (March); CARLA N-13423.232.

[286] Robert A. Doughty, *The Evolution of US Army Tactical Doctrine, 1946-76* (Fort Leavenworth Combat Studies Institute, 1979), pp. 19-21.

return to the Davidson model by establishing 'a progressive and orderly transition toward the goals established by MOMAR'. He expressed concern that MOMAR objectives be evaluated 'in the critical light of what had actually been achieved' and warned of problems if the concept were considered 'in a vacuum' without sufficient 'lead-time in material research and development'. In his end-of-tour report, McGarr noted that 'the coordination of future doctrine was 'of such importance as to justify close study and supervision of my successor'.[287] The revolutionary had become the conservative.

Conclusion

From their earliest days, the schools at Leavenworth existed 'to facilitate change.' Throughout most of its existence, the pace and degree of change at CGSC were limited by the nature of the strategic environment. Conservative approaches to what was taught, how it was taught, and the development of doctrine served the army well. The success of Leavenworth graduates in managing and employing a massive citizen army in the Second World War validated the status quo and created a significant psychological barrier to change. Nevertheless, a significant amount of change did occur over the period described in this disseration.

The college moved from training centric organization focused on near-term army requirements to an educational organization that considered requirements across the probable longevity of its products, its graduates, and doctrine. Like combat development, the innovations associated with CGSC did not spring from the mind of a single maverick or flow naturally from a comprehensive plan.

Many of the elements of change were serendipitous. For example, lacking a clear basis for major doctrinal and curriculum changes, early post-war commandants focused their efforts on modernizing the college's educational methods. The gradual shift from a college with a significant emphasis on training to one resembling civilian graduate school programmes was a necessary precondition to significant curriculum and development changes to follow.

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[287] McGarr, 'End of Tour Report', pp. 23-24.

The Korean War and subsequent partial mobilization put tremendous pressure on the college to return to a more proven model of preparing officers for the future. However, two countervailing pressures continued to drive the college in another direction. The development of tactical atomic weapons, coupled with the economizing pressure of a national security strategy focused on strategic atomic weapons, forced the college, for the first time in its history, to focus its efforts beyond the current war. In some ways this was inevitable given the direction of the nation's strategy; however, it was also a reflection of the move toward education and a clear break with the past.

Under the leadership of Davidson, the college became an integral part of the army's growing process of capability development. Davidson anticipated the integrated process that would finally emerge in the early 1960s and mature through the army's post-Vietnam intellectual renaissance. However, CGSC was not immune to the influences of the larger institution of which it was a part. Pressure from the top for a dramatic change in the army's tactical character forced a temporary halt to the integrated development of doctrine. During McGarr's command, the CGSC executed a radical change in its orientation and processes. The McGarr period was important not for what it accomplished but for the negative example it came to ptovide. Despite pronouncements to the contrary, the changes to CGSC in 1957–1958 aimed at promulgating a concept that was not the considered result of the innovative processes then in place.

Changes in the CGSC are rarely seen on their own terms but instead judged on the basis of contemporary events. Like most education programs, the evidence of success lags the actual process of learning. To a lesser degree, the development of future oriented doctrine shares this attribute since its utility requires the alignment of associated developments in materiel and an amenable strategic context. In both of the college's missions, education and doctrine, changes across the early Cold War moved the army's intellectual preparation for future war from a single or narrow definition of the requirements for the next war to one where the capacity existed to adapt to a relatively broad range of possibilities.

Having a capacity to innovate and getting the innovation correct in the short term are two very different things. The failure of the Pentomic concept was perhaps the best example of innovation proceeding down the wrong track. The relative balance between a requirement to be prepared to fight and win outnumbered in Europe versus one to face a growing threat from guerrilla movements and

insurgencies was not affected by the processes used to prepare for either. Nothing that occurred at Leavenworth could change the constant of an unknowable future. Nothing in Davidson's process or the variations that followed eliminated the internal frictions of policy, budget, and personality, when it came to setting priorities within the system. However, without a structured intellectual process, the army's capacity to innovate would have no chance of 'keeping pace with the future.'

Conclusion

This dissertation argues that in the period 1945–1960 the institutional army created the capacity to innovate. This capacity did not exist, except in the most nascent form, before the Second World War. It continued to develop organizationally after 1960 and the capacity to innovate is still broadly in place in today's army.

In their examination of the army's record during these years, scholars have tended to analyze the results of peacetime innovation in light of the relative success or failure of change. In the case of innovation in the early Cold War army, there are two dominant innovation 'results', both of which were failures. The first failure of innovation occurred in the late 1950s when the army raced to create an ultra-modern force under the purposely-evocative name Pentomic. The Pentomic experiment has become a modern case study of peacetime innovation run amok where enthusiasm for untested concepts-dependent on risky technological development ran ahead of common sense and military judgment. Upon closer inspection, however, it seems clear that the Pentomic concept, and the decisions which brought it to fruition, were not the result of the emerging processes of innovation. Rather, both developed in spite of them. The second failure derives from the perspective of the army's performance in Vietnam. The governing view is that the army was wedded to a Second World War concept of how wars ought to be fought, the so-called 'Army Concept'.[1] According to this view innovation, insofar as it occurred at all, did not succeed in creating an army to meet strategic requirements because to do so would have violated 'Army Concept'.

Both conclusions derive in part from a methodological bias. One can look at innovation from two different perspectives: the results or the process. The more common method is to judge by results, using this to frame an understanding of the larger question of innovation as a phenomenon. The primary problem with this and related arguments stems from the problems of hindsight and the unstated assumption that given a range of possible futures, peacetime innovations can ever be accurate. As Michael Howard observed almost forty years ago, despite the best of intentions, those working on the development of doctrines in peacetime 'have got it wrong'. It turns

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[1] The characteristics of the 'Army Concept' are 'a focus on mid-intensity, or conventional, war and a reliance on high volumes of firepower to minimize casualties – in effect, the substitution of material costs at every available opportunity to avoid payment in blood.' Andrew F. Krepinevich Jr., *The Army and Vietnam* (Baltimore: The Johns Hopkins University Press, 1986), p. 5.

out that using a results-based approach to understand peacetime innovation during this period says surprisingly little about the innovation process itself. The key for peacetime innovators, continuing Howard's observation, 'is their capacity to get it right quickly when the moment arrives'.[2]

This dissertation began as an attempt to understand the relationship between innovation in the U.S. Army during the early Cold War and the army's performance in the Vietnam War. It is telling that in both cases, the processes described were never brought to bear on the problem. The Pentomic concept, although it included some useful elements, was an incomplete product of an immature process accelerated by political concerns. In the second case, the army of the late 1950s lacked the strategic justification to anticipate that counterinsurgencies would become a co-equal problem to the still unresolved issue of how to defeat the Soviet Union in non-atomic combat. A more appropriate question for army planners in the early 1960s was not how to move more aggressively to a force capable of conducting large-scale counterinsurgency operations, but rather how could the army develop two forces. It was a question famously not considered by the army, as its chief of staff boasted in 1962, 'any good soldier can handle guerillas'.[3]

The findings laid out earlier suggest that in a large and technologically complex army, the institutional capacity to move from ideas to concepts to capabilities does not emerge simply or chiefly from the support of a few key leaders, the agitation of mavericks, or the admonitions of external reformers.[4] These drivers of innovation must create or move bureaucratic processes in order to produce actual change. Service culture, individual officers, institutional will, fiscal realities, and political and strategic constraints all interact and impact, in a chaotic fashion, the process of innovation as it unfolds. Finally there is the role that chance plays in determining which senior officers are in which key positions when critical decisions are being made. General William Westmorland's decision to emphasize destruction of enemy forces over the protection of the population has been singled out as a critical early mistake of the Vietnam War. Given that there were alternative strategies

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[2] Michael Howard, 'Military Science in an Age of Peace', *RUSI Quarterly*, 119 (1974), 3-9 (p. 7).

[3] General George H. Decker cited in Robert Buzzanco, *Masters of War: Military Dissent and Politics in the Vietnam Era* (New York: Cambridge University Press, 1997), p. 90.

[4] This dissertation does not argue that one or the other of the factors which drive innovation described in the introductory section is dominate — only that they are insufficient or lacking some underlying institutional capacity for change.

available, it is reasonable to believe a different commander might not have pressed, as Westmorland did, for conventional units to fight 'the big unit war.'[5]

The degree and speed with which the army could adapt to the actual requirements of the Vietnam War directly related to its institutional capacity to do so. This dissertation asserts that such a capacity existed in the army as a result of three innovations that occurred between 1945–1960: the expansion of professional knowledge through the use of operations research, the creation of a coherent combat developments system, and the evolution of the CGSC's mission from training and current doctrine to education and near-term future doctrine.

The elevation of operations research from a new and to the army relatively unknown academic discipline to a critical tool in pursuit of military innovation signaled a significant expansion in what was considered to be professional knowledge. The traditional sources of military knowledge, derived from the lessons of history and recent experience, both drew primarily on the known past and the informed judgment of other military professionals. The strategic and technological context of the early Cold War made these inadequate. The navy and air force, being inherently more technologically oriented, were quickly to add operations research to their philosophies. The army followed somewhat reluctantly in the late 1940s, primarily in order to remain competitive in the increasingly data-driven competition over budgets. Despite coming to operations research later that its sister services, the army soon adopted the field's underlying logic: operational decision makers can benefit from the close collaboration with scientists and their analyses. In the increasingly complex and fast paced context of the early Cold War, the army discovered that 'such analysis can be of the utmost value, and the lack of such analysis can be disastrous'.[6]

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[5] Westmorland quoted in Krepinevich Jr., *The Army and Vietnam*, p. 140. On alternative strategies, see the March 1966 army study short-titled PROVN, which advocated a strategy centered on pacification and long-term development noting that the U.S. and South Vietnam 'must accept the principle that success will be the sum of innumerable, small and integrated localized efforts and not the outcome of any short-duration, single master stroke'. 'A Program for the Pacification and Long-Term Development of South Vietnam', I (Washington DC: Department of the Army, 1965), p. vii. (DTIC AD37743). On the debate over Westmorland's early decisions, see also Andrew J. Birtle, 'PROVN, Westmorland, and the Historians: A Reappraisal', *The Journal f Military History*, 72 (2008), 1213-1247; Lewis Sorley, 'To Change a War: General Harold K. Johnson and the PROVN Study', *Parameters*, 28 (1998), 93-109.

[6] P.M.S. Blackett, *Studies of War: Nuclear and Conventional* (New York: Hill and Wang, 1962), p. 172. Blackett's 1941 quote refers to operational analyses in general.

As promoted by the ORO under Ellis A. Johnson, army operations research provided a vehicle through which the army could explore an ever-expanding array of missions, tasks, and issues. The continued existence of the army's relatively weak staff system and the diffusion of responsibilities between combat arms, technical services, and field commands made the exploration of new issues, especially those that challenged an existing interest, difficult if not impossible. The ORO catalogue of studies ranged widely, including the first concepts, doctrine, and procedures for tactical atomic weapons; the implications of racial integration on readiness; weapons effectiveness tests under actual conditions; analyses of psychological operations; and the development and testing of new concepts. It is worth noting that the ORO or its direct spin-offs, the HumRRO and the SORO, produced a large body of work on military capabilities that would not meet the test of Krepinevich's 'Army Concept'.

The ORO existed for thirteen years, opening in 1948 and closing in 1961. Its influence and legacy extended well beyond the direct role it played in the developments and decisions of the time. The existence of the ORO spawned a series of similar research organizations throughout the army. By 1960, the increasing number of activities employing operations research as a primary tool of analysis moved the field from outside the army's intellectual mainstream to near co-equal status with history and experience as a source of professional knowledge.

Analytical research, regardless of how accurate or timely it may be, can carry innovation only so far. Military innovation is, for all its potential, an extremely practical endeavor. If a process does not result in an actual physical, organizational, or doctrinal change, then it has failed the definitional tests. Until the Second World War, the army developed new capabilities through a disparate system of arm-and service-based boards and a few government-owned research and manufacturing arsenals. Assuming any resources existed, the process by which a future requirement was identified, articulated, developed, tested, and delivered to the ultimate user was, at best, ad hoc and uncertain. In many cases the determination of requirements was just as likely to be in the hands of the procurement officers as it was in those of combat arms officers. The pace and complexity of new developments during the Second World War dramatically changed this process, but did not leave in place a model useful for the peace that followed.

The creation of a combat developments process after the war was, like many of the issues described in this dissertation, a gradual one that occurred after it became

clear that a return to the pre-war state was not going to happen. The story of combat developments had two major components. First, the decisions on who was responsible for the generation of requirements and the development process that followed were inextricably tied to the institutional questions nagging at the army since the 1902 Root Reforms. After the dissolution of the wartime ASF, the army entered a period of transition with regard to developments. The return of the traditional power and independence of the technical services and their representatives serving as logistical officers on the senior military staffs led to a contest over diminished resources and authority against the increasingly centralized authority of the AFF.

The intervention of outside parties moved institutional change forward when Project VISTA and later the Haworth Committee strongly endorsed an integrated model of combat developments, wherein the process would retain a degree of continuity from cradle to grave rather than being passed off between staff sections, arms, and services. An important consequence was the gradual weakening of the technical services as tools to develop new capabilities. The CONARC created a combat development system that gradually moved from the collaborative to one directive in nature, further strengthening the idea that combat developments could be centrally managed and de-centrally executed.

The final component of the innovation process examined in this dissertation, the Command and General Staff College, existed in generally the same form after the Second World War as before it. The changes that have been charted unfolded in a series of gradual shifts over a fifteen-year period. By shifting the horizon from the 'as-is' army to one that might emerge during the second half of their careers, forward-looking commandants not only affected not only how and what officers were taught but also changed the army's collective and institutional expectations. By the mid-1950s, officers graduating from CGSC were increasingly the product of a graduate education programme and not merely a staff-training academy with an educational flavor. In addition to familiarization with existing programmes, officers were increasingly asked to plan for future contingencies under combat conditions that, because they involved atomic weapons, were not part of historical scenarios.

The secondary mission of CGSC was the development of doctrine. Its role in this regard began prior to the Second World War but was never an authoritative one or, given the relative autonomy of the arms and services, a comprehensive one. The advent of tactical atomic weapons forced a significant reconsideration of army

doctrine. The CGSC increasingly carried the weight of developing the new doctrines of the Cold War while the combat development system matured. The pressure on the army to produce new doctrines that had the potential to force dramatic changes to long standing norms was disruptive and, as the Pentomic debacle demonstrated, fraught with risks.

At the apex of the debate, Major General Garrison Davidson, probably the most thoughtful of the post-war commandants, instituted a logical set of processes to develop and test doctrine and concepts. His five-step doctrine development process and three-year development cycle were holistic, accounting for context, capabilities, weapons, and organization simultaneously. Davidson's replacement, Major General Lionel McGarr, brought in by General Maxwell Taylor with a narrow mission to institute an untested organizational concept, masquerading as a war-fighting doctrine, abandoned the deliberate approach. McGarr's tenure was proof that rapid change is possible in peacetime but at the risk of widening the gap between the doctrines one has and the doctrines one will need. The utility of Davidson's approach to development was validated when McGarr found himself, by the end of his tour, fighting to regain CGSC's place in a process that was rapidly maturing around it and that was generally following his predecessor's approach.

There is nothing in the creation of an institutional capacity to innovate that insulates the user from the realities of the human condition. The development and growth of operations research in the service of land warfare did not prevent the later application of a broader cousin of the field, systems analysis, from warping the decision making process under Secretary of Defense Robert McNamara's so-called "Whiz Kids'.[7] Similarly, there was nothing in the combat development process that would require the army's senior leaders to insist that a logical series of development and test regimes be applied to new concepts before they were promulgated to the field army. As already noted, in hierarchical organizations individuals matter.

Although the creation of a capacity to innovate appears to have had a limited impact on the army's readiness for the nature of the Vietnam War, the capacity did nevertheless exist. The army reorganization of 1961 gave much of what had been a diverse set of capabilities a clearly defined place in the larger institution. The fully matured capability to innovate in peacetime would have to wait until the withdrawal

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[7] System analysis used many of the same tools and methods as operations research but with an eye toward comparing cost, effectiveness, and risks and if necessary proposed alternative course of action.

of the army from Vietnam in 1972 to demonstrate its potential under the right set of leaders.[8] Nevertheless, leaders alone, no matter how talented, cannot reshape or redirect a modern army. The institution itself requires a set of capabilities that uses all available tools and sources of information, maximizes the intellectual capital of its best practitioners, and applies as rigorous a peacetime testing regime as possibly can be devised.

This dissertation set out to explore and analyze the innovation process in the United States Army as it related to the onset of the Vietnam War. What it discovered was the disjointed creation of a set of capabilities that for the first time gave the army the capacity to innovate in peacetime. A concentration on the vagaries of the Pentomic division, and on the miscalculations and misfortunes that colour the history of the war in Vietnam, has concealed the existence of an increasingly sophisticated innovation process that provided the Army with new and effective tools with which to exercise its profession. Put simply, these 'failures' do not demonstrate that the Army lacked the requisite capacities. As Michael Howard has noted, having the capacity to innovate is a necessary but insufficient condition for successful innovation. Other factors will determine the degree to which an army gets things 'least wrong', when preparing for the next war.

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[8] For a description of the post-Vietnam renaissance see Henry G. Gole, *General William E. Dupuy: Preparing the Army for Modern War* (Lexington: The University Press of Kentucky, 2008), pp. 213-274; Paul H. Herbert, *Deciding What Has to Be Done: General William E. Depuy and the 1976 Edition of FM 100-5, Operations*, Leavenworth Papers 16 (Fort Leavenworth: Combat Studies Institute, 1988).

Appendix 1 – Memorandum from General Eisenhower, Subject: Scientific and Technological Resources as Military Assets

CCS 020 (10-4-44), Sec. 1

TO DIRECTORS AND CHIEFS OF WAR DEPARTMENT,   April 30, 1946

GENERAL AND SPECIAL STAFF DIVISIONS AND

BUREAUS, AND THE COMMANDING GENERALS

OF THE MAJOR COMMANDS

Memorandum

Subject: Scientific and Technological Resources as Military Assets

The recent conflict has demonstrated more convincingly than ever before the strength our nation can best derive from the integration of all of our national resources in time of war. It is of the utmost importance that the lessons of this experience be not forgotten in the peacetime planning and training of the Army. The future security of the nation demands that all those civilian resources which by conversion or redirection constitute our main support in time of emergency be associated closely with the activities of the Army in time of peace.

The lessons of the last war are clear. The military effort required for victory threw upon the Army an unprecedented range of responsibilities, many of which were effectively discharged only through the invaluable assistance supplied by our cumulative resources in the natural and social sciences and the talents and experience furnished by management and labor. The armed forces could not have won the war alone. Scientists and businessmen contributed techniques and weapons which enabled us to outwit and overwhelm the enemy. Their understanding of the Army's needs made possible the highest degree of cooperation. This pattern of integration must be translated into a peacetime counterpart which will not merely familiarize the Army with the progress made in science and industry, but draw into our planning for

national security all the civilian resources which can contribute to the defense of the country.

Success in this enterprise depends to a large degree on the cooperation which the nation as whole is willing to contribute. However, the Army as one of the main agencies responsible for the defense of the nation has the duty to take the initiative in promoting closer relations[s] between civilian and military interests. It must establish definite policies and administrative leadership which will make possible even greater contributions from science, technology, and management than during the last war.

In order to ensure the full use of our national resources in case of emergency, the following general policies will be put into effect:

(1) *The Army must have civilian assistance in military planning as well as for the production of weapons.* Effective long-range military planning can be done only in the light of predicted developments in science and technology. As further scientific achievements accelerate the tempo and expand the area of our operations, this interrelationship will become of even greater importance. In the past we have often deprived ourselves of vital help by limiting our use of scientific and technological resources on contracts for equipment. More often than not we can find much of the talent we need for comprehensive planning in industry or universities. Proper employment of this talent requires that civilian agency shall have the benefit or our estimates of future military problems and shall work closely with Plans and the Research and Development authorities. A most effective procedure is the letting of contracts for aid in planning. The use of such a procedure will greatly enhance the validity of our planning as well as ensure sounder strategic equipment programs.

(2) *Scientists and industrialists must be given the greatest possible freedom to carry out their research.* The fullest utilization by the Army of the civilian resources of the nation cannot be procured merely by prescribing the military characteristics and requirements of certain types of equipment. Scientists and industrialists are more likely to make new and unsuspected contributions to the development of the Army if detailed directions are held to a minimum. The solicitation of assistance under these conditions would not only make available to the Army talents and experience otherwise beyond our reach, but also establish mutual confidence between ourselves

and civilians. It would familiarize them with our fundamental problems and strengthen greatly the foundation upon which our national security depends.

(3) *The possibility of utilizing some of our industrial and technological resources as organic parts of our military structure in time of emergency should be carefully examined.* The degree of cooperation with science and industry achieved during the recent war should by no mean be considered the ultimate. There appears little reason for duplication within the Army an outside organization which by its experience is better qualified than we are to carry out some our tasks. The advantages to our nation in economy and to the Army in efficiency are compelling reasons for this procedure.

(4) *Within the Army we must separate responsibility for research for research and development from the functions of procurement, purchase, storage and distribution.* Our experience during the war and the experience of industry in time of peace indicate the need for such a policy. The inevitable gap between the scientist of technologist and the user can be bridge, as during the last war, by field experimentation with equipment still in the developmental stage. For example, restricted-visibility operations with the aid of radar, such as blind bombing and control of tactical air, were made possible largely by bringing together technologist who know the potentialities of the equipment and field commanders familiar with combat conditions and needs. Future cooperation of this type requires that research and development groups have authority to procure experimental items for similar tests.

(5) *Officers of all arms and services must become fully aware of the advantages which the Army can derive from the close integration of civilian talent with military plans and developments.* This end cannot be achieved merely by sending officers to universities for professional training. It is true that the Army's need for officers well trained in the natural and social sciences requires a thorough program of advance study for selected military personnel, but in addition we must supply inducements which will encourage these men in the continued practical application of scientific and technological thought to military problems. A premium must be place on professional attainments in the natural and social sciences as well as other branches of military science. Officers in each arm and service must familiarize themselves as much as possible with progress and plans made in other branches. Only then can the

Army obtain the administrative and operative talent essential to its task and mutual understanding by the arms and services of their respective problems.

In general, the more we can achieve the objectives indicated above with respect to the cultivation, support, and direct use of outside resources, the more energy will we have left to devote to strictly military problems for which there are no outside facilities or which for special security reasons can only be handled by the military. In fact, it is our responsibility deliberately to examine all outside resources as to adequacy, diversity, and geographical distribution and to ensure their full utilization as factors of security. It is our job to take the initiative to promote the development of new resources, if our national security indicates the need. It is our duty to support broad research programs in educational institutions, in industry, and in whatever field might be of importance of the Army. Close integration of military and civilian resources will not only directly benefit the Army, but indirectly contribute to the nations's security, as civilians are prepared for their role in an emergency by the experience gained in time of peace. The association of military and civilians in educational institutions and industry will level barriers, engender mutual understanding, and lead to the cultivation of friendships invaluable for future cooperation. The realization of our objectives places upon us, the military, the challenge to make our professional officers the equals in knowledge and training of civilians in similar fields and make our professional environment as inviting as those outside.

In the interest of cultivating to the utmost the integration of civilian and military resources and of securing the most effective unified direction of our research and development activities, this responsibility is being consolidated in a separate section on the highest War Department level. The Director of this section will be directly supported by one or more civilians, thus ensuring full confidence of both the military and the civilian in this undertaking. By the rotation of civilian specialists in this capacity we should have the benefit of broad guidance and should be able to furnish science and industry with a firsthand understanding of our problems and objectives. By developing the general polices outlined above under the leadership of the Director of Research and Development the Army will demonstrate the value it places upon science and technology and further the integration of civilian and military resources

Appendix 2 – Memorandum from Major General A.C. McAuliffe, Subject: General Research Office (circa May 1948)

DEPARTMENT OF THE ARMY
General Staff, United States Army
Washington 25, D.C.

DEPARTMENT OF THE ARMY
GENERAL RESEARCH PROGRAM

Two general types of research will be conducted under this Program which, although they are independent of one another, are closely interrelated. They can probably be best defined as "Operations Research" and "basic research of a non-material nature". Initially, the latter will constitute a minor portion of the Program.

Specifically, research on problems or phases of problems which are unique to the Department of the Army, in the following general fields, will be processed by or for this Group:

- Combat and strategic intelligence techniques;
- Combat psychology and morale;
- Analysis of weapons and weapons systems;
- Comparative over-all economic cost of various methods of waging ground warfare;
- Psychological warfare and "Cold War" techniques;
- Logistics;
- Analysis of general progress in psychology as it pertains to Army application and other related broad fields of non-material research.

The entire Program will be under the direct supervision of a civilian scientist. He will have at his disposal a General Research Office, staffed with the necessary scientific and administrative personnel to implement this Program. The entire Project will be handled on a contract basis with a civilian university or institute. The specific problems will be formulated, analyzed, and evaluated by the staff of the General Research Office. Certain of these problems will be carried to their conclusion by this group; others will be sub-contracted to various universities and non-profit research institutions.

Although the initial cost of this type of research is expensive, the eventual savings to the Government in time, money, materials, and manpower, will be immeasurably greater.

The following statement is extracted from the Report of the Civilian Scientific Advisors to the Research and Development Board:

"We should like to point out that our general investigation into these matters revealed that although the Navy and Air Force have operational analysis sections working on problems particular to their respective services, the Army and the Joint Chiefs of Staff have no analytical groups of a similar nature within their organizational structure. This, we believe, is a serious shortcoming an one which we recommend should be corrected at the earliest possible date.

"The application of scientific analysis techniques to military problems offers a useful adjunct to military thought. We believe the next war will so completely drain our national resources that ever military plan will have to be rigidly examined to permit our leaders to choose the one with the minimum cost-result ratio. We suggest therefore that our armed forces expand the facilities and the scope of their operational analysis units.

"Also, there is a requirement for true engineering-type analyses of the weapons and weapon requirements which will result if current research and development projects are completed successfully. We believe such investigations will indicate the probably critical limitations of these yet undeveloped instruments of war; will reveal future requirements for critical materials and will point out probably avenues for future research; and will also give a preview of the training problems which might be expected to arise when these new items of equipment are turned over to the service for use."

Organizations now conducting research of this nature for the other armed services are:
- Operations Evaluation Group, Office, Chief of Naval Operations
- Office of Naval Research, Office, Secretary of the Navy
- Operational Analysis Section, Office, Chief of Air Staff
- Research Division, Air University
- Project RAND, U.S. Air Force

All problems falling within this Program will be arranged in order of priority. Only those that have the very highest priority can be undertaken with the amount of money requested for this Fiscal Year.

Some of the suggested problems which should be analyzed and evaluated under this Program are shown in a separate list. It is requested that this list be excluded from the record owning to the fact that some of the problems listed therein are classified.

A.C. McAuliffe
Major General, GSC
Dep Dir for Research & Development
Logistics Division

Appendix 3 – Letter from Ellis A. Johnson, Director Operations Research Office to Dr. Detlev W. Bronk, President The Johns Hopkins University, 11 November 1949.

Dr. Detlev W. Bronk, President
The Johns Hopkins University
Charles & 34th Streets
Baltimore, Maryland

Dear Dr. Bronk:

I have an appointment to discuss the general status of the ORO, its progress, and its policies with General Collins, Chief of Staff of the Army, on 21 November. This briefing will probably result in important policy decisions. I believe that it is essential that I discuss with you and with Mr. Macaulay the probably subjects to be discussed and the possible effect upon the Operations Research Office, the Army , and the University. I believe that the following are the broblems [*sic*] that will be discussed and given serious consideration.

First, the scope of the ORO's work will be considered. Should the scope be very wide and include a serious attempt to apply operations research methods to the strategic problems of the Army? In the Army itself there is a wide and normal distribution of opinions and attitudes with respect to this question. On the extreme right are officers who believe that this is solely the function of military personnel and that scientists should be concerned solely with consideration of the design of weapons. On the extreme left are officers who believe that the strategic problems can be solved only by civilian groups who work with some assistance from the military. It is difficult to determine where the median lies, and whether or not the particular decision will be chosen at random and on the basis of immediate advices of the officers concerned in the decisions.

The second question, resulting in part from the problems which have arisen in connection with the first, is whether or not operations research should attempt to integrate the findings of social science in its solutions of action problems. Again there is the same wide difference of opinion within the Army. It is obvious the strategic problems cannot be considered at all unless the economic and other human factors are given prime consideration. There are, however, many tactical and human engineering problems in which the findings of social sciences are also deeply concerned.

I have discussed this widely with the leaders in the social sciences. I enclose a copy of a letter that I have sent to our consultants on this problem, also a list of consultants to whom it was sent. In addition, Dr. Pendelton Herring of the Social Science Research Council has been preparing, with the assistance of Dr. Donald Young, Head of the Russel Sage Foundation, a study to answer the question of what applications of social science were successfully made in World War II, what research findings from the social science disciplines are now substantially ready for most application without further research, and how these findings can be most effectively applied in the Army. I have further discussed this problem in the meetings of the Joint Operations Research Group. These meetings brought out the fact that the Navy was neutral, or possibly negative to the use of social science disciplines in operations research, and that the WSEG was at best luke warm, that the Air Force, and in particular the RAND Corporation was enthusiastic and believed that the application of the social science disciplines constituted the only new and hopeful approach towards the solution of action problems. In this respect it should be noted that RAND and ourselves are interested in cold war solutions that go toward peace as well as the ones that need to be considered as going toward a hot war.

I need to face the fact that there is an exceedingly strong contingent within the Army which feels that although social science is important and may have much to contribute, the Army ought to stick strictly to hardware and tactical problems, leaving these more difficult problems to the higher echelons. My own opinion is that, although ORO should restrict its studies to problems of direct concern to the Army, it would be a mistaken and short-range policy which eliminated the exceedingly important questions of the vulnerability of our allies and ourselves to subversive actions on the part of Russia, the will of the populations of the Atlantic Pact Allies to fight in our mutual defense, the relation of Army actions to our announced cold war or hot war aims (an unconditional surrender policy can effect an Army's operations, including the ability to complete an occupation), our treatment of civilian populations, both during combat and after occupation of enemy territory (note the serious mistakes of the Germans in the Ukraine which probably greatly effected [sic]their ultimate defeat by the Russians), and on down to such mundane human engineering problems as the size of the seats and closeness of controls in AA guns with respect to the average size of U.S. men, or our capability of finding an adequate number of Army personnel with a high IQ score to service our complicated electronic gadgets (it appears that taking all of our designed gadgets and extrapolating to full scale productions, it will take on the average one to two

years to train personnel in their use, and there is only a remote possibility that there will be enough U.S. personnel to service the planned mechanisms, let alone operate them).

The third question is concerned with the freedom to be given to ORO in its work. At the present time there is an intensive effort on the part of the Army to develop a ststem for detail and specific control over all of ORO's research work. This is accompanied by a very high pressure to provide immediate and useful answers to the General Staff. This is the usual effect which results from a lack of understanding on the part of the customer of the way in which research can contribute. If this Army effort is successful, it will in my opinion result in a lowering of integrity in ORO, and in ultimate and serious conflict with the General Staff, because we will be competing with them or will act as skilled technicians under their direction to answer only immediate problems. There are, however, cogent reasons why we should compromise with respect to this pressure. On the other hand, to yield completely, as the Army desires, will mean that we give little or no consideration to long range solutions. It is a truism that if you work only with the short-range solutions, you will never be able to achieve maximization of the more desirable and possible long-range futures. In military operations this means that the best battleships or the best tanks will be developed, only to find that when the war actually occurs, that battleships or tanks may no longer be useful weapons, in proportion to their costs. A war can be lost because of such reasons (Germany is a case to point).

The present situation arises because the General Staff of the Army has a very limited internal technical competence with respect, for example, to guided missiles, atomic weapons, etc., in fact, most of the weapons the future. Daily decisions are being made. They want and need immediate help in making these decisions. If we refuse any assistance on such short-range studies, then the road along which the Army goes will be decided from day to day, and a point is then gradually reached such that a long-range plan cannot be adopted because of the many serious commitments and the establishment of many powerful technological and tactical empires. It is for this reason that I believe some compromise must include a reasonable proportion of short-ranged studies carried out by the ORO without prior approval by the Army. It is this last proportion which is in controversy. These must be included because only research personnel can have a full appreciation of the fact that the answers urgently desired at a later time by the customer when these become the short-ranged questions asked by the executive as he is faced with a decision. It is my opinion that ORO

can retain and attract a top staff only if the Army exercises control with a very light rein, and agrees to reasonable freedom in proportion of our studies.

There are two things that you might do to help me. First, to discuss these questions from a viewpoint of what you believe would be a good policy for ORO, and which the University would support and, second, you might consider joining me in a discussion with General Collins. You might either join the discussion on the 21st of November, or it might be better to discuss the problems separately with General Collins, perhaps some evening. Dr. Bush might be interested in such a discussion.

I have several other questions which need to be discussed, separately and apart from the Army. The first is the question of whether or not the University would approve eventual separate contracts in operations research with industry, or with city or state governments or agencies. There is a question of where personnel engaging in such work should be housed. Second, our professional working conditions at the War College are distressing, in that there is insufficient space to permit adequate privacy which will allow maximum efficiency in thinking by the individual.

I will return from Kansas on the 17th. I hope I may have the opportunity to discuss these questions with you at your convenience, prior to the 21st.

Sincerely,

Ellis A. Johnson
Director

EAJ:dh
Enclosures

Appendix 4 – Extract 'Project VISTA – A Study of Ground and Air Tactical Warfare with Especial Reference to The Defense of Western Europe'. Series B, Volume B of Eight Volumes, Ground Force Operations, Chapter 3. Appendix III (4 February 1952), pp. 89-92.

3F. Development and Research

3F. Ground Combat Development and Research

3F1. Integration of Ground Weapons

The additions to and modifications of our weapons systems discussed in the previous sections are believed to represent and important increase in our effective firepower capability achievable in a relatively short time. Rockets can give a very considerable increase in short-range barrage fire capabilities and relieving the artillery for missions in which its range and accuracy of fire are uniquely demanded. Systematic and extensive use of mines will add greatly to the effectiveness of small arms, artillery, and rocket fire, as well as being a most important part of an obstacle and barrier system. A highly mobile anti-tank vehicle such as the ONTOS appears to represent the most rapid means of producing a strong anti-tank capability.

We have chosen to discuss these particular weapons in some detail because we believe that they can remedy the most conspicuous weakness in our present defensive firepower system. However, it is clear that a similar examination must be given to *all* components of the fire system, to determine to what extent augmentation within probable manpower limitations is possible. Proposals have been made, for example, to increase the numbers of automatic weapons in the rifle company, to increase the number of mortars, to introduce the eight gun battery in the field artillery, all with the objective of increasing the firepower per man. We believe that many of these proposals have merit, but hesitate to give them our unqualified support because it is not clear to us to what extent such changes may upset the rather delicate balance within the fire team. The present weapons system has evolved as the result of extensive battle experience and presumably such questions as the optimum ratio between riflemen and automatic weapons have been resolved through the examination of such experience.

At the same time, we must realize that the situation now confronting us is rather new and requires a careful evaluation of our basic philosophy of weapons systems. Certain factors

which have strongly influenced our choice of equipment and organization in the past are no longer pertinent and have been replaced by others whose effect must be taken into account. Perhaps the most important of these factors in the past has been the United States military emphasis on offensive capability. As we look back upon wars in which we have enjoyed ultimate success, we find, not unnaturally, that victory came as the result of offensive, not defensive action. The present organization, and present military thinking is therefore strongly slanted toward offensive action. Acknowledging the fact that we will not start the next war and that we will inevitably be less prepared for it than the aggressor, it follows that the initial action will be defensive on our part and our present organization may be inappropriate. It is believed that the US Army has not developed as fully as possible the tactics of defense nor the techniques of withdrawal.

New factors which modify the problem of the defense are the impact of new enemy weapons; for example, the atomic bomb and other mass-destruction media. Not only are the space factors in a division layout affected by the threat of such new weapons, but perhaps also the interrelation of the defensive weapons systems will take on quite a different aspect in this new situation. Although the evolution of doctrine from historical studies is undoubtedly a most necessary an fruitful pursuit, it is absolutely essential that the most careful consideration be given to the effect on that doctrine of new elements for which there is no historical precedent.

In the present chapter, we have attempted to indicate, in a limited way, how certain features of the situation in Western Europe bear on the tactical application of the weapons described. Many of these applications have been suggested by the Army War College study "Defense on a Wide Front," and by the extension of that study by Lt. Colonel A. C. Miller presented in Appendix IIIA5 of this report. Studies by the Operations Research Office (ORO) and the Operations Evaluation Group (OEG) have been of invaluable assistance. However, it has not been possible for VISTA even to make a complete paper study of the optimum integration of these weapons into a defensive fighting system, nor is it the belief or experience of VISTA that this can be accomplished without a considerable amount of experimentation in the field.

Tactical experiments must be carefully designed and critically analyzed, using the cooperative effort of expert operational analysts, such as may be available from the staff of the ORO, and military experts such as found on the staffs at Headquarters, Army Field Forces, the Army War College and the various Field Forces Boards. Technical assistance on weapon performance (particularly when the weapon is being simulated) must be made

available from such organizations as the Ballistics Research Laboratories. But, to be truly effective, these tactical studies must be under the direction of an organization planned specifically for this type of work. Such an organization, a *Combat Development Group*, is proposed in the following section. Its first and immediate mission should be to develop by study and by field tests the integration of the weapons system proposed here with tactics uniquely suited to the defense of Western Europe.

3F2. Combat Development Group

The most effective method for developing sound doctrine for ground force operations lies in the combination of analysis, of combat synthesis, and experimental research. It is the strong belief of the VISTA staff that no one or two of these elements is sufficient: analysis of past battles must be injected into the frame-work of future situations and synthesized into new techniques and doctrine. Once so synthesized, however, new methods *must be tested experimentally in the field* by a task group organized and equipped for the purpose. We cannot overemphasize the importance of carrying out experimental research in problems of ground combat by close coordination of experimentation in the laboratories and in the field. There is today great emphasis on systems studies, operational analysis, doctrinal application, staff planning, and the preparation of directives and requirements for research and development. These activities are all worthwhile but it must not be expected that new developments in devices and concepts will follow from them as a matter of course. Rather we must look to the joint pursuit of experimental research *and* field operations to yield the greatest dividends in new ideas and hardware. As corollaries to this point of view it is essential, first, that the laboratories and experimental ranges be in close proximity to the site of regular field maneuvers and war games and, second, that the experimental scientists, both civilian and military, work closely with the field soldier. In this connection it will be the function of research and development staffs in headquarters establishments to serve primarily to facilitate in all possible ways the operations of all laboratory and field agencies.

Therefore, we propose a new agency - the Combat Development Group - to establish and operate a combined laboratory and field research team. The functions of this new agency will somewhat overlap those of the Technical Services and Field Forces Boards but this overlap need not be extensive nor harmful, since the latter agencies will continue, as now, to be properly concerned with the production and testing of items of equipment for field operations in the terms of established doctrine. Furthermore, it will be imperative that some

of the graduate work in the War and Staff colleges be closely integrated with laboratory and field research rather than being devoted primarily to the theoretical and often somewhat artificial studies of organization, doctrine, and war plans. Finally, the activities of the Combat Development Group (CDG) must be very closely coordinated with the Operations Research Office (ORO), which has already reached a preeminent position in the military science, and with the research activities of university and industrial laboratories. The findings of this agency should be made available on a periodic basis to the Weapons Systems Evaluation Group and these findings should serve in considerable measure as the Army contribution of raw material for the careful and detailed analytical studies in overall national defense made by this group.

Maneuvers, as they have normally been carried on in this country, have been largely for the purpose of training units in current doctrine. Occasionally one or two new elements are introduced in an experimental way (e.g. the considerations of the A-bomb at Operation SOUTHERN PINE) but these maneuvers rarely have the flexibility or the controls for truly effective experimentation. Careful planning of the field experiments must be done if the results are to be meaningful and if they are to complement existing and future battle experiences. Appendix IIIF, Statistical Battle Study, is particularly pertinent to these operational experiments.

The development and establishment of new combat tactics, techniques, and doctrine, discussed in the previous paragraphs, must be very closely coordinated with the operational testing and evaluation of new weapons, devices, and equipment. The organization entrusted with one of these missions must be entrusted with the other. Only in this way will it be possible to effect the rapid introduction of new ideas and concepts into ground warfare. In some cases the impetus will come from the discovery of new devices which will demand new tactics for their most effective employment in combat. In other cases, new tactics uncovered in war games and maneuvers will establish needs and requirements for new weapons and other devices.

At the same time that a group for research and development in ground force operations is established it will be necessary to expand in considerable measure army-wide support of fundamental research and correlated development. This army-wide program will be absolutely necessary if a healthy atmosphere is to be created in which the Combat Development Group can participate in the over-all scientific effort of the nation. Moreover, this program will supplement in a conclusive manner the very properly limited research programs of the Technical Services. This army-wide program will serve as the direct basis of

support, financial and otherwise, of the ORO and of university and industrial research programs which are of interest to the laboratory-field development unit. It is specifically recommended that the army-wide program include the direct administration of contractual arrangement for university projects, such as Project VISTA, independent of the Technical Services. It is therefore recommended that:

F1. The United States Army establish a Combat Development Group.

We make the following comments in summary form on this command:

The Combat Development Group should report to the Army Chief of Staff through the research and development staff in his headquarters. Although we do not wish to make specific recommendations concerning the functions of the research and development staff, we do suggest that it augment and extend and army-wide program of research in the basic, applied, and military sciences including close coordination of all Army sponsored research in universities, industrial laboratories, and the technical services.

The first mission of CDG should be the development of new tactics and techniques in battlefield combat. Because of the urgency, the first projects under this mission should be concerned with the defense of Western Europe. The organization for the proposed CDG in its broader and long-range concept can evolve from these studies as a nucleus.

The second mission of the CDG should be the evaluation and operational testing of the new weapons, devices and equipment which are or may be applicable to the accomplishment of its first mission. Because of the great promise in such systems as MTI, Lofar, Magnetic Induction Communication, and Infrared Signaling, it is suggested that one of the major projects under this second mission would be a research program on problems in battlefield communication and combat intelligence. Another major project might be a comprehensive study of weapons effectiveness.

The CDG should include the largest combat unit consistent with the deployment of military forces; this unit might be a reinforced battalion, a regiment, a brigade, or even at times, a division. In any case, it should always be broadly representative of a combat unit and not just of infantry, armor, artillery or signal. The units assigned to CDG should be rotated at regular intervals consistent with project commitments. Units furnished with basic and advanced training and awaiting combat assignment should be those primarily considered for

attachment to CDG. In this way, the findings of CDG will find most rapid introduction into the combat armies.

The CDG must have adequate maneuver, range, and laboratory facilities located insofar as practicable in one central location.

The CDG would have a permanent staff of civilian scientists. This staff should include experimental specialists in all equipment fields including artillery, rockets, guided missiles, atomic and chemical weapons, radar, electronics, etc., as well as competent theoretical specialists. Operations analysis may be assigned from ORO but will retain the independence and objectivity essential to the operations of that office.

The administrative staff of the CDG scientific group should be kept to the lowest possible minimum, with administrative duties and responsibilities entrusted to the technical staff. At the same time every effort should be made to restrict insofar as possible such functions as report writing, preparation of job descriptions, etc. It is imperative that the CDG not be hampered by restrictive regulations which defeat their own ends.

CDG would not perform the difficult dual functions, as do the Field Forces Boards, of writing requirements and then testing new devices in the light of these requirements. Rather the CDG would be informed from time to time by the headquarters research and development staff of the general and over-all Army needs, as expressed by field commanders. It would attempt to meet these needs through norm al scientific procedures rather than through the requirements-evaluation system.

The CDG should not be concerned with the established operations of the Technical Services and of the Field Forces Boards, but it should supply the capability to supplement and short circuit these agencies when there is need for crash programs designed to bring the newest ideas and inventions of modern science into combat employment. The CDG may serve as a much needed mechanism for cooperative action on the part of the Technical Services and the Field Forces Boards.

The CDG should work in close collaboration with other experimental and operational groups such as the Operational Development Force of the Navy and the Tactical Air Development Wing of the Air Force on all joint problems.

Appendix 5 – Extract: Easterbrook Committee Report – Nature of the Curriculum CGSC in Light of Atomic Weapons (5 November 1954) (Letter of Transmittal)

NATURE OF THE CURRICULUM COMMAND AND GENERAL STAFF COLLEGE

IN LIGHT OF IMPACT OF ATOMIC WEAPONS

PROBLEM

1. To establish a concept for the 1955-56 curriculum which will reflect the impact of atomic weapons on the conduct of tactical operations in an authoritative, realistic, and forward looking manner.

2. To establish a body of guide lines for authors which will ensure understanding and effective implementation of the curriculum concept.

3. To establish a method for indoctrinating the faculty in those matters necessary to accomplish the above

ASSUMPTIONS

1. US forces will conduct tactical operations either with or without the employment of atomic weapons.

2. Current T/O&E will be applicable for units of instruction during the 1955-56 course of instruction. However, in appropriate units of instruction, new or developmental items of equipment may be introduced within this organization.

FACTS BEARING ON THE PROBLEM

1. Both the U.S. and the enemy have the capability of employing atomic weapons tactically.

2. Department of Defense planning includes the conduct of operations with or without the employment of atomic weapons in the event of a major conflict.

3. Basic doctrine for the conduct of atomic warfare is contained in current and proposed training literature.

4. The concept as established by this paper constitutes a guide for detailed curriculum planning for the academic year 1955-56.

DISCUSSION

1. General. The discussion of this study is developed in the following sequence: First, the present curriculum is reviewed to determine the adequacy of the present instruction in atomic warfare. Next, the desired objective of the curriculum with relation to the impact of atomic weapons is developed. To meet this objective, two plans are proposed and analyzed. Finally, the guide lines necessary for the preparation of units of instruction and a plan for indoctrination of the faculty are presented.

2. Adequacy of the 1954-55 Course of Instruction

    a. In light of the latest developments, the atomic coverage and the concept of atomic instruction in the 1954-55 curriculum does not fully meet the criteria of a realistic and forward looking approach (Annex C). However, instructional material presented in the field of atomics is considered authoritative and up-to-date as security and text material will permit.

    b. College policy pertinent to the past development of atomic coverage in units of instruction is contained in Academic Staff Memo 33, 14 Feb 52; Faculty Memo 22, 21 July 52; and Faculty Memo 12, 2 Mar 54. As understanding of the application of atomic weapons in warfare has increased over the past few years, atomic considerations have been added to units of instruction in a piecemeal fashion. As a result, the atomic coverage in the present curriculum contains deficiencies in proportion, realism and impact. Proportion is not in balance as evidenced by the high proportion of non-atomic coverage over atomic coverage. Realism capability is ignored or treated as an incident. Impact is considered lacking since much of the atomic coverage is diffused throughout the curriculum so that the significance of atomics is lost in a large variety of non-atomic subjects.

3. Objective of Instruction

    a. The committee is agreed that increased emphasis is needed in the curriculum in subjects related to atomic warfare. However, the committee differs as to the degree of emphasis that should be given in the 1955-56 curriculum. Furthermore, the committee differs as to the best approach for incorporating the increase in instruction in atomic warfare into the curriculum. (Annex D)

b. These differences as to emphasis and approach result in the split views of the committee as to the objective of the curriculum. The basis for this divided view is the estimated employment of atomic weapons in future wars.

c. The differences expressed within the committee are reduced to two views. Each view reflects the degree of emphasis to be placed upon instruction in the field of atomic warfare. Those two views (View A and View B) are presented in parallel to facilitate comparison.

d. Committee Views

View A	View B
(1) Command and General Staff College instruction in atomic warfare must primarily reflect the general type of warfare which constitutes the more dangerous threat to national security.	(1) The curriculum should be designed to prepare the student to perform his duties as commander or staff officer under the various general conditions of combat which U.S. forces are likely to encounter.
(2) There are two basic types of operations which must be considered.	(2) Those conditions of combat are predicted to be either of the following:
a. The first and more important is that of conducting war where both sides employ atomic weapons.	a. Each side will use atomic weapons in support of tactical operations to the extent that his capability will permit.
b. Second and less important is that of limited operations in loss vital areas with restricted objectives, neither combatant employing atomic weapons; however the national capabilities to employ atomic weapons exists.	b. Each side will have an atomic capability, but US forces will not employ atomic weapons unless the enemy forces use their own. When this occurs, the condition becomes that describe in 'a' above.
(3) The objective of instruction should be to prepare the student to perform command and staff duties	(3) The relative probability or frequency of occurrence of either condition of warfare cannot be

under the two general conditions predicted. The objective of instruction must have at its basis the idea that two sided atomic warfare, which constitutes the greatest threat to our national security, will be the normal battlefield situation. Instruction in operations where atomic capability exist, but are not executed, must be clearly identified as special operations. A detailed evaluation of the relative importance of each is presented in Appendix 1 to Annex D.

conclusively predicted. Additionally, in establishing the objective and proportion of instruction under various potential conditions of warfare it is necessary to recognize that an instructional procedure need not necessarily stress one or the other condition of combat in the same proportion that it is believed those conditions may actually exist in future war.

(4) Therefore the objective of instruction should be to prepare the stuident to perform command and stuff duties in combat under the two general conditions predicted. The emphasis and scope of this instruction should recognize that there exists no way of establishing a relative probability of occurrence between those two conditions; that the student may require complete knowledge of either condition of warfare; and that the concept of the course should give weight to the most simple, most easily understandable method of teaching

both conditions. See Appendix 2 to
Annex D.

4. Courses of action.

a. As a logical result of the basic differences between the two objectives explained in paragraph 3 above, two different plans are prepared. These two plans are summarized below and developed in detail in Annex E.

b. Plan A: Emphasis is placed on operations in which atomic weapons are employed. The bulk the course is therefore devoted to operations in which atomic weapons are allocated, and operational plans considered for their employment. To attain this objective, instruction based upon employment of nuclear weapons begins with the fundamental subjects. In a limited number of subjects which are taught as special operations, atomic weapons are not employed but the capabilities exist.

c. Plan B: This plan provides for an initial orientation on the effects of atomic weapons to provide a common understanding of the influence of an atomic capability on warfare. This will be followed by the presentation of fundamentals, staff techniques, division, and initial corps units of instruction under conditions where both sides have atomic capability but no employment of the weapon is planned by US forces. This will be followed by a series of division, corps, and army units in which atomic weapons are actually employed by US forces and Aggressor forces as appropriate.

d. For amplification of the threat imposed by the atomic capability see paragraphs 2a and b, Annex F, Guide Lines to Authors.

	View A	View B
Basis of Plan	Any war between major powers in which the objective is destruction of the other government will most likely employ atomic weapons. Wars in which major powers are not	Any future major war will be one in which both sides will possess a significant atomic capability. There is a possibility that the use of atomic weapons will be denied

	directly engaged or the objective is something less than the total defeat of the enemy may be less likely to employ atomic weapons	to both sides through political maneuver. If one side uses the weapon, the other side will also use it.
Emphasis of Instruction	College instruction must emphasize combat in a major atomic war since atomic wars offer the greatest threat to our national security. Instruction in combat under non-atomic conditions will follow atomic instruction and will be treated as special operations.	College instruction must give equal consideration to combat in which atomic weapons are used and combat in which the capability exists but is not employed. To accomplish the emphasis need not coincide with any estimated probability or frequency of occurrence of either condition of combat.
Proportionment	This concept is proportioned on the assumption that atomic warfare is the primary consideration of our instruction. Warfare without atomic support is relegated to the role of a special operation.	This concept is proportioned on the assumption that either atomic or non-atomic warfare may occur and both should receive emphasis.
Impact on Students	The concept will have considerable impact on the students by the very frequency and volume of atomic coverage, and will make the students extremely conscious of the effect of atomic weapons on warfare. The student is provided maximum	The impact of instruction where atomic weapons are used is strengthened by contrast with preceding non-atomic instruction; by the concentration of atomics in a segment of the course; and by the possibility of a scenario-type series being developed to

time while attending CGSC to consider the atomic employment problem. The impact of the course with respect to warfare where atomic weapons are not employed will be reduced considerably. portray the cumulative effect of atomic warfare.

Faculty Preparations

(1) Many of the units of instruction will require revision under either Plan A or Plan B to reflect realistically the impact of the enemy's atomic capability and the employment of atomic weapons by US forces. Under both plans, where capabilities only are being played, revision to reflect the enemy's atomic capability will be about the same. A larger number must be revised under Plan A to reflect the employment of atomic weapons than under Plan B.

(2) The graphic portrayal below is intended to show the approximate placement and extent of the coverage envision b y the two plans is the sequence and length of the blocks of instruction of the present course should remain unchanged.

6. Guide Lines for Authors. In view of the wide range of opinions as to the impact of atomic weapons on tactical operations, and to provide a common starting point for the coordination of units of instruction in which atomics are applicable, a set of guide lines is submitted for College use (Annex F).

7. Faculty Indoctrination. A program for the faculty indoctrination should be prepared and conducted in order to develop understanding of the data, techniques, and procedures used in the tactical employment of atomic weapons. The scope of this program should be sufficient to assist instructors in the preparation and conduct of atomic instruction in /6 subjects under either Plan "A" or Plan "B". The outline of course to include the subjects, scope, and time considered appropriate is presented in Annex G.

CONCLUSIONS

1. The committee as a whole agrees on the following conclusions:

a. Atomic employment coverage in the 1954-55 curriculum does not fully meet the criteria of a realistic and forward looking approach

b. Instructional material presented in the field of atomics is considered as authoritative and up-to-date as security and text material will permit.

c. The College must qualify students for command and staff duty under combat conditions where

(1) Each side will have atomic weapons available and will use them to the extent that his capability permits

(2) Each side will have an atomic capability, but atomic weapons may not be employed.

d. Two plans, either of which will improve atomic instruction, are proposed. See Annex E

e. Guide lines enumerated n draft Faculty Memo in Annex F are essential to the coordinated production of 1955-56 units of instruction.

f. An indoctrination program for the faculty is necessary to ensure a proper basis for the preparation and conduct of the 1955-56 course.

2. The committee as a whole does not agree on the following conclusions. These are offered as conclusions supported by View A and View B.

View A	View B
a. The 1955-56 curriculum must be based on the premise that our primary concern is with all-out atomic warfare.	a. The 1955-56 curriculum must be based on the premise that we must give emphasis to both all-out atomic warfare and warfare in which the atomic capability exists but is not employed.
b. Plan A is the preferred plan for integration of atomic coverage into the 1955-56 curriculum.	b. Plan B is the preferred plan for integration of atomic coverage into the 1955-56 curriculum.

RECOMMENDATIONS

1. The committee as a whole recommends:

a. That the proposed faculty memorandum presented in Annex F, Guide Lines for Authors, be approved.

b. That the outline plan for indoctrinating the faculty present in Annex G be approved and implemented without delay.

2. The committee as a whole disagreed on the following recommendations which are therefore the separate recommendations of a majority and minority group.

View A (Minority Group	View B (Majority Group)
That the concept of Plan A contained in Annex E be approved as the basis for the 1955-56 curriculum	That the concept of Plan B contained in Annex E be approved as the basis for the 1955-56 curriculum.

Silas Gassett
Colonel, Artillery
Member

R. L. Shoemaker
Lieutenant Colonel, Artillery
Member

Coleman W. Thacher
Lieutenant Colonel, Artillery
Member

Robert L. Woolfolk III
Lieutenant Colonel, Infantry
Member

James H. Lynch
Colonel, Infantry
Member

John W. Romlein
Colonel, Artillery
Member

C. F. Kane
Lieutenant Colonel, Infantry
Member

John E. Kinzer
Lieutenant Colonel, Artillery
Member

Howard C. Parker
Lieutenant Colonel, Armor
Member

John R. Barclay
Major, Armor
Member

Ernest F. Easterbrook
Colonel, Infantry
Chairman

Appendix 6 – Letter from Major General Garrison Davidson, Commandant CGSC to

General Willard G. Wyman, Commander CONARC, 6 July 1956

General Willard G. Wyman

Headquarters Continental Army Command

Fort Monroe, Virginia

Dear General Wyman:

On the eve of my departure from this fine College, I am writing to let you know how pleasant it has been serving with you, and also to leave with you, personally, two problems with regard to the College mission that give me great concern.

I have drawn up an "after action" report of my tenure here and am leaving it for such use as General McGarr cares to make of it. In preparing it, I have received the many aspects of the College and recorded those comments that I consider appropriate. From these I have selected two problems which appear to me to be of the greatest importance because they have such a serious effect on the Army as a whole. One involves the College instructional mission; the other concerns its related mission to develop doctrine for the combined arms and services.

First, in my opinion, a serious deficiency exists in the education of our senior officers in the tactical employment of the combined arms and services. This results from the fact that command and General Staff College schooling, which the average offices receives during his twelfth year of service, is the END of formal tactical education in preparation for command and senior staff duty at division, corps, army and comparable levels of the communications zone. World War II experience indicates that at least fifteen years will pass before and officer can aspire to those commands. During this period of time some, perhaps a great deal, of they have learned will have become outmoded. My apprehension in this regard is substantially confirmed in a report resulting from the recent survey of the College by and Educational Survey Commission consisting of three senior retired officers (Generals Eddy, Middleton, and Keyes) and three equally able civilian educators. As a result of the Commission's report, I am forwarding through channels, a recommendation to the effect that a Refresher or Advanced Course in tactics, or approximately three to four month's duration, for more senior officers (20-25 years of service) be instituted at this College. This I feel is essential to the proper tactical education of our senior officers.

Secondly, while in a few days I will be out of the developmental game after spending five years at it, I will carry with me and extreme concern over our procedures for the development of tactical and logistical doctrine. The basic deficiency can beat be illustrated by the fact that when recent chiefs of staff have assumed command., they did not find thoroughly analyzed and developed,

new, modern concepts of tactical and logistical doctrine and organization within which they could readily incorporate their own ideas and be confident of the timely development of the best means to carry out their mission. Instead, it appears that the Department of the Army staff, on occasion, has been compelled to direct development of new concepts on a more or less arbitrary and crash basis.

To a certain extent, this is a repetition of what I said when I briefed you here last October. In my opinion, not only do we not now have the type of answers which the Department of the Army staff requires, but neither are we laying a sound foundation to provide those answers in the future. I question, then, whether we actually will avoid a repetition of the situation outlined above and insure the timely, periodic and continuing availability in the future of new concepts arrived at through a sound, logical and systematic procedure. I give it as my fixed opinion, that until the Army develops an adequate system for the development of future doctrine, future Chiefs of Staff will again find themselves in similar positions.

I read the speech you made at Benning with great interest and enthusiastically support your views. I, too, am a firm believer in the power of collective thinking which will tap the vast reservoir of military experience and brains in our Army. An optimum system would make the maximum use of these assets, which we are not now doing. To my mind, as I also mentioned last October, the key to the success of any development system will lie in the manner of implementation of the phrase which is contained in the typical development directive -- within the concept guidance furnished.

Under current procedures, new ideas with regard to tactical and logistical doctrine very often come down from the top with such a degree of detailed guidance and with such close time limits, they tend to stifle the thought of subordinate agencies, require superficial thinking to meet deadlines, and in general dissipate the total effort. A proper system would instead be based on feeding new ideas up from the bottom through a process that would tap our vast reservoir of brainpower and experience that can be brought to bear if given an adequate chance.

Such a system, to be realistic and most valuable from the operational point of view, should essentially include a plan of study which:

a. A definite objective is established;

b. All components of the plan support that objective;

c. Logical, step by step development of each component and logical coordinated development among components are provided for;

d. Each step is realistic as to appropriateness and as to time and space factors;

e. All agencies looked to for support have similar plans closely coordinated with the master plan, particularly with regards to timing and emphasis.

The Combat Development Objective Guide is a step in this direction, but only a very limited one. It does list all the development work that is going on and is a good catalogue in that respect. However, insofar as its constituting a program of studies is concerned, it has up to the present remained only a catalogue; and because of this, the direction furnished by the guide offers little promise yet of

providing an orderly and repetitive cycle of development which would insure a self-perpetuating, logically developed and scheduled program. An adequate system, once established, would continually have available studies reflecting the most modern, up-to-date thinking.

I urgently recommend that you give these thoughts most careful consideration. They are not intended to be critical of any individual or headquarters. These situations are merely developments of our time when overly busy must consider first things first and depend on established procedure to provide for the things that seem least important at the moment. Unfortunately, our traditional procedures are inadequately under existing circumstances. This assignment and my previous one have brought me face to face with this problem. It impresses me as being sufficiently important to the future of our country to the extent that I feel compelled to bring it to your personal attention now as I am about to relinquish command here.

General McGarr arrived Tuesday afternoon. I turned over command here Monday, after I have acquainted him with the innerworkings and hidden mechanisms of the College. Let me repeat how very much I have enjoyed serving with you. I am looking forward to seeing you someday at rockbound highland home.

Best regards.
Sincerely,

Garrison H. Davidson
Major General, USA
Commandant

Appendix 7 – Briefing for Chief of Staff on Army Organization 1960-1970 (PENTANA)

15 May 1956

U.S. DEPARTMENT OF THE ARMY
Office of the Deputy Chief of Staff for Military Operations
Washington 25, D.C.

15 May 1956

OPS OT DC

MEMORANDUM FOR RECORD

SUBJECT: Briefing for Chief of Staff on Army Organization 1960-70 (PENTANA)

1. An action briefing was presented by ODCSOPS representatives to the Chief of Staff in Room 2E687, at 0945 hours, 12 May 1956. The purpose was to present staff recommendations on the Continental Army Command PENTANA ARMY study which forecasts organizational and doctrinal concepts for the 1960-70 decade. The following personnel were present:

- General Maxwell D. Taylor, Chief of Staff
- General Willis D. Palmer, Vice Chief of Staff
- General Willard G. Wyman, Command General, CONARC
- Lt General J. M. Gavin, Chief of Research and Development
- Lt General C. D. Eddleman, Deputy Chief of Staff for Military Operations
- Lt General Williams, Deputy Commanding General, CONARC
- Major General O'Neill, Assistant Deputy Chief of Staff for Logistics
- Major General Bouth, Assistant Deputy Chief of Staff for Personnel
- Major General Bush, Office, Comptroller of the Army
- Brigadier General Frederick, Office Assistant Chief of Staff for Intelligence
- Brigadier General Metheny, Chief, Coordination Group, OCS
- Brigadier General Abrams, OCS
- Colonel Surles, Deputy SGS, OCS
- Colonel Fuqua, Deputy Director of Organization & Training, ODCSOPS
- Colonel F. C. Feil, Chief, Doctrines & Combat Developments Division, ODCSOPS
- Colonel S. W. Horstman, Chief, Organization Division, ODCSOPS
- Colonel R. C. Gildart, CONARC
- Colonel Coburn, Coordination Group, OCS
- Lt Colonel Roberts, Assistant SGS, OCS
- Lt Colonel Nelson, ODCSOPS
- Lt Colonel Bennett, ODCSOPS, Briefer
- Lt Colonel Cowles, ODCSOPS, Assistant Briefer
- Additional Observers

2. The briefing officer, ODCSOPS, presented staff evaluation of and recommendations on the subject of study. Recommendations provided that

    a. CONARC be directed to revise and resubmit the study in phased increments incorporating staff comments prior to Department of the Army approval

    b. Both the Department of the Army staff and the CONARC prepare additional studies or take additional action related to further defining organizational and operational concepts for the 1960-70 period, including preparation of a detailed plan for transition to the PENTANA organization as modified.

3. General Wyman, CG, CONARC, expressed his non-concurrence with staff recommendations and recommended that:

    a. The broad concepts expressed in PENTANA be approved, with minor modifications based on new data, for further development by continuing detailed analysis, war-gaming, and field testing.

    b. CONARC be directed to develop a detailed phased transition for the Army based generally on equipment that can be made available by the end of FY 1959 or 60 and include improvements of present divisions based on the results of AFTA and ROTAD tests.

4. Discussion disclosed differing views concerning the exact role of PENTANA. CONARC proposed PENTANA for the entire 1960-70 decade as broad concepts or objectives that were not firm, and which would form the basis for continuing study and revision. The Army Staff, while recoginzing that PENTANA, as directed by the Department of the Army, forecasts broad organizational and doctrinal concepts for the 1960-70 decade.

    a. Considered that PENTANA proposes concepts which are, in general, desireable objectives for the latter part of the decade, but

    b. Considered that PENTANA must be looked at closely, particularly for the early part of the 1960-70 decade, due to its immediate influence on planning and on research and development and considered that PENTANA must be revised extensively for the early part of the decade to reflect greater consideration of attainability and joint and budgetary implications.

5. During and following discussion of major problem areas by senior officers present, the Chief of Staff issued the following comments and/or guidance:

a. The Army staff should avoid undue conservatism and should be progressive in its thinking and approach to new ideas. New ideas and progressive thinking should not be discarded on the basis of preconceived notions.

b. CONARC must tell the Army staff what is required. The Army staff should accept these requirements and analyze them based on their merits. These requirements should be so framed as to give guidance to science and industry in producing the equipment which is needed. The allegation is frequently made that scientists are not given positive guidance on Army requirements. We must, therefore, project our ideas on material requirements ahead and with a progressive approach if we are to exploit to the maximum technological advances of science and industry. In a progressive program, it must be recognized that some items will succeed while others will fail, but we must not reject requirements submitted by CONARC as unattainable unless information is available here which is not known to CONARC

c. PENTANA should provide objectives for research and development and should be considered in that frame; therefore, it should be looked at closely.

d. The Chief of Staff agreed with General Wyman that PENTANA, as modified, should be put on the wall as an objective toward which we will progress. The gap will be filled by a series of evolutionary, modified versions of PENTANA closely related to availability of new weapons and equipement.

e. The Chief of Staff stated that he expects to visit CONARC at an early date to discuss ATFA and to talk with CONARC small-war planners

f. Single-type Army for Atomic/Non-Atomic War. The Chief of Staff has doubts concerning our abiulity to attain both capalities equally well in a single organization. He agrees with the Army staff approach to determine the optimum atomic army and the optimum non-atomic army and then examine these tp see where our most pressing requirements lie. We must have flexibility. It is increasingly difficult to visualize a general war without the use of tactical nuclear weapons. General war probably will be atomic, but will be fought under some ground rules. What would be the effect on our planning if we accept the fact that we would have to develop the necessary capability for conventional general war after D-day? This would require an organization which is basically atomic, with conventional fire support other than in divisions available from corps/army on a pooled basis. The problem is

essentially one of what is feasible under fund limitations; we can put a dual-capability organization on a chart, but can we put it in the budget? The Chief of Staff desires that further examination be made of the restrictive effects upon organizational structure of the dual-capability requirement. Also, the Chief of Staff desires further examination be made of the restrictive effects upon organizational structure of (1) the degree of use of air lines of communication proposed in PENTANA and (2) the requirement stated in PENTANA for a completely air-transportable field army in 1965.

g. Integrated Combat Group. The Chief of Staff favors attachment as opposed to integration. The principal [sic] criterion in judging relative merits should be: "are all elements necessary all of the time"? CONARC will have to support integration strongly to obtain Chief of Staff approval, if war-gaming and field testing result in a recommendation for its adoption.

h. Single-type Division. This is a desirable objective; however, more than one type will be required for the transition period. 101st Abn Div organization is visualized as the pattern for the light division, with the infantry division being a reinforced version thereof, and the armored division being essentially the same plus tanks.

i. Pentagonal Structure. This is a desirable concept. We should have the same pattern throughout (all echelons and type organizations). CONARC should isolate this problem and analyze it to see if five (5) is the proper number. This structure is excellent for dispersion and for conduct of all-around defense. The control problem must be analyzed.

j. Army-Air Force Agreements. This problem does not belong in the PENTANA study; however, the Army staff and CONARC should not limit their thinking on the basis of any existing restrictive agreements.

k. Target Acquisition. Has this problem been given enough consideration in PENTANA? Do we not need a special armored reconnaissance type unit with SKYCAV capabilities to operate with divisions? We must have elements at division and corps echelons available to go out and seek targets with the capability to call down and control REDSTONE and comparable missile fires. Such elements must contain engineers, survey, and similar elements. Do we need special target acquisition units in divisions? Perhaps we should change

the name of the Special Operations Units in PENTANA to reflect the target acquisition requirement more clearly.

l. Mechanized Division. PENTANA proposes a completely mechanized, very expensive division with limited ground holding capability. We need other types of units capable of sweeping operations, securing lines of communication, and holding ground. The effect of mass destruction and of enemy guerrilla operations is to increase requirements for forces which can hold areas and provide security for rear areas. CONARC should study this problem. Perhaps large divisions with reduced equipment are required, as opposed to the smaller, mobile type divisions required for active offensive operations. The use of National Guard divisions in these roles should be considered.

m. Tanks. Tanks are useful for the transition period. Tanks should be smaller, lighter, and use less fuel. The eventual role of tanks is not clear.

n. OPFRAG. OPFRAG is visualized as something to back up atomics. The staff has been asked for an evaluation. The present system has little anti-material capability. A different principle is probably necessary to obtain an anti-material capability.

o. Engineers. Agree with the Army staff that a requirement exists for engineers within divisions.

p. Atomic Capability. An atomic capability should be developed for direct support artillery at the earliest practicable date; planning should consider modification of the diameter to fit the atomic shell, if necessary.

q. Fire Support. CONARC should develop the ideal dual-capability system; consideration should be given to providing conventional fire support for conventional general war from corps/army pools. Should we develop HE warheads for HONEST JOHN and other comparable systems? CONARC stated we cannot afford to do so.

r. Air Lines of Communication. Maximum use of air lines of communication is a desirable objective toward which we should progress. However, we could not be credited with a very practical approach if we state that we will rely 100% on air lines of communication in all theaters world wide [sic]. In some limited areas and situations, we may approach 100% air LOC. We should study all

possible applications of air lines of communication, particularly the problems of air bases and POL requirements.

    s. <u>Further Studies by CONARC Related to PENTANA</u>. The additional studies recommended by the Army staff (Para 4(2), DCSOPS Summary Sheet) should not be DA directed studies. The letter to CONARC should note these as areas which the staff considers require additional and continuous examination and exchange of information between CONARC and Army Staff.

    t. <u>Requirements for the Army Staff</u>. Actions required of the Army staff (Para 4d(3), DCSOPS Summary Sheet) should be completed only if required. The Army staff should not get in CONARC's business. CONARC should be contacted prior to initiation of these studies to avoid duplication.

    u. The Chief of Staff is impressed with the work done on PENTANA. We should look deeper all of the time. We have no experience to guide our thoughts for the next 10-15 years. We must be optimistic and farsighted in developing concepts for the future.

6. The Chief of Staff directed that the implementing directive to CONARC be revised to include the following:

    a. The concepts in the PENTANA ARMY study will be approved, with modifications, as goals or objectives to provide organizational, planning, and research and development guidance and to provide a basis for further experimentation, war-gaming, field testing, and evaluation.

    b. The specific requirement for CONARC to revise and resubmit the PENTANA study, as such, for the Department of the Army approval will be deleted.

    c. Department of the Army staff comments and evaluation will be made available to CONARC as guidance.

    d. The requirement for CONARC to develop addition studies will be withdrawn, in view of the fact that CONARC is already undertaking man of the studies recommended, and the study areas will be noted as areas requiring continuous consideration.

    e. CONARC will be directed to develop a detailed plan for phased transition to the PENTANA organizations, as modified.

7. DCSOPS is charged with responsibility for revising the implementing letter to CONARC to incorporate the guidance and decisions noted above.

C. D. Eddleman
Lieutenant General, GS
Deputy Chief of Staff
for Military Operations

Distribution:
SCS - cys
CONARC - 10 cys
Vice C/S - 1 cy
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Appendix 8 – Extract: Special Report of the Commandant, U.S. Army Command and General Staff College, Fort Leavenworth Kansas, 1 January 1959

U.S. ARMY COMMAND AND GENERAL STAFF COLLEGE

Fort Leavenworth, Kansas

1 January 1959

Foreword

This Special Report represents a record of events occurring during my tenure as Commandment, which I consider especially significant. It treats 1956-57 College in sufficient detail for orientation with respect to changes instituted in the 1957-58 school year. In addition it indicates refinements and continued improvements developed for the 1958-59 course being conducted and the 1959-60 course now in preparation. The report correlates and places events of this period of change in proper perspective.

My assignment to the College in July 1956 provided a unique and challenging opportunity, coinciding as it did with the Pentomic reorganization at the division level and the resultant necessity for the development of completely modern doctrine for its employment. Forced by the fast-moving pace of technology, the College, at the time, was also faced with the concurrent requirement for the accelerated production of doctrine for the use of nuclear weapons and their delivery systems. Even more important, the complete integration of these interacting developments into instruction was a vital necessity if the Army was to remain an eminent part of the Tri-Service Defense Team.

This report makes no attempt to treat all period of my tour with equal priority. Rather, it concerns itself primarily with the chain reaction of problems growing out of the rapid compression of time on the nuclear battlefield caused by the unusual set of circumstances described above and the consequent resulting decisions for planning, preparing, and presenting the 1957-58 course.

In recording in detail the interrelationship of the reorganization of the College and the complete rewrite and reorientation of the 1957-58 curriculum, I am hopeful that other school commandants who may be faced with the necessity for fundamental change may find this report helpful.

Lionel C. McGarr

Major General, USA

Commandant

Chapter 1

Introduction

At the time of my assumption of command in July 1956 as Commandant of the USA CGSC, the fast-moving tempo of doctrinal change required by technological advances urgently demanded a forward-looking, properly balanced curriculum with a well integrated supporting organization. At the same time a number of important events occurred which pointed up both the advisability and necessity of a complete revision and reorientation of the course of study. As a result, the College made an exhaustive study of previous College curriculums and organizations. This study was then objectively considered by a number of special College boards in determining the course of action which led to the curriculum rewrite with required reorganization of the resident instruction departments, Staff, and later the Combat Developments Department.

Most important among these events impacting on the College revision were the Report of the USA CGSC Educational Survey Commission dated 1 June 1956, pending pentomic divisional reorganizations, Army Roles and Environments as stated in the Chief of Staff's National Military Program, and the US CONARC directive requiring increased emphasis on nuclear instruction while at the same time authorizing a more flexible approach to the use of doctrine in the instruction.

The Educational Survey Commission recommended far-reaching changes in the College curriculum, instructional philosophy, methods of instruction, and operating procedures, and suggested the need for changes in the College organization.

The pending decision of the Chief of Staff, US Army, on division organizational changes indicated a complete rewriting of almost every tactical unit of instruction (Subject) and the partial revision of the others.

A staff visit by two members of the Office of the Chief of Staff, US Army, in April 1956, indicated a requirement for strategic settings of units of instruction (Subjects) to conform with the forms of war as described in the Chief of Staff's National Military Program. As practically all the College Subjects portrayed general war in Western Europe, frequently in a World War II type environment, this adjustment indicated the rewrite of a majority of the curriculum.

On 20 August 1956 US CONARC directed that emphasis on nuclear instruction be increased so that the student would develop "equal facility" in atomics and nonatomics and directed that atomics "not merely be superimposed" on previous nonnuclear Subjects. Implementation

of this directive indicated a rewrite of the majority of the curriculum. This directive also authorized and encouraged a more forward-looking and flexible approach to the use of doctrine in instruction and directed improvement in the quality of this doctrine.

Recent fast-moving developments in the Army had caused obsolescence of the majority of the training literature (field manuals, special texts, etc.) for which the College was responsible and indicated a major modernization effort.

About the same time, US CONARC directed that the nonresident instruction program, which, due to workload, was lagging an average of 2 years behind resident instruction, be brought up to date.

My own investigation and study substantiated the need for the above changes and indicated a unique opportunity to incorporate other essential revisions in conjunction with the directed changes so as to comply with DA and US CONARC policies and directives.

The most recent Fifth Army Manpower Survey, as well as the Educational Survey Commission, noted that the Staff and Faculty, to include instructional support agencies such as the Army Field Printing Plant, were already heavily committed.

Because of the yearly cycle of the curriculum, the directed changes could not be made in the 1956-57 course which had already been planned and prepared by my predecessor. That curriculum could not be adjusted to meet subsequent, new requirements because of preparation lead times and inherent inflexibility of the crowded curriculum. Further, basic changes for the 1957-58 College year could be made only if action was taken within 5 months of my arrival. This decision had to be made if I were to influence the next, 1957-58, course. Otherwise changes could not be made until the preparation of the 1958-59 course for which I had not expected to be present. This situation is inherent in the 2-year tour of a Commandant in relation to the annual cycle of planning and preparation. This was pointed out by my predecessor and undoubtedly accounts for some deferred modernization in the Army School System. (My tour as Commandant was subsequently extended, which enabled me to present the 1958-59 course and plan the curriculum for 1959-60.)

The College was organized and staffed for the normal annual correctional curriculum and doctrinal adjustments of previous years. This curriculum adjustment had consisted of minor revisions of most units (Subjects) based on after-action reports and the writing of approximately 1 to 3 new Subjects each year. A full curriculum rewrite for the Regular Course alone as indicated by the new directives mentioned above would involve about 180 entirely new Subjects as well as much new doctrinal material.

To capitalize fully on any changes made, required programming and completion within a *single year* because of the interlocking nature of the elements of the curriculum as well as instructional methods, evaluation procedures, operating methods, and College organization.

After research mentioned above, on 30 October 1956, an intensive examination was initiated by the College on how best to carry out the directives of higher headquarters for the coming 1957-58 course. After careful consideration of the recommendations of special College boards and committees, I issued the required curriculum, organization, and personnel decisions on 4 December 1956. These decisions were based on a complete rewrite of the curriculum and the necessary adjustments in College organization to support this new curriculum.

The plan selected involved establishment of a planning group for the 1957-58 College year which would gradually expand, as 1956-57 teaching commitments decreased, into the new College organization by the end of the 1956-57 course.

[Chart Showing Annual Class Schedule Deleted]

This plan permitted the 1956-57 course to be taught as planned by those who had prepared it, and within the *same* organization that had existed prior to the 4 December decisions. At the same time it provided for the concurrent writing of the new curriculum within the framework of the new organization and by personnel who would be responsible for teaching it in 1957-58. The plan temporarily increased the workload of the Staff and Faculty but ultimately reduced this workload through improved organization and procedures. This was a practicable method of accomplishing the directed changes and capitalizing on the other improvements, which could be made because of the revision, while at the same time teaching the 1956-57 course without lowering traditional USA CGSC standards.

The decision involved a definite, calculated risk. The College had no experience with a rewrite or reorganization of this magnitude, time was short, and no additional manpower was available. However, there was no alternative. The exceptional quality of the personnel of the Staff and Faculty was a favorable factor and, in addition, time could be saved by organization and methods specifically tailored for the job.

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