# SQUARE PEGS AND ROUND HOLES:

# AIR FORCE DOCTRINE AND THE B-2 BOMBER

A Research Paper

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## Disclaimer

The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the US government or the Department of Defense.

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## *Abstract*

AFM 1-1 and the United States Air Force's new vision paper, *Global Engagement: A Vision for the 21st Century Air Force*, allow significant flexibility in the employment of Air Force resources.  However, as doctrine or the core for doctrinal development, both documents intimate significant flaws in the process of creating guidance from theory, then applying that guidance to warfighting.  An incongruent relationship exists between the creation of formal Air Force doctrine and the development of operational weapon systems.

More specifically, the Air Force's inventory of long-range strategic bombers, although conceived as weapons of nuclear deterrence during the Cold War, must now fit within parameters of post-Cold War air power doctrine.  In the B-2 particularly, the Air Force justifies the existence of a platform not entirely compatible with its overarching doctrine of global reach, global power, and global attack—an aircraft whose technological advances belie anachronistic origins.  Thus, it denies or subjugates the application of other possibilities for strategic attack.  The lingering correlation of nuclear deterrence and long-range strike to the word "strategic" represents a doctrinal parochialism that resists the development of more effective, appropriate theory and doctrine—and their accompanying weapons.  The extremely focused remnants of that forty-year-old doctrine must now meet the more varied demands of post-Cold War hostilities.

Doctrine and technological development should be interrelated.  Ideally, we first develop concepts from ideas and theories.  Through experience, we validate these

concepts. The resulting written, published, authoritative guidance is formal doctrine; we can *then* derive the technological means for implementing that doctrine. Thus, we start with ideas, develop the concepts, test those concepts in the crucible of experience, produce the doctrine, build the weapon system, and enter the next evolution of the process. What happens when we procure weapon systems based on obsolete doctrine? Worse yet, what happens when we build doctrine around existing resources designed from obsolete ideas?

If the ongoing doctrine process is supposed to maintain the Air Force's essence and its mission—air power—then allowing the proliferation of incompatible systems denies coherence among ideas, doctrine, and practice, and results in dogmatism and pragmatism.

# Chapter 1

# The Purpose of Doctrine

*At the heart of warfare lies doctrine. It represents the central beliefs for waging war. Doctrine is of the mind, a network of faith and knowledge reinforced by experience which lays the pattern for the utilization of men, equipment, and tactics.*

—General Curtis E. LeMay

On October 8, 1996, three B-2 bombers successfully struck targets in the Nevada desert using the Global Positioning Target System (GATS) and Global Positioning System-Aided Munitions (GAM). Air Force commanders heralded this achievement as a demonstration of the B-2's "'unprecedented' capability to strike faraway enemy targets with 'near-precision' conventional bombs in bad weather."[1] The apparent success of the test appears to support the Air Force's core competencies of global attack and precision engagement, as well as basic AFM 1-1 doctrine for exploiting the capabilities of the aerospace platform: "Aerospace power results from the ability to use a platform operating in or passing through the aerospace environment for military purposes. These military purposes ultimately affect surface military activities."[2]

However, AFM 1-1 further states the following: "In designing an aerospace platform, the first question to be asked is: What purpose will the platform serve—what mission(s) will it perform?"[3] Herein lies the conflict between the successful demonstration of the B-2's conventional capability, the aircraft's original purpose, and its role in future conflicts.

The B-2 is a product of the Cold War, a long-range bomber designed for an intercontinental nuclear mission: to penetrate the former Soviet Union's air defense system while offering the flexibility of recall or retargeting. The expense of the platform was arguably commensurate with the significance of its mission; its technological sophistication offered the United States the one-upmanship necessary to maintain nuclear deterrence and introduce additional leverage in arms reduction talks.

The end of the Cold War created a dilemma concerning continued development of the B-2. Opponents claimed that "a stealth bomber designed to evade Soviet air defenses for the purpose of delivering nuclear weapons during a third world war [was] superfluous in a post-Soviet world dominated by small-scale conflicts."[4] In addition, the cost, $45 billion for the 20 aircraft ordered,[5] was no longer justified. Supporters of the B-2 argued that the same cost did not warrant the acquisition of a mere 20 aircraft—a larger force of B-2s could combine both an ongoing nuclear role, as well as a conventional role, well into the next century.

From a purely doctrinal perspective, the fiscal and numerical dilemmas, while significant, are secondary to the process by which the weapon system developed: from the identification of a need to the creation of an answer to that need. An understanding of this process depends on an understanding of the purpose of doctrine. Indeed, the process highlights the significance of doctrine in relation to technology.

In order to analyze the process, we must begin with a basic definition of doctrine. I. B. Holley and Dennis M. Drew offer similar useful definitions:

> Doctrine is what is officially taught. It is an authoritative rule, a precept, giving the approved way to do a job. Doctrine represents the "tried and true," the one best way to do the job which has been hammered out by trial

and error, officially recognized as such, and then taught as the best way to achieve optimum results.[6]

Military doctrine is what is officially believed and taught about the best way to conduct military affairs.[7]

These definitions establish the significant elements of doctrine. First, doctrine should be the product of experience. The body of experience supports the original idea, or more specifically, the concept: "What is a concept? To conceptualize an idea is to formulate it in words in the mind.…To conceptualize is to devise a mental construct, a picture in the brain that can be expressed in words eventually."[8] Experience then validates the concept, allowing the development of formal doctrine—written, published, authoritative guidance. Holley refers to doctrine as "the one best way to do the job." Such a statement may seem restrictive, at first. However, it has immense value in the application of doctrine to the development of weapon systems. Doctrine separates necessity from frivolity. It focuses technology on purpose.

## Notes

[1] Steven Watkins, "A Giant Step for the B-2: Precision-Strike Bombs Destroy Their Test Targets," *Air Force Times*, 4 November 1996, 24.

[2] *AFM 1-1: Volume I, Basic Aerospace Doctrine of the United States Air Force* (Washington, DC: US Air Force, March 1992): 71.

[3] Ibid., 72.

[4] Jeffrey Record, "The Never-Ending Bomber Debate," *Strategic Review* 23, no. 4 (Fall 1995): 7.

[5] Ibid., 8.

[6] I. B. Holley, "The Doctrinal Process: Some Suggested Steps," *Military Review* 59, no. 4 (April 1979): 4-5.

[7] Dennis M. Drew, "Of Trees and Leaves: A New View of Doctrine," *Air University Review* 33, no. 2 (January-February 1982): 41.

[8] I. B. Holley, "Concepts, Doctrines, Principles: Are You Sure You Understand These Terms," *Air University Review* 35, no. 5 (July-August 1984): 91.

# Chapter 2

# Doctrine and Technology, Dogmatism and Pragmatism

> *This is the catechism: If the Air Force is to have a future of expanding horizons, it will come only from understanding, nurturing, and applying technology. There is a circle of faith here: If the Air Force fosters technology, then that inexhaustible fountain of technology will ensure an open-ended future for flight; which, in turn, will ensure the future of the Air Force.*
>
> —Carl H. Builder
> *The Icarus Syndrome*

Retired Air Force Colonel Dennis M. Drew parallels the development of doctrine with the classic steps for accomplishing a research project. He begins with the fundamental question, "What is the best way to use airpower?"[1] With this entering question, he then delineates the doctrine process.

At the starting point of the process is the applicable body of experience, theory, and technology. We consolidate and analyze this information, then develop concepts, the equivalents of the theses and antitheses of a research paper. The next stage involves testing and evaluating the concepts, discussing, arguing, and debating their validity. We may then accept or reject concepts, or modify and synthesize them. The resulting product becomes formal doctrine, in writing, or informal doctrine, the refined beliefs lacking only the official sanction inherent in publication. We apply this informal or formal doctrine to warfighting—it is what Holley refers to as the best way to do the job.[2] However, the

cyclical process begins again, immediately, as we add new experience, theory, and technology.

The significance of the above cycle lies in its congruence. The creation of doctrine should be an iterative process which continuously validates new experiences and theories. Thus, formalized doctrine recognizes the presence of new technology and follows the next four steps: consolidation and analysis; development of concepts; test and evaluation; and acceptance or rejection. Only upon synthesis with the existing doctrine through the above process does technology establish the need to revise established doctrine.

Clearly, the doctrinal process should not stop. Ideally, the formal product demands constant revision to accommodate the influx of new or evolving ideas, theories, and technology. At the point where doctrine fails to change, it becomes dogma. We then follow the formal doctrine as a formality, without honoring the process. Dogmatism can lead to a harmful pragmatism in warfighting, where we limit change because we are accustomed to the status quo falsely associated with formal doctrine. It is indeed easier to do things the way they have been done in the past, at least until we learn the hard lessons about present day reality.

When doctrine become dogma, the overall process deteriorates into a closed cycle. New ideas, concepts, and technology are no longer the essential inputs for doctrinal change. How does dogma affect the development and incorporation of new weapon systems? Doctrine looks to the past in order to prepare for the future. If it embraces the inevitability of change, including technological change, then it should better prepare us for future conflicts and future needs.

However, as Holley points out in his benchmark book *Ideas and Weapons*, such is not always the case:

> If armies have been slow in applying the maxim that superior arms favor victory, it may be shown that their intransigence has resulted to a great extent from three specific shortcomings in the procedure for developing new weapons. These shortcomings appear to have been: a failure to adopt, actively and positively, the thesis that superior arms favor victory; a failure to recognize the importance of establishing a doctrine regarding the use of weapons; and a failure to devise effective techniques for recognizing and evaluating potential weapons in the advances of science and technology.[3]

According to Holley, effective doctrine helps define the best weapons to do the job. An effective doctrine process prevents dogmatic or pragmatic development of weapon systems. Holley uses the Unites States' slow development of an effective bomber during World War I to illustrate an incongruent process. We may use the continued development and procurement of the B-2 as another example.

**Notes**

[1] Dennis M. Drew, "Inventing a Doctrine Process," *Airpower Journal* 9, no. 4 (Winter 1995): 44.

[2] Ibid., 44-47.

[3] I. B. Holley, *Ideas and Weapons* (New Haven: Yale University Press, 1953): 10.

# Chapter 3

# The Doctrine of Deterrence

*The unique Air Force institutional problem with ballistic missiles was its threat to the manned bomber—not to the fighter or transport—since it offered an alternative to the one means of air power theory cherished by the airmen.*

—Carl H. Builder
*The Icarus Syndrome*

The long tradition of the manned bomber in air power theory and doctrine needs only brief rehashing here. It emerged from the trenches of World War I; was elevated to supreme doctrinal and institutional importance between the wars; survived the crucible of the strategic bombing campaigns of World War II; and claimed an immense role in the doctrine of deterrence during the Cold War. Along the way, the ends and the means—the relationship between doctrine and technology—became confused. The B-2 bomber is, to a certain extent, a product of this confusion.

The stagnation inherent in World War I trench warfare resulted in early theories on the potential of air power, and strategic bombing in particular, to break the stalemate.[1] Thus, early theorists such as Hugh Trenchard and Billy Mitchell rose to prominence as advocates of offensive, strategic air power. Carl H. Builder, a senior staff member at RAND, describes how their ideas would have far-reaching effects on Air Force doctrine:

Two aspects of air power theory had taken firm root in the minds of British and American leaderships who would build their military aviation establishments after the war:

1. The importance or primacy of the offense in the use of military aviation; and
2. The bombing of cities could have a demoralizing effect upon the populations supporting modern warfare.

Although these two ideas would never become explicit axioms of air power theory, they would lurk behind almost everything the air power prophets and their disciples would do and say for the next four decades.[2]

Builder's diction emphasizes the impact of the early theorists—they were prophets in a time when aviation technology was in its infancy. Trenchard, Mitchell, and Giulio Douhet introduced ideas about air power that preceded the breadth and depth of technology necessary to implement them in actual war. Thus, while Mitchell demonstrated the ability of the manned bomber to sink warships under peacetime conditions, the idea still needed additional experience and technological advances to enter the cycle of doctrinal development.

The same process of the idea preceding the technological capability, but not fulfilling the overall demands of doctrine, is evident in the Air Corps Tactical School's industrial web theory and Air War Planning Document 1. Until the strategic bombing campaigns of World War II, the theory lacked the body of experience necessary to become doctrine. However, the war offered the necessary inputs of theory, technology, and experience to formalize a doctrine of strategic bombing.

A macro perspective reveals the doctrine of deterrence to be the end result of the above movement from prophecy to a questionable fulfillment. The cumulative input of the

first air power advocates' ideas, strategic bombardment theory, experience in Europe and the Pacific, and the atomic bomb initiated the doctrinal cycle:

> Hence, the outlines of the Strategic Air Command emerged barely more than a year after World War II, even before the Air Force had achieved its impending independence from the Army. Air power theory in America had begun its 15-year transmogrification into deterrence theory.[3]

At the crux of the theory, which was evolving into doctrine, were the technological means, the long-range strategic bomber, and its ability to deliver a particular type of weapon in a particular kind of conflict.

Thus, at the completion of this doctrinal cycle, we already see the growing dogmatism and pragmatism. The strategic bombing envisioned by the theorists quickly became the strategic bombing of the Cold War: "The two nuclear attacks on Japan [made] strategic bombing synonymous with nuclear war . . . and have thus clouded the purpose of the long-range bomber."[4] More specifically, the word "strategic" became synonymous with "nuclear," at once dogmatic and pragmatic to the development of air power doctrine.

This doctrinal limitation persisted until Desert Storm, and even that conflict could not entirely remove the stigma. The strength of the association between the long-range bomber and the nuclear mission is quite apparent when we consider momentary breaks in the link. During the Korean War, B-29s saw limited use, but only south of the Yalu River, thus never asserting a role as a conventional, long-range, penetrating weapon system. B-52s achieved some distinction during Vietnam, switching from a nuclear role to a conventional one:

> The Christmas bombing of 1972, carried out by…B-52s, brought the North Vietnamese scurrying back to the Paris conference table, but in the final analysis, the bomber, like all our airpower in that unhappy war, was mainly used to signal rather than incapacitate the enemy.[5]

Ironically, a decade later the B-2 would be used for a similar role as a bargaining tool in strategic arms reductions talks, but this time years before achieving operational capability. The B-52's conversion to a mixed role still could not break the "determined resistance within the Air Force itself to any alteration of [the] nuclear commitment…the strategic bomber-nuclear mission link had become too deeply imbedded in airpower doctrine."[6]

**Notes**

[1] Ibid., 44.
[2] Ibid., 47.
[3] Ibid., 139.
[4] T. Ross Milton, "Strategic Airpower: Retrospect and Prospect," *Strategic Review* 19, no. 2 (Spring 1991): 11.
[5] Ibid.
[6] Ibid.

# Chapter 4

# The Tail of the Dilemma: The B-2

*Our very early airpower visionaries clearly allowed their concepts to race ahead of technology. Therefore, we found ourselves in a position where there were a lot of unfulfilled promises and false expectations relative to what airpower could and could not do.*

—General Ronald Fogleman

Clearly, the doctrinal process as applied to the long-range strategic bomber is imperfect, but more in the iterations than in its inception. Even after combining previous ideas with experience and new technology following World War II, Air Force doctrine faced another dilemma. Once the technology caught up with the ideas, could the two coexist and, more importantly, evolve within the cyclical pattern? The post-war development of long-range strategic bombers suggests not:

> The Air Force has a long history of spending large amounts of money on new bombers before anyone knows if they are needed or if they work as advertised. This happened in the B-36 program in the 1940s, the B-58 program in the 1950s, the B-70 program in the 1960s, the B-1 program in the 1970s, and the B-1B and B-2 programs in the 1980s.[1]

The above history of the strategic bomber is the story of unfulfilled promise, a conflict between the function of the aircraft to fulfill the needs of doctrine, the inadequacy of that doctrine, and the creation of aircraft for their own sake.

At the outset, we must recognize that the professed *capabilities* of the B-2 answer many current needs of the Air Force. Given the drawdown in U.S. military strength, the

reduction in overseas bases, and the success of strategic bombing during Desert Storm, intercontinental bombers, "represented in future forces by the B-2, match the strategic need of the country as no other weapon system."[2]   In addition, stealth technology, when combined with precision weapons, becomes a force multiplier, offering a viable substitute for mass and meeting the need for economy of force, the offensive approach to warfighting, and the element of surprise.  The B-2 in concept thus meets the requirements of significant principles of warfare delineated in U.S. military doctrine.[3]

However, from a doctrinal perspective, the B-2's origins rest not in sound principles, but in a dogmatic adherence to the manned bomber and strategic nuclear deterrence—an impediment to the advancement of forward-looking ideas in concert with technology and experience.  In spite of the advanced second-generation stealth capabilities, the weapon system itself must today still find a place in developing Air Force doctrine.  That is, the doctrine must accommodate the technology of the aircraft as a whole; and the fit is not entirely perfect.

Although the precise origins of the B-2 program remain unclear due to security, Michael E. Brown, Senior Research Fellow in U.S. Security Policy at the International Institute for Strategic Studies, states three factors which influenced its development: operational experiences against Soviet air defense systems in Vietnam and the Middle East; the Air Force's desire to preserve the manned, penetrating bomber, particularly after President Carter canceled the B-1 program; and advances in stealth technology in the late 1970s.[4]  Both Lockheed and Northrop were asked to submit proposals for a stealth bomber to the Air Force in September 1980.[5]  What is significant in the development of the program is that the Reagan administration decided its fate.  President Reagan

advocated a robust military buildup to compensate for a perceived decline in U.S. defense programs during the 1970s.  The goal was to regain a competitive edge over the Soviet Union, which had deployed a significant number of strategic systems in the same decade.[6]

Brown delineates the six main bomber modernization options available to Washington policy makers in 1981:

1. Do nothing.
2. Build just the FB111H.
3. Build just the B-1B.
4. Proceed directly to the stealth bomber.
5. Deploy the FB111H as an interim to the stealth bomber.
6. Rush the B-1B into production while continuing development of the stealth bomber.[7]

Of the several choices, President Reagan opted to produce the B-1B while supporting continued development of the stealth bomber.  It is important to recognize here the Air Force's real desire at the time: to promote the development of the FB111H as an interim to the stealth bomber.[8]  Strategic Air Command was concerned that the B-1B would be too capable as a penetrating bomber, perhaps sufficiently so to prevent production of the much desired B-2.  The less capable FB111H would have offered Strategic Air Command and the Air Force greater assurance of one thing: continuation of the long-range, manned strategic bomber.

At this point in the production of the B-1B and the development of the B-2, the clear objective was to maintain Strategic Air Command's arsenal of long-range, manned penetrators.  The Cold War still determined the priority of roles.  Both new aircraft would above all augment and ultimately assume the *nuclear* mission of the aging B-52 fleet; conventional considerations remained secondary.  Political and military interests focused

on the dogmatic equation of "strategic" and "nuclear," to the detriment of Air Force doctrine and capabilities.

The association of nuclear deterrence and the long-range strategic bomber most affected the interim solution, the B-1B. Its history foretold the eventual need to draw the B-2 out of a doctrinal stovepipe. Rushed to its initial operational capability (IOC) in 1986, the B-1B suffered from both systems deficiencies (particularly the ALQ-161 defensive avionics suite) and concurrent development (simultaneous production, operational capability, and testing). Although it had assumed its nuclear role and stood Single Integrated Operational Plan (SIOP) alert, it had yet to achieve conventional validation. Thus, it could carry nuclear weapons (gravity bombs and short-range attack missiles), but it lacked the conventional flexibility of the B-52.

Five years after IOC, during Desert Storm, the B-1B was still undergoing field operational test and evaluation for high altitude Mk-82 releases, its only conventional weapon capability at the time. In the midst of war, the Air Force's newest operational long-range bomber was indeed restricted to the strategic-nuclear role. Looking back to the prophets' expansive vision for manned bombers, we see instead how doctrinal limitations also helped to limit usable technology. The B-1B became a victim of both dogmatism and pragmatism bred through generations of manned bombers.

The combination of the end of the Cold War and the success of air power during Desert Storm highlighted the need for a revival in realistic, usable doctrine. The air campaign against Iraq redefined the word "strategic" after decades of stagnation. This is quite apparent in the definition offered in the second draft of Air Force Doctrine Document (AFDD) 2-1.2:

> Strategic attack is defined as those offensive operations intended to satisfy our national, multinational, or theater strategic-level objectives without first having to engage the adversary's fielded military forces at the operational and tactical levels.[9]

Here is a belated return to the iterative process of doctrine development. The concept of strategic attack, combined with the experience from Desert Storm, seeks technological inputs to complete the cycle. "Strategic" is once again an idea not tied to a particular weapon or weapon system. The same draft admits to previous shortcomings in Air Force operational doctrine by drawing lessons from Vietnam and the use of B-52s:

> Additionally, heavy bombers, the weapon of choice for World War II strategic warfare, were not used for the same missions into North Vietnam until 1972—eight years into the war. Perceptions of the synonymy of "strategic" and nuclear prevented their use until the final LINEBACKER campaign.[10]

Equally revealing of the flawed doctrine behind the post-World War II long-range strategic bombers is a caveat from an early draft of the nascent Air Force Doctrine Document 1 which stated the following:

> Airmen control technology; technology does not control airmen....We must avoid a myopic view that places technology as the driver of doctrine rather than its facilitator.[11]

However, the B-2 remains to remind the airman that technology did indeed drive the ideas with regard to the long-range strategic bomber.

Unlike the B-1B, the B-2 had the advantage of being in development rather than operational at the end of the Cold War and during Desert Storm. Its 1997 IOC for the first squadron at Whiteman AFB has allowed sufficient time for the Air Force to begin to mold its technology to fit developing doctrine. Although the B-2 will assume what remains of the B-1B's nuclear mission, this role will be secondary to its conventional capabilities—thus the significance of the October 1996 GATS/GAM testing. An aircraft

doctrinally designated as principally a nuclear penetrator must convincingly assume a secondary role as primary.

However, the very technology with which the Air Force sought to maintain the viability of its bomber force now becomes both a help and a hindrance. The B-2 brings all of the aforementioned capabilities to the fight: long range, stealth, and large payload in a home-based weapon system. As part of the 184-aircraft bomber inventory approved by the 1993 Bottom-Up Review, it represents a significant facet of the new strategic attack doctrine where long-range bombers "are supposed to intervene early and effectively in a major regional war."[12] The tradeoff is cost and adequacy.

One way to view military doctrine is as the blueprint for force planning.[13] "Doctrine takes the conceptual notions of the functions to be served by military operations and, as General LeMay said, 'lays the pattern' from which the force structure can be constructed."[14] When the force structure precedes the doctrine, deficiencies may arise. Such is the case with the B-2, which must now fit within the conventionally oriented doctrine of strategic attack. Alone, this reversal in the doctrine cycle is problematic. It also reveals the incongruencies between conventional and nuclear roles:

> What has been lacking in the past is the will to use bombers seriously in a conventional conflict. Their survivability and the accuracy needed to cause damage in proportion to their massive weapon load is also a concern. The first problem has been addressed by the formation of ACC; the second and third are being dealt with by upgrades and new technology.[15]

In the case of the B-2, the Air Force must still await some of the backfill of technology, particularly the Joint Direct Attack Munition (JDAM), not available until the end of the decade. ("The USAF plans to buy only eight 16-weapon loads of GATS/GAM to provide an interim, near-PGM capability for the B-2 until JDAM is available."[16]):

Without a guided weapon, however, the B-2 is confined to medium-altitude area bombing: although the B-2 can fly at low level and Mach 0.8, no commander would expose so scarce and valuable an aircraft to random ground-fire as a first resort.[17]

The scarcity and value of the aircraft, while not explicit concerns of strategic attack doctrine, do raise another doctrinal principle—simplicity:

Compared on the basis of equal range and disposable load, one of the most important design characteristics a strategic delivery platform can have is survivability and low cost. Both of these qualities focus on bringing numbers to bear in conventional warfighting—the sustained delivery of conventional explosives—where the rate of bomber attrition must seriously be taken into account.[18]

As the one long-range strategic bomber designated to penetrate to its targets, with no standoff role, the B-2 will face the highest risks in spite of stealth technology. Should the total number of B-2's remain at 21, commanders will indeed need to weigh the risks versus the benefits before employing this asset. Once employed, the limited number of airframes will need to endure the high operational tempo of conventional warfare. Before any major conflict, the B-2 must validate its ability to maintain conventional operational readiness, not just SIOP readiness. The B-1B required a six-month operational readiness assessment to demonstrate to Congress its ability to sustain a 75 percent mission capable rate[19]; the B-2 should be able to do the same. Simplicity is at the heart of such sustainability. Only time will tell if the B-2 can adhere to this principle.

The issue of numbers of aircraft in being raises another consideration in the relationship between technology and doctrine: lead times. At the most basic level, we may not have the luxury of waiting for aircraft to be built. In a major contingency, "something nearer 75 percent rather than 100 percent of the surviving bomber force is a more reasonable figure to represent operational availability for aircraft in sustained operations at

extreme ranges against formidable defenses."[20]   Here is a situation where appropriate technology should follow doctrinal requirements.  In other words, doctrine should ideally precede technology to define the best weaponry.

The question of lead time becomes increasingly problematic with the added complexities of the acquisition and production processes.  W. Harriet Critchley uses the rational model alternatively to illustrate the ideal doctrine cycle:

> The rational model applies readily to an analysis of the relationship between strategic doctrine and weapons development.…A strategic doctrine is…fashioned from the optimal combination of alternatives [for defense] to the range of threats.  Finally, weapons are acquired or developed and armed forces are organized in accordance with the dictates of strategic doctrine.[21]

Military weapon systems on average have at least five- to eight-year lead times from initial conception to production.[22]  The time from the start of production to IOC increases this lead time, sometimes substantially.  In the interim, doctrine should be changing with new ideas, new experiences, and new technologies.  Unfortunately the processes of acquisition and production, complicated by politics, are not always sufficiently flexible to adapt to rapid doctrinal changes.  The result: a potential mismatch between the most current doctrine and the weapon system which is supposed to fit within that doctrine.

Modern weapon systems—the B-1B, the Sea Wolf, and the B-2, among others— amply demonstrate the significance of lead times.  The Air Force requested proposals for a stealth bomber design in 1980; and the B-2 will reach IOC in 1997.  In the meantime, the originally projected 132 B-2s fell to 21; the Cold War ended; and Desert Storm took place.  The final bomber will not be operational until the next century, extending the total lead time to over two decades.  Unfortunately, there is no ready solution to the dilemma;

we can only recognize the problem and not allow it to affect doctrinal progress.  To do

less would perpetuate the dogmatism and pragmatism of the past.


**Notes**

[1] Michael E. Brown, "The Case Against the B-2," *International Security* 15, no. 1 (Summer 1990): 153.

[2] Steven J. Lambakis, "America's Option: The Long-Range, Land-Based Bomber," *The B-2 Bomber: Air Power for the 21ˢᵗ Century* (Lanham, MD: University Press of America, 1995): 37.

[3] *AFM 1-1: Basic Aerospace Doctrine of the United States, Volume I* (Washington, DC: US Air Force, March 1992), 1.

[4] Michael E. Brown, *Flying Blind: The Politics of Stealth* (Ithaca, NY: Cornell University Press, 1992): 273.

[5] Ibid., 275.

[6] Ibid.

[7] Ibid., 275-79.

[8] Ibid., 278.

[9] *AFDD 2-1.2*, second draft (AFDC/XDD, 10 October 1996): 3.

[10] Ibid., 7.

[11] Quoted by Gene Myers, "Air Force Has 'Lost Its Ideological Way,'" *Air Force Times*, 14 October 1996, 35.

[12] Bill Sweetman, "Reading the US Air Force Bomber Roadmap*," International Defense Review* 26, no. 10 (October 1993): 791.

[13] Harry G. Summers, "Military Doctrine: Blueprint for Force Planning," *Strategic Review* 20, no. 2 (Spring 1992): 19.

[14] Ibid., 9.

[15] Sweetman, 792.

[16] Ibid., 794.

[17] Ibid., 793-94.

[18] Arthur G. B. Metcalf, "Strategic Airpower in Conventional Warfare: Some Considerations," *Strategic Review* 19, no. 2 (Spring 1991): 18.

[19] *Air Force Magazine*, May 1996, 132.

[20] Metcalf, 18.

[21] W. Harriet Critchley, "Does Doctrine Precede Weaponry?" International Journal 33, no. 3 (Summer 1978): 526.

[22] Ibid., 547.

# Chapter 5

# Conclusions

*To exist in a warring world the nation must pick winning weapons; if military analysts will distill every possible lesson from the history of two world wars such weapons will be easier to find and odds on national survival will go up.*

—I. B. Holley
*Ideas and Weapons*

The B-2 poses a significant dilemma in our understanding of sound doctrinal development and the selection of winning weapons. We must recognize this particular weapon system as the offspring of one doctrine, and the inheritor of another. As such, it bears the burden of past dogmatism and must accept its place among new ideas. It represents the imperfect relationship between ideas and weapons.

Doctrine and technological development should be interrelated. Ideally, concepts, validated through experience, lead to doctrine; we then derive the technological means for implementing that doctrine. Thus, we should formulate the doctrine, then build appropriate weapon systems. In the case of long-range strategic bombers, the Air Force initially followed this process, then became so entrenched in the doctrine of nuclear deterrence that it allowed dogmatism and pragmatism to drive the acquisition of manned aircraft. At the tail end of a string of bombers is the B-2, a weapon system first promoted within obsolete doctrine, then forced to fit within the evolving strategic attack doctrine of

the 1990s. Its advanced technology and potential capabilities belie the doctrinal inconsistencies.

The uncomfortable relationship between the B-2 and Air Force doctrine should ultimately serve as a lesson for future acquisitions of weapons and weapon systems. While we cannot overcome such impediments as long lead times and unanticipated changes in the strategic environment, we must at least better understand how the doctrinal process should work. We can then be prepared to change doctrine as inputs to the ongoing cycle demand, and perhaps come closer to coherence among ideas, technology, and practice.

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