

4 Dec 84

Col Boyd (2C282):

I've attached a xerox of Baucom's editorial, the one Hale and I did, and a copy of some comments on Holley's piece an issue back about definitions that Dennie Drew did. Drew, by the way, did not like what Hale and I said at all, and his fretting about informal doctrine appears to be a response. Krieger's piece, which comes across to me as a defense of the "doctrinal farm," has some amazing passages. His thinking does, however, seem to represent the Air Force's institutional views on doctrine far more than main; he's definitely mainstream, whereas Hale and I inhabit the radical fringe insofar as the institution is concerned.

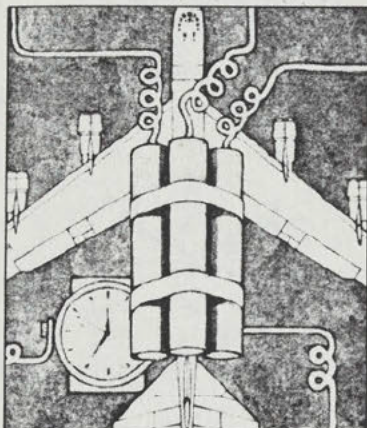
I also attached a letter I wrote to Fabyanic regarding the current edition of AFM 1-1. I have a copy of Fabyanic's response to Gen Leaf, should you be interested. However, given the potential use of this stuff that you hinted at on the phone, let me hang onto Fabyanic's response until I get a chance to talk with him.

Barry



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"We are ready to blow up this base. We want a B-52." Is your base prepared to respond?—page 80

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- 2 UNFINISHED BUSINESS
Editorial
- 4 DOCTRINE: MERE WORDS, OR A KEY TO
WAR-FIGHTING COMPETENCE?
Lt. Col. Barry D. Watts, USAF
Maj. James O. Hale, USAF
- 16 USAF DOCTRINE: AN ENDURING CHALLENGE
Col. Clifford R. Krieger, USAF
- 26 INTERNATIONAL ORDER AND AMERICAN POWER
Dr. Colin S. Gray
- 35 THE ISRAELI STRIKE AGAINST OSIRAQ
Lucien S. Vandenbroucke
- 48 SURPRISE FROM ZION
Maj. Mark G. Ewig, USAF
- 58 HOW SECURE IS NATO'S NORTHERN CAP?
Maj. Robert E. Russell, USAF
- 69 WAR-FIGHTING DETERRENCE AND ALLIANCE COHESIVENESS
Dr. Stephen J. Cimbala
- 74 THE DANGER OF NUCLEAR DIPLOMATIC DECAPITATION
Dr. Howard Tamashiro
- 80 IS YOUR BASE READY TO COUNTERACT TERRORISM?
Capt. Michael T. McEwen, USA
- Military Affairs Abroad
- 88 THE INDIAN AIR FORCE OF THE 1980S
1st Lt. Jerrold F. Elkin, USAF
- Commentary
- 96 INFORMAL DOCTRINE AND THE DOCTRINAL
PROCESS: A RESPONSE
Lt. Col. Dennis M. Drew, USAF
- 98 ON SEEKING A FORUM FOR THE MITCHELLS
Colonel Paul F. Murphy, USAF
- 99 ON CLASSICAL MILITARY STRATEGY
AND BALLISTIC MISSILE DEFENSE
Maj. Gen. Haywood S. Hansell, Jr., USAF (Ret)
- Books, Images, and Ideas
- 101 AN INSIDER'S WARNING TO THE WEST
Lt. Col. Gregory Varhall, USAF
Maj. Kenneth M. Currie, USAF
- 107 KREMLIN CONTINUITY AND SOVIET SOCIETY
Dr. Carl A. Linden
- 111 Potpourri
- 127 Contributors

EDITORIAL

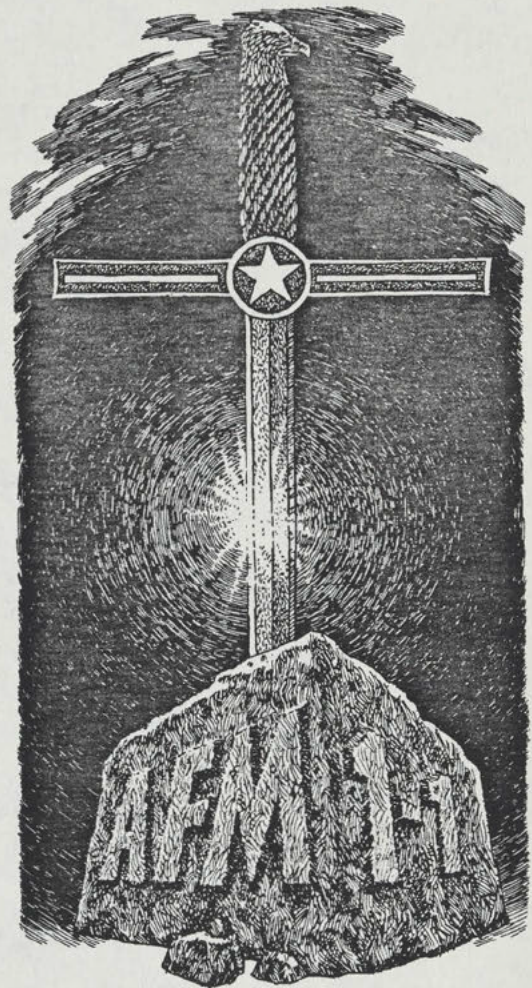
UNFINISHED BUSINESS

The Air Force continuously refines aerospace doctrine to make it relevant to present operations and viable for future contingencies.

AFM 1-1, 5 January 1984, p. vii

FOR the past thirty years Air Force officers have benefited from I. B. Holley's research and teaching on doctrine. Many of his ideas have shaped the framework of military doctrinal debates in the United States and have become part of the mainstream of Air Force doctrinal thinking. From his classic study *Ideas and Weapons* (1953), we learned that it is essential to institutionalize the rigorous analysis of experience and to use the results of the analysis process as the basis of our doctrine. His 1974 Harmon Memorial Lecture reminded us that developing sound doctrine is an "Enduring Challenge," a task never finished. Both of these ideas can be found in the latest edition of AFM 1-1, *Basic Aerospace Doctrine of the United States Air Force*.

The new manual is a marked improvement over the 1979 version, which had several flaws. The earlier edition apparently attempted to include something for every constituency in the Air Force. As a result, it lacked the focus one expects in a manual purporting to explain how aerospace power is used in war. Basic doctrine was buried among extraneous image-building and irrelevant discussions of the Triad, the total force, education and training, and personnel management. Additionally, the number and types of illustrations accompanying the text tended to discredit any claim the manual might have had to being a rigorous treatment of a complex, fundamental, life-or-death matter—basic doctrine. The overall result was a manual that pointed to an organization apparently more



concerned with training, organization, and equipment than with warfighting—an emphasis that is exactly what military professionals must guard against in a peacetime environment.

Reflecting the spirit of the Warrior Program, the latest edition of 1-1 gets down to serious business immediately and focuses throughout on the role of aerospace power in war. Doubtless, there will be ideas in the manual that will elicit disagreement. But of this, there can be no doubt—the manual

clearly lays out a basic military doctrine, a body of beliefs about how best to employ aerospace power in war.

Gone is the puffery of the 1979 edition. There are few quotations in the new manual, and those that appear obviously belong, coming from the likes of LeMay, Douhet, and Clausewitz. Gone also are the numerous illustrations that led some to speak of "cartoon doctrine" when the 1979 manual was published. Another refreshing aspect of the 1984 version is that it speaks candidly of war and victory. Passages like this one remind us all that we are in a military organization that is part of the cutting edge of the sword of the Republic.

The conduct of war is the art and science of using military force with other instruments of national power to achieve victory. Military victory is normally the decisive defeat of an enemy which breaks his will to wage war and forces him to sue for peace. In a broader sense, the attainment of stated objectives, limited or total, defines victory. (p. 1-1)

These changes alone are enough to alter the tone of the manual radically and give this edition much greater credibility than its predecessor.

A more elaborate review of the new 1-1 is contained in the second article in this issue, by Colonel Clifford R. Krieger. This article not only reviews the new manual but emphasizes the historical underpinning of Air Force doctrine. In one of his more important observations, an observation that echoes the ideas of Professor Holley, Krieger notes that Air Force doctrine is never finalized. Even as the new edition of 1-1 hits the streets, there are unresolved questions that will eventually make their mark on doctrine. Krieger maintains that

professional officers throughout the Air Force have a responsibility to contribute to the effort to clear up such matters and help refine our Air Force doctrine.

The lead article in this issue may be considered an effort to help in the refinement of the January 1984 AFM 1-1, which, like all doctrine manuals, will need to be revised some time in the future. In this article, Lieutenant Colonel Barry Watts and Major James O. Hale fault air power leaders for developing doctrine that tends to be composed principally of abstract definitions of roles and missions and fails to give sufficient consideration to combat experience. Moreover, the nature of this doctrine bespeaks a perception of war that does not give adequate recognition to the unknowns that are produced by war's fog and friction and the enemy (i.e., an animate object that reacts). The result, the authors believe, is a rigidity in the Air Force way of war that tends to inhibit appropriate modifications of doctrine in response to the everchanging circumstances of war.

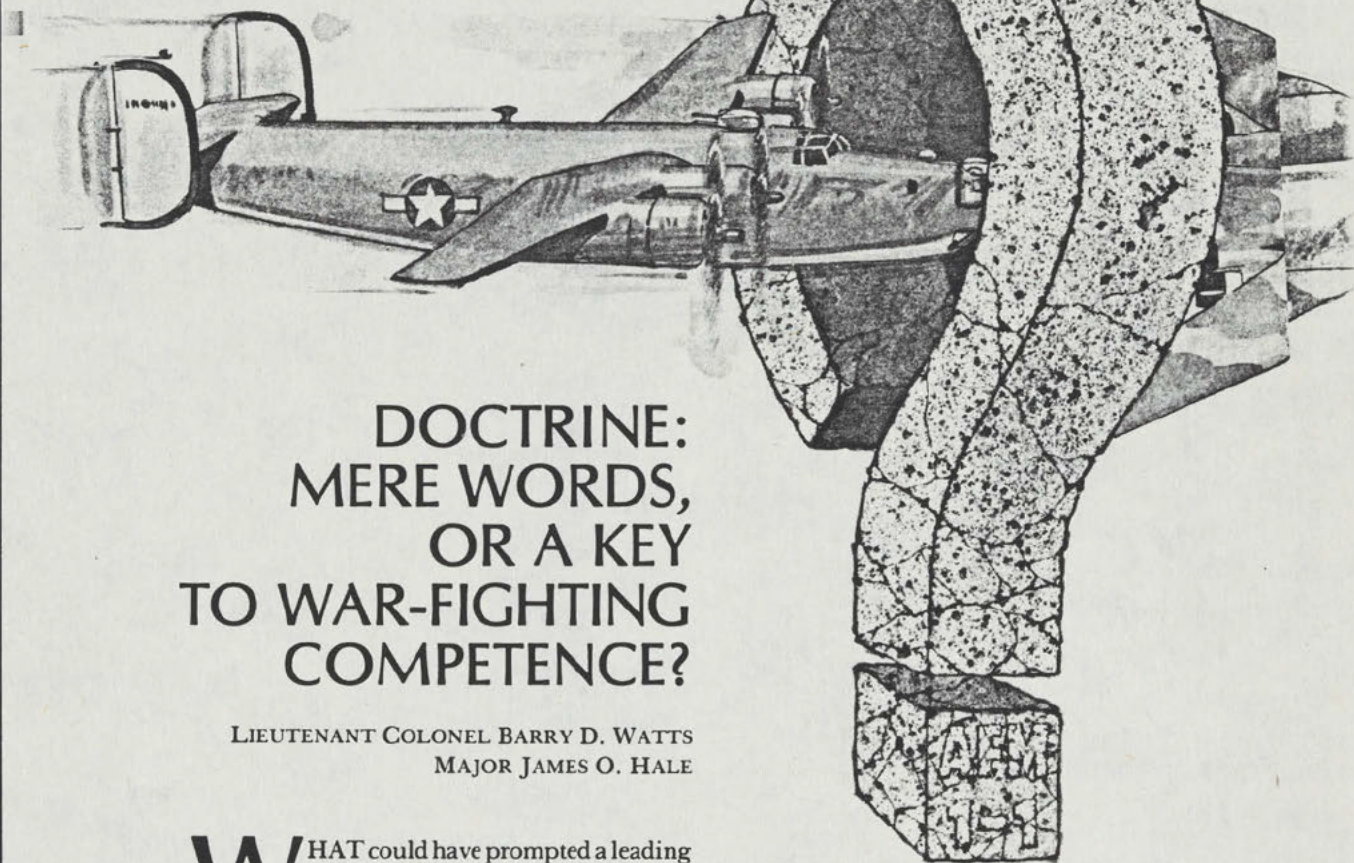
The publication of these two articles on doctrine, coming hard on the heels of the appearance of the new 1-1, illustrates well some fundamental characteristics of doctrine itself—it is indeed an enduring challenge. We at the Review hope that the two articles on doctrine in this issue will make a significant, perhaps lasting contribution to the process of rigorous analysis that must be a part of the enduring challenge.

As we work to refine our doctrine, we would do well to keep in mind Colonel Krieger's observation that there is no best doctrine, only a better one.

D.R.B.

Somewhere, somehow in the late 1950s, the quest for Air Force doctrine began to go stale in the very years in which dynamic studies were needed to integrate new aerospace ideas into the main body of Air Force thinking.

Robert Frank Futrell, 1971



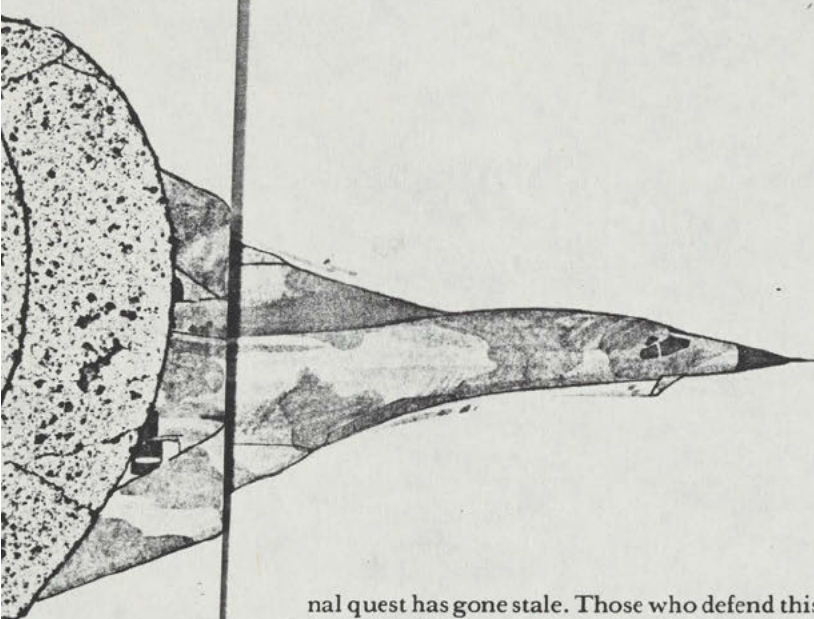
DOCTRINE: MERE WORDS, OR A KEY TO WAR-FIGHTING COMPETENCE?

LIEUTENANT COLONEL BARRY D. WATTS
MAJOR JAMES O. HALE

WHAT could have prompted a leading air power historian like Dr. Robert Futrell to conclude that the Air Force's doctrinal quest went stale during the 1950s and, worse, that even by the early 1970s, the young service had failed to perfect "semantic thought patterns" encompassing the totality of its rationale?¹ Insofar as Dr. Futrell's 1971 assessment remains valid today, part of the answer seems to lie in his awareness that the Air Force's basic doctrinal beliefs have remained

essentially unchanged since World War II (and can trace strong roots back even further). All too often since 1947, the keepers of U.S. air power doctrine have viewed their inheritance as holy writ more in need of protection than of evolution or change.

Of course, this lack of change in our basic doctrine is not, in itself, proof that the doctri-



nal quest has gone stale. Those who defend this lack of evolution tend to argue that by 1943, if not earlier, American army aviators had developed a good idea of what usually worked best and thereafter wisely stuck with that.²

On reflection, though, this explanation raises more questions than it answers. First, is it self-evident that what did the job in World War II (or in Southeast Asia) will do so today? One of the most fundamental air power ideas developed at the Air Corps Tactical School³ during the 1930s was that precision bombardment alone could swiftly destroy the means or will of an enemy society to wage war.⁴ But today, against a nuclear-armed adversary like the Soviet Union, is a conventional bombardment campaign of the sort envisaged by Tactical School theorists feasible at all? How, in particular, could we prevent such an operation from simply provoking the very thing we dread most, an all-out nuclear exchange?

Equally important questions can be asked about documents like Air Force Manual 1-1. Are the basic concepts and principles in the more recent versions of this manual discussed

or debated by those in operational units? Do Air Force professionals genuinely believe that officially sanctioned doctrine would promote, rather than hinder, successful combat performance in a future conflict? Indeed, is there even much consensus within the Air Force about what our core war-fighting principles are or our basic doctrinal concepts mean?

At the heart of the present authors' misgivings about the health of Air Force doctrine is the suspicion that our service's doctrinal quest has become entangled in abstract questions of definition that lead nowhere, while the practical problems of actual warfighting have been neglected. Is doctrine preeminently a peacetime tool for developing force structure? Or does it also have an important, perhaps even crucial role to play in battle? These are questions that every generation of American aviators has raised. But truly final answers have not been forthcoming.

Consider the problem of defining doctrine's essence. In his pioneering 1955 book *U.S. Military Doctrine*, Brigadier General Dale O. Smith accepted the proposition that Air Force thought progresses from the nebulous ideas of individuals, to unofficial concepts (or hypotheses), to doctrines taught at service schools and sanctioned at the highest military staff levels, to enduring principles.⁵ And while General Smith admitted that the exact point at which an idea becomes a concept (or a concept, a doctrine) may not always be clear, his formulation of basic doctrine as the fundamental beliefs of Air Force people about "the development, deployment, and employment of aerospace power in peace or war" seemed at the time to settle once and for all what doctrine is.⁶ But as the title of General I. B. Holley's recent article "Concepts, Doctrines, Principles: Are You Sure You Understand These Terms?" implies, serious definitional problems persist.⁷ General Holley insists that the official definition of doctrine long promulgated by the Joint Chiefs of Staff is confusing, if not erroneous. Evidently, despite three decades of effort, we have still not pro-

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gressed beyond the definition of basic terms. And if so, then one cannot help but wonder whether we have been working on the right questions.

Yet if we have been asking the wrong questions about doctrine, what questions should we be raising? Perhaps it would be helpful at this stage to stand the problem on its head and consider what doctrine is not. If we could first ascertain some of the things that doctrine cannot be, we might have a better basis for making some sense of this elusive concept.

The Problems of Defining Doctrine

How can a man understand the name of anything, when he does not know the nature of it?

Plato, Theaetetus

The truth lurks in the metaphor.

Anthony Athos, quoted in
In Search of Excellence, 1982

One thing that doctrine *is not* is a concept that can be exactly defined in a natural human language such as English or German. While it is customary to assume that a notion like doctrine must be unambiguously defined before it can be intelligently discussed, no general theory of definition capable of providing unsailable answers to a question like "What is basic doctrine?" exists. Consequently, efforts to ground doctrinal development on an exact account of what doctrine *is* are doomed from the start.

(*Authors' Warning:* The next half dozen paragraphs or so contain a rigorous substantiation of our skepticism about the utility of precise definitions as the point of departure for doctrine. Those readers who do not need further convincing, who regularly fly warplanes for a living, or whose eyes glaze over at the mere mention of JCS Publication 1, *Dictionary of Military and Associated Terms*, may wish to skip ahead.)

The problems encountered in trying to define general concepts have been with us since Plato's early dialogues.⁸ The structure and outcome of

these early works are monotonously similar. First, the participants begin to discuss some broad ethical question, such as "What is the nature of courage?"⁹ Next, they make a number of attempts to define (in the abstract, not in particular cases) the idea or concept at issue. But after intense Socratic questioning, the participants find that the proposed definitions always turn out to be faulty.¹⁰ Hence, the upshot of Plato's early dialogues is that the abstract essence of courage, piety, virtue, and other general concepts is never explicitly determined.¹¹

It has been some centuries since Plato walked the streets of Athens, and the reader may be inclined to assume that these problems of definition were solved long ago. Indeed, as a practical matter, need we look any farther than a good dictionary?

But dictionaries, disappointingly, offer less help than might be supposed. The problem is that dictionary definitions are circular in that, sooner or later, they define every word in terms of itself. This circularity holds even for concepts drawn from that most rigorous of all branches of human knowledge, mathematics. Take the intuitive notion of a set as it has been used in mathematics since Georg Cantor originally characterized it, around 1895, as "any collection into a whole (*Zusammenfassung zu einem Ganzen*) *M* of definite and separate objects *m* of our intuition or our thought."¹² Webster's Third New International Dictionary defines this particular sense of "set" as "a collection of things and esp[ecially] mathematical elements (as numbers or points)."¹³ But in this context the explicit synonym for "collection" turns out to be "aggregate," and when we look up "aggregate" we find it defined, in turn, as "a set of mathematical elements."¹⁴ So all the dictionary can ultimately do is lead us around closed loops of synonymous terms and phrases.

Regardless of how vicious or benign we deem this sort of circularity, cannot mathematicians themselves specify unambiguously what a set is—at least for mathematical purposes? Certainly Cantor's notion of a set as any collec-

tion into a whole of definite and separate elements of our thought or intuition *seems* straightforward enough. However, as Bertrand Russell discovered in 1901, Cantor's definition of "set" is not merely unclear but permits outright contradiction. The difficulty, now known as Russell's paradox, arises from noticing that many sets do not contain themselves. Then, when we ask whether the set of all sets not containing themselves contains itself, the answer that logically follows is that it both *does* and *does not*.¹⁵

What this paradox demonstrates is that the general problems of pinning down in words the precise meanings of abstract concepts were not discernibly closer to solution in 1901-02 than they had been at the time of Plato's early dialogues. Moreover, we see no signs of major progress toward their solution in the decades since the discovery of syntactic paradoxes like Russell's. As the philosopher Raziel Abelson summarized the situation in 1967:

The problems of definition are constantly recurring in philosophical discussions, although there is a widespread tendency to assume that they have been solved. Practically every book on logic has a section on definitions in which rules are set down and exercises prescribed for applying the rules, as if the problems were all settled. And yet, paradoxically, no problems of knowledge are less settled than those of definition, and no subject is more in need of a fresh approach.¹⁶

Lastly, note that the successful development since 1901 of formal or axiomatic approaches to set theory that avoid the known paradoxes reinforce, rather than undercut, Abelson's conclusion that a general solution to the problems of definition continues to elude us.¹⁷

For those who may feel inclined to dismiss this entire problem as only of relevance to ivory-tower academicians, we would offer two cases that strike somewhat closer to home. Consider, first, the notion of battlefield air interdiction (BAI). As a term, *BAI* seems to have been introduced in an attempt to explain better air power's contribution to the ground battle, especially in what had come to be seen as an

ill-defined gray area between close air support (CAS) and air interdiction (AI). But despite literally years of effort to nail down a notion introduced to explain two others, we see little evidence of a definition of BAI's abstract essence that the various interested parties in this country and among our allies could all unequivocally accept.¹⁸

More substantive disagreement about the essence of *doctrine* can be seen in the fundamental difference between American and Soviet usages of the term. Since 1947, the notion of military doctrine generally accepted within the Department of Defense has centered around the allocation of roles and missions among the various services. Air Force basic doctrine, in particular, has focused on defining Air Force missions, describing air power's special characteristics, and explaining the need for an independent air force.¹⁹ The view of military doctrine (*voyennaya doktrina*) that has held sway in the Soviet Union since the 1960s, by contrast, deals with a level of military thought far above the missions or characteristics of individual services. As reiterated in 1982 by then-Chief of the General Staff Marshal Nikolay Ogarkov, Soviet military doctrine is "a system of guiding principles and scientifically substantiated views of the CPSU [Communist Party of the Soviet Union] and the Soviet government on the essence, character and mode of fighting a war which may be forced by the imperialists on the Soviet Union."²⁰ Superficial differences in nomenclature notwithstanding, there is very little common ground between American and Soviet views of military doctrine's essence. Among other reasons, the highest echelon at which the Soviets do permit service-specific doctrine, the operational level of fronts and armies (*operativnoye iskusstvo*), has not been seriously discussed by U.S. airmen.²¹ Indeed, we have yet to recognize it as militarily important.

Returning to what doctrine *is not*, should Air Force doctrinal discussions begin by trying to define in the abstract what doctrine *is*? Our

answer must be: definitely not! General Holley has written that the search for sound military practice is *certain* to be seriously flawed without uniform, clearly understood definitions of terms like *doctrine*.²² But in the absence of a solution to the long-standing problems of definition, we would answer that the only outcome this insistence seems certain to ensure is that the Air Force's quest for sound military practice will continue to flounder. At the outset of any doctrinal foray, our best efforts at formal, abstract definitions are seldom much more than hunches; and even after long study, no one has been able to offer much more than metaphors. Thus, to insist that doctrinal thinking begin with formal, once-and-for-all definitions seems roughly akin to demanding that mathematics proceed from the solution to problems, such as exactly trisecting an angle with straightedge and compass alone, that are known to be impossible.

Yet if we cannot explicitly nail down the abstract essence of concepts like BAI and doctrine, how can doctrinal development ever be given an adequate foundation? How, indeed, can we even communicate? The dilemma is not insoluble. Combat experience appears to offer a practical way out that is "good enough" for purposes of warfighting.

Combat Experience

We have identified danger, physical exertion, intelligence, and friction as the elements that coalesce to form the atmosphere of war, and turn it into a medium that impedes activity. In their restrictive effects they can be grouped into a single concept of general friction. Is there any lubricant that will reduce this abrasion? Only one . . . combat experience.

Carl von Clausewitz, *On War*

. . . with increasing frequency, I'm seeing combat needs being contaminated by a lot of theoretical hogwash.

Brigadier General Eugene Lynch, USA (Ret), 1983

The second thing that doctrine is *not* is something that can be safely cut off from the

uncompromising evidence of the battlefield. Any attempt to develop concepts, doctrines, or principles for the actual practice of war that fails to ground itself squarely in concrete battle experience risks outright disaster.

To insist that there is little to be gained from trying to nail down a notion like doctrine in words does not mean that one is unable either to produce obvious examples of doctrinal statements or to subject these statements to the test of experience. For example, consider Brigadier General Kenneth N. Walker's famous maxim that a well-planned and well-conducted bombardment attack, once launched, cannot be stopped.²³ In the hands of Air Corps Tactical School bombardment advocates, this assertion was eventually construed to mean that bombers like the B-17 Flying Fortress could be sufficiently self-defending to penetrate enemy defenses and bomb the target without unacceptable or uneconomic losses.²⁴

What we would emphasize here is the historical lack of support in actual combat experience for this bomber penetration doctrine. The first missions of the American daylight bomber offensive from the United Kingdom were flown in August 1942. By October of that year, the senior leaders of the U.S. Eighth Air Force were "absolutely convinced," based on the command's experiences against targets in France and the Low Countries, that a force of 300 or more unescorted heavy bombers could "attack any target in Germany with less than 4 percent losses."²⁵

It took time, though, to build up the force structure in England necessary to raise Eighth's dispatchable bomber strength to the 300-plus level. For a variety of reasons, it was not until the summer of 1943 that Eighth Air Force's Commander, General Ira C. Eaker, managed to accumulate enough B-24s and B-17s to begin putting the idea of self-defending bomber formations to the test.

The bitter dénouement of this grand doctrinal experiment in early October 1943 is well known. Without fighter protection all the way

to the target, the bombers proved far more vulnerable than had been calculated. Over the period 8-14 October 1943, Eighth Air Force mounted four all-out efforts to break through the German fighter defenses unescorted. Since a total of 1410 heavy bombers were dispatched, losses should not have exceeded fifty-six B-17s and B-24s, according to doctrine.²⁶ However, Eighth lost 148 bombers and crews outright, mostly as a result of determined opposition from Luftwaffe fighters.²⁷ Adding in the fifteen additional heavies that returned damaged beyond economical repair, these four missions cost Eighth Air Force 21 percent of bombers on hand in its tactical units and at least 31 percent of its heavy-bomber crews.²⁸ As General Holley justifiably said in his 1974 Harmon Memorial Lecture, "The vigor with which *Luftwaffe* pilots subsequently pressed . . . attacks on 8th . . . formations over *Festung Europa* provides all the commentary that is necessary for this particular bit of doctrinal myopia."²⁹ Although Eighth's bombers had not been turned away from their targets, General Walker's penetration doctrine had failed the test of World War II battle experience in the specific sense that German fighter defenses had shown themselves able to impose unsupportable losses on the American bomber formations.³⁰

Even more significantly, the Army Air Corps' prewar penetration doctrine also lacked justification in *prior* combat experience from World War I. During the early years of the Air Officers School at Langley Field, Virginia, when the experience of the Great War was still heavily relied on, the prevailing view among the instructors had been that pursuit (fighter) aviation dedicated to gaining and holding control of the air was a necessary prerequisite for successful bombardment operations. The school's texts up to 1927 made this point clear:

Pursuit in its relationship to the Air Service . . . may be compared to the infantry in its relationship to the other branches of the Army. Without Pursuit, the successful employment of the other branches is impossible.

Pursuit aviation will provide the main protection for Bombardment aircraft.³¹

So to suggest that the main reason for the doctrinal myopia regarding bomber penetration that came to dominate Air Corps Tactical School thinking during the 1930s was insufficient experience seems dubious history at best. Admittedly, from the standpoint of tactical detail, bombardment enthusiasts such as General Walker (and later, General Eaker himself) did make their theoretical extrapolations from "a virtually clean slate."³² Also, in the context of their heartfelt desire for autonomy from the U.S. Army, it is easy to understand why these same air power crusaders tended to be overly optimistic where the emerging technology of the B-17 was concerned.³³ But in a more fundamental sense, *they* were the ones who chose to erase the slate of experience.

This conclusion may seem harsh. Certainly, the various American airmen who advocated daylight, precision bombardment during the 1930s and early 1940s would be on firm ground in pointing out that World War I produced precious little empirical data on large-scale, sustained bombardment operations against the industrial heart of an enemy nation. Yet to accept this explanation as an adequate defense of bomber invincibility is to interpret the word *experience* in a dangerously narrow way. The seminal flaw in the doctrine of bomber invincibility was not a lack of empirical data either about large-scale bombardment operations or the aircraft technologies that had emerged by the outset of World War II. Rather, it was the refusal of American airmen, *as a matter of basic doctrine*, to recognize that in real war, as opposed to war on paper, one must interact with an animate adversary who is motivated, literally on pain of death, to respond in surprising and unpredictable ways.³⁴ In their headlong rush to prove that strategic bombardment could be decisive, Eighth's bomber leaders were tempted to act as if, contrary to all past experience, they had forged an offensive weapon

against which no enemy could defend successfully.³⁵

Is it reasonable to suggest that American bomber enthusiasts might have read the record of past wars less narrowly, less parochially? All we can say is that during the 1920s and 1930s there were those who clearly did. As a case in point, we would offer the following excerpt from a 1936 U.S. Army translation of the introduction of the German army's field service regulations (or *Truppenfuehrung*) of 1933:

Situations in war are of unlimited variety. They change often and suddenly and only rarely are from the first discernible. Incalculable elements are often of great influence. The independent will of the enemy is pitted against ours. Friction and mistakes are of everyday occurrence.³⁶

It is difficult to overstate the profound difference between the Clausewitzian image of war so vividly articulated in this brief passage from the 1933 German *Truppenfuehrung* and a notion like the Army Air Corps' dictum about bomber invincibility.

In any event, the lesson concerning doctrine's intimate relationship with combat experience should, by now, be apparent. As episodes like Eighth Air Force's costly failure in October 1943 to penetrate German air defenses unescorted demonstrate, flawed doctrine can cost lives. And the shortest road to flawed doctrine is to develop it in the abstract, that is, without sufficient attention to the unpromising realities of battle.

Doctrine as *Fingerspitzengefuehl*

To win, you've got to take risks. How does a commander tell which risks are worth taking? He has a lot of conflicting inputs. But computers don't give the answer. Nor does intelligence. None of them gives the answer. In Israel, it's the combat experienced commander who's qualified to tell which risks are worth taking.

General Ben-Nun, Israeli Air Force, 1984

Those who start in the company's mainline jobs, the making or selling parts of the business, are unlikely

to be subsequently fooled by the abstractions of planning, market research, or management systems as they are promoted. Moreover, their instincts for the business develop. They learn to manage not only by the numbers but also, and perhaps more importantly, by a real feel for the business. They have been there. Their instincts are good. [Emphasis added.]

Thomas J. Peters and Robert H. Waterman
In Search of Excellence, 1982

To this point we have concentrated on what doctrine is *not*, arguing that it can be neither exactly defined nor safely cut off from battle experience. Having done so, are we finally in a position to say something useful about what doctrine *might be*?

By making the abstract definition of roles and missions the touchstone of their thinking, U.S. airmen have turned the doctrinal enterprise into a sterile scholasticism too little related to the concrete activities of war itself. Presumably, then, what we need to do in the future is to tie doctrine more directly to combat experience.

How does combat experience provide a practical alternative to first trying to nail down in words exactly what doctrine is? Michael Polanyi, physical chemist turned philosopher, has argued that human beings have a capacity to know more than they can tell.³⁷ Skillful feats, like air combat maneuvering or manual dive bombing, illustrate this sort of tacit knowledge (or implicit understanding³⁸). Such acts are *tacit* (or *implicit*), according to Polanyi, because the dissection of a skill into its constituent parts is always incomplete. But skills also represent *knowledge* (or *understanding*) insofar as they can be mastered and reliably repeated on demand.

To be stressed is Polanyi's realization that if the constituents of a given skill cannot be exhaustively and explicitly specified, then each individual must discover for himself "the right feel" for any particular skill.³⁹ A striking illustration is provided by the George Air Force Base F-4 instructor pilot who, in the early 1970s, developed such a flair for dive bombing that he could turn off his gunsight and still, more often than not, drop the best bombs in the flight. Asked how he did it, he would reply: "I pickle when it feels

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right."⁴⁰ If common experience about skillful feats is any guide, no other reply is possible (although one presumes that the pilot in question must have dropped quite a few bombs before he was able to function this well without the aid of a gunsight).

It may seem a long step from particular tactical skills like dive bombing to warfighting in general. In reality, however, the two have more in common than what first meets the eye. The stresses of actual war may not always test the bodily strength, intellect, and character of a high commander in precisely the same ways as they test those of a young pilot, but test them they do. And the nub of that test, as the World War II fighter ace Donald S. Gentile (19.83 victories air-to-air) so poignantly stated, is the life or death imperative to act. Air-to-air combat, Gentile recounted while still flying missions with the Eighth Air Force's 4th Fighter Group in 1944,

goes in a series of whooshes. There is no time to think. If you take time to think you will not have time to act. There are a number of things your mind is doing while you are fighting—seeing, measuring, guessing, remembering, adding up this and that and worrying about one thing and another and taking this into account and that into account and rejecting this notion and accepting that notion . . . But while the fight is on, your mind feels empty . . . as if the flesh of it is sitting in your head, bunched up like muscle and quivering there.⁴¹

What is Gentile saying? For the most part, he is describing the implicit but interactive cross-referencing process by which combatants continually orient and reorient themselves in the unfolding circumstances of battle.⁴² Only his final sentence in the cited passage—where Gentile ostensibly says that in the heat of battle his mind feels empty—requires explanation. Those of us who have been exposed to combat would suggest that he really means something other than what his words literally say. If the mind is constantly seeing, measuring, guessing, and weighing this or that during battle, then it cannot be literally empty of activity. But

it may be empty in a less obvious sense: namely, that while directly engaged in fighting, combatants are seldom fully conscious of their mental processes. In other words, thinking during battle is mostly a matter of skilled responses so deeply internalized or nearly autonomous that the combatants themselves are no more than partially aware of all that they are doing.⁴³

The point is that in real war there is almost never enough time, unambiguous information, or relief from the dreadful pressures of combat to think though any situation in the step-by-step, fully conscious manner possible at home, in the office, or in the classroom. For better or worse, war compels combatants of every rank to lean heavily upon whatever *Fingerspitzengefühl* (or implicit feel for battle) they may possess.⁴⁴ Yes, everyone who engages in combat strives to plan in advance as systematically as he can, to use every available scrap of information, and to leave as little to chance as possible. But despite one's best efforts, real war has a ruthless way of forcing combatants to respond first and foremost on the basis of their implicit appreciation for what is likely to work in specific combat situations.⁴⁵

A Warfighter's View of Doctrine

As warfighters, what can we ultimately say about what doctrine is? Clausewitz stated, early in *On War*, that theory can never fully define the general concept of friction.⁴⁶ But realizing that useful metaphors could be given, he variously characterized friction as (a) "the only concept that more or less corresponds to the factors that distinguish real war from war on paper," (b) "the force that makes the apparently easy [in war] so difficult," and (c) "the elements that coalesce to form the atmosphere of war."⁴⁷ Following Clausewitz's lead, we would insist that a formal definition of doctrine that explicitly captures all its particulars and nothing more cannot be given. But, we would likewise go on to characterize doctrine—

at least in the sense of offering a baseline metaphor—as *the implicit orientation with which a military culture collectively responds to the unfolding circumstances of war*.

What is this metaphor intended to convey? It implies first of all that doctrine can be an overriding determinant of combat outcomes. In *Attack and Die*, Grady McWhiney and Perry Jamieson have argued that in the first three years of the American Civil War, the Confederacy “simply bled itself to death . . . by taking the tactical offensive in nearly 70 percent of the major actions”—even though, by 1861, advances in infantry weapon technology had begun to give the upper hand to the defense.⁴⁸ While McWhiney and Jamieson undoubtedly rely overmuch on crude statistical comparisons, they are right to draw attention to the pivotal role of doctrinal orientation in the South’s eventual defeat. The plain fact seems to be that the Confederates were never able to transcend a tactical mindset that saw offensive action as the only honorable approach to war.

Second, doctrine-as-implicit-orientation highlights the tacit nature of the assumptions and beliefs by which combatants fail or succeed. Regardless of how much we do or do not write down in our doctrine manuals, the precepts that count most in the heat of battle are those that have become more or less second nature. This reality obviously places a heavy burden on everyone in military uniform to master the craft of warfighting. But if we are to go by the evidence, the shoulders of warriors and “operators” are precisely where this burden should lie. As one veteran Israeli pilot said after the June 1982 air campaign over Lebanon in response to American questions about how much doctrine the Israeli Air Force had written down, “Yes, we have books. But they are very thin.”⁴⁹ Or, to offer a more concrete metaphor, the doctrine that really wins or loses wars is the collection of internalized values, rules of thumb, and elemental images of war on which a military group instinctively relies in battle.

The foremost observation that we would make about our metaphorical characterizations of doctrine is that they do appear more likely to be useful to combatants than the abstract definitions of terms so typical of mainstream Air Force doctrine to date. After all, construed as the implicit orientation or collective instincts of battle-wise veterans, doctrine can be seen as a *working synthesis* of the *Fingerspitzengefühl* of successful warfighters. And because the mature *Fingerspitzengefühl* of a George Patton, a Heinz Guderian, or an Erich Hartmann has so often produced amazing battle results, doctrine then boils down to what is known to work where it counts—in combat.⁵⁰

Why might this view of doctrine work better than an approach grounded on definitional abstractions? Consider the sorts of insights that skilled practitioners of military art have distilled from battle experience in the past:

- “Survive first, kill bogies second.”⁵¹
- “The battle will never go as you planned it. Improvise. Surprise is your most important weapon. Risk, risk, risk.”⁵²
- Knowledge is important: efficiency even more so. But character and personality are the most important. Knowledge can easily fail and can, in fact, be the cause of failure. Not intelligence but character is the unfailing factor. Only character is reliable in tough situations, and . . . in combat.⁵³
- It is better to render a partly faulty decision at the right time than to ponder for hours over various changes in the situation and finally evolve a perfect decision, but too late for execution.⁵⁴
- Wars are only won by risking the impossible.⁵⁵
- Develop intuitive judgment and understanding for everything.⁵⁶
- Keep it simple, stupid!⁵⁷

To those skilled in war, these statements are concrete and easily understood. They reflect the face of battle as it is, not as pure theoreticians and force planners so often wish or as-

sume it to be. Above all else, they provide a clear basis for action. It is the down-to-earth, battle-tested *Fingerspitzengefühl* embodied in propositions like these that should be the warp and weave of Air Force doctrine.

This last thought suggests another observation regarding doctrine-as-implicit-orientation. The pressures of the annual Pentagon budget process neither excuse nor justify the historical concentration of Air Force doctrinal thought on abstract definitions. Admittedly, budgets cannot be ignored, and careful definitions may even have a certain utility vis-à-vis allocations within and between the various services. We would suggest, however, that for the most part the Air Force at large would be better advised to concentrate more on questions like: Does war remain fundamentally a contest between independent wills dominated by friction? For not only has there been ample-to-overwhelming evidence in favor of this essentially Clausewitzian view of war's nature for decades (if not centuries), but an implicit orientation that is shared, unifying, and easy to implement has also been one of the keys to overcoming friction.

FINALLY, however one elects to think about

basic air power doctrine, it must be firmly grounded on hard evidence. To view Air Force doctrine primarily in terms of abstract roles and missions requiring zealous protection tends to equate past success with historical validity. True, the United States and its allies won World War II; and after that war, American airmen won service autonomy. But neither of these victories can be said to have validated the Air Force's basic doctrine to any great degree. The unpleasant reality is that, beyond clearly foreseeing the future importance of air power at a time when most men did not, the majority of American air commanders, as late as the fall of 1943, "failed completely to grasp the essential meaning of air superiority," and every salient prewar belief of American air strategists "was either overthrown or drastically modified by the experience of war."⁵⁸ Our air doctrine, in short, has not always enjoyed the firmest basis in empirical fact. And if we hope to do better in the future, then we must never forget that the ultimate arbiter of doctrinal beliefs is whether they help us to prevail in the air. "Anything else," as Baron Manfred von Richthofen once said, "is absurd."⁵⁹

Washington, D.C.

Notes

1. Robert Frank Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907-1964* (Maxwell AFB, Alabama: Air University Press, 1971), pp. 6-7.
2. Air Force Manual 1-1: *Basic Aerospace Doctrine of the United States Air Force* (Washington: Headquarters U.S. Air Force, 5 January 1984), pp. v, A-1, A-2, and A-4.
3. The Air Service Field Officers School that began at Langley Field, Virginia, in October 1920 changed its name to the Air Service Tactical School in 1922. In the wake of the 1926 Air Corps Act, the school became the Air Corps Tactical School, and in 1931 it moved to Maxwell Field outside Montgomery, Alabama. See I. B. Holley, Jr., *An Enduring Challenge: The Problem of Air Force Doctrine* (Colorado Springs: U.S. Air Force Academy, 1974), Harmon Memorial Lectures in Military History, Number Sixteen, pp. 3 and 15.
4. David MacIsaac, *Strategic Bombing in World War II: The Story of the United States Strategic Bombing Survey* (New York: Garland, 1976), p. 7; Haywood S. Hansell, Jr., *The Air Plan That Defeated Hitler* (Atlanta, Georgia: Higgins-McArthur/Longino and Porter, 1972), pp. 4, 8, and 75-76; Thomas A. Fabyanic, "The Development of Airpower between the Wars," video taped lecture to the Air Command and Staff College, Maxwell AFB, Alabama, 3 February 1983, transcription by Barry D. Watts, pp. 16-18.

5. Futrell, p. 5; also see Brigadier General Dale O. Smith, *U.S. Military Doctrine: A Study and Appraisal* (New York: Duell, Sloan, and Pearce, 1955), pp. 4-6.
6. Futrell, pp. 5 and 7.
7. I. B. Holley, Jr., "Concepts, Doctrines, Principles: Are You Sure You Understand These Terms?" *Air University Review*, July-August 1984, pp. 90-93.
8. The dialectical dialogues of Plato's earliest period are considered to include, among other works, the *Laches*, *Protagoras*, *Euthyphro*, and *Meno*. See Gilbert Ryle, "Plato," *The Encyclopedia of Philosophy*, edited by Paul Edwards (New York: Macmillan and the Free Press, 1967), Vol. 6, p. 319.
9. Plato, *Laches*, translated by Benjamin Jowett in *The Great Books of the Western World*, edited by Robert M. Hutchins (Chicago: Encyclopaedia Britannica, 1952), Vol. 7, p. 32.
10. Illustrative of the substantive difficulties that arise is the objection in the *Euthyphro* that to define piety as being what is loved by the gods merely gives an attribute of piety, not its essence. Plato, *Euthyphro*, in *Great Books*, p. 196.
11. At the end of the *Euthyphro*, for example, the most positive statement that the participants can make is that they "must begin again and ask, What is piety?" *Ibid.*, p. 198.
12. Georg Cantor, *Contributions to the Founding of the Theory*

of *Transfinite Numbers*, translated by Philip E. B. Jourdain (New York: Dover, 1955), p. 85.

13. Webster's Third New International Dictionary of the English Language: Unabridged, definition 44b, p. 2078.

14. Ibid., definition 6, and definition 5. Emphasis added.

15. In full, Russell's paradox goes as follows. "One notes that many sets do not contain themselves. Examples are the set of all books (which is not itself a book), the set of all primes less than ten, the set of all things which are not themselves sets, etc. We may call such sets *normal*. *Abnormal* sets are those sets which do contain themselves. Examples are the set of all sets, the set of all sets describable in fewer than 20 English words, the set of all sets which contain more than three members, etc. Now consider the set of all normal sets and ask whether it is normal or abnormal. If it is normal, then it doesn't contain itself, by definition of *normal*. However, if it doesn't contain itself, it does contain itself, since it is the set of all normal sets. If, on the other hand, it is abnormal, then it contains itself, by definition of *abnormal*. However, if it contains itself, it is excluded from itself, since it is the set of only normal sets. In short, we again have a contradiction." See Howard DeLong, *A Profile of Mathematical Logic* (Menlo Park, California: Addison-Wesley, 1970), p. 82.

16. Raziel Abelson, "Definition," *The Encyclopedia of Philosophy*, Vol. 2, p. 314.

17. There are at least two reasons why formulations of set theory that avoid the known paradoxes do not undercut Abelson's view that no general theory of definition exists.

First, even though formal axiomatizations of set theory, such as that associated with the work of Ernst Zermelo, Abraham Fraenkel, and Thoralf Skolem, equate the word "set" with the primitive variables (or terms) occurring in the Zermelo-Fraenkel-Skolem axioms, the mathematical system deduced from them is formally "independent of any meanings which may be associated with the primitive terms" employed in those axioms. See Howard Eves and Carroll V. Newson, *An Introduction to the Foundations and Fundamental Concepts of Mathematics*, rev. ed. (New York: Holt, Rinehart and Winston, 1965), p. 117.

Second, the fact that two of the Zermelo-Fraenkel-Skolem axioms (the axiom of choice and the continuum hypothesis) are now known to be independent of the others demonstrates "the intuitive incompleteness of the standard axioms of set theory—incompleteness to a degree hardly expected. To a certain extent the situation is comparable to that in geometry after the independence of the parallel postulate was established. We now have many geometries and presumably we may expect many set theories." See Patrick Suppes, *Axiomatic Set Theory*, rev. ed. (New York: Dover, 1972), pp. 252-53. In other words, because alternative set theories would, like non-Euclidean geometries, be based on embracing at least one axiom that is logically inconsistent with the "standard" ones, existing means of avoiding the known set-theoretic paradoxes fail to furnish a unique understanding of what a set is.

18. The definitional difficulties that have been encountered by various NATO agencies and groups dealing with BAI have led the Tactical Air Command (TAC) staff recently to recommend that BAI be subsumed into air interdiction. TAC's view is that BAI and AI are so functionally similar that they would be best directed and controlled as a single "mission area." We would note, however, that working definitions of BAI adequate for practical purposes are less troublesome. In the Israeli Air Force (IAF), for example, a sortie or mission either participates in the ground battle or not. If it does participate in the ground battle, then the sortie or mission is either coordinated (i.e., targets are generated by the ground forces or else decided on jointly) or not coordinated (i.e., targets are specified by the IAF alone and do not require army support, input, or control).

19. Air Force Manual 1-1, *Functions and Basic Doctrine of the United States Air Force* (Washington: Headquarters U.S. Air Force, 14 February 1979), p. vii; Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force*, pp. v and vii.

20. Marshal of the Soviet Union Nikolay Vasil'yevich Ogarkov,

Always in Readiness to Defend the Homeland, translated by Foreign Broadcast Information Service [JPRS L/10412] (Moscow: Voenizdat, 1982), p. 41. This characterization of Soviet military doctrine was revived in the 1960s and can be traced back to Mikhail V. Frunze. See, for example, A. A. Grechko, *The Armed Forces of the Soviet Union*, translated by Yuri Sviridov (Moscow: Progress, 1977), p. 270; V. D. Sokolovskiy, *Soviet Military Strategy*, edited and translated by Harriet Fast Scott (New York: Crane, Russak and Company, 1968), pp. 38-40; and *The Soviet Art of War: Doctrine, Strategy, and Tactics*, edited by Harriet Fast Scott and William F. Scott (Boulder, Colorado: Westview, 1982), pp. 27-30.

21. Stephen M. Meyer, *Soviet Theater Nuclear Forces (Part I: Development of Doctrine and Objectives)*, Adelphi Papers Number 187 (London: International Institute for Strategic Studies, Winter 1983/4), pp. 3-5; John Hemsley, *Soviet Troop Control: The Role of Command Technology in the Soviet Military System* (New York: Brassey's, 1982), p. 261; Harriet Fast Scott and William F. Scott, pp. 92-93 and 140.

22. Holley, "Concepts, Doctrines, Principles," p. 90.

23. Hansell, p. 15.

24. Fabyanic, pp. 11 and 16.

25. Williamson Murray, *Strategy for Defeat: The Luftwaffe 1933-1945* (Maxwell Air Force Base, Alabama: Air University Press, 1983), p. 170.

26. Roger A. Freeman with Alan Crouchman and Vic Maslen, *Mighty Eighth War Diary* (London: Jane's, 1981), pp. 123-26.

27. Alfred B. Ferguson, "POINTBLANK" in *The Army Air Forces in World War II*, edited by Wesley F. Craven and James L. Cate, Vol. 2, *Europe: TORCH to POINTBLANK, August 1942 to December 1943* (Chicago: University of Chicago Press, 1949), p. 705.

28. Murray, Tables XXXIII and XXXIV on pp. 175-76; Freeman, pp. 123-26.

29. Holley, *An Enduring Challenge*, p. 5.

30. William R. Emerson, *OPERATION POINTBLANK: A Tale of Bombers and Fighters* (Colorado Springs: U.S. Air Force Academy, 1962), Harmon Memorial Lectures in Military History, Number Four, p. 24. During World War II, Emerson flew a combat tour in the P-47 in the Mediterranean theater of operations.

31. Fabyanic, p. 2. The statements cited were taken from Air Corps Tactical School documents.

32. Holley, *An Enduring Challenge*, p. 7.

33. Fabyanic, p. 13.

34. Von Clausewitz, pp. 139 and 149. As Williamson Murray has recently observed, the unpardonable aspect of Eighth Air Force's staggering bomber losses in October 1943 stemmed from the refusal of American airmen to alter their prewar doctrine in the face of battle experience. Thus, while the sixty bombers lost on the Schweinfurt/Regensburg raid of 17 August 1943 can be defended, "the second great disaster over Schweinfurt in October 1943 (where another sixty bombers were lost) raises the most serious doubts about the willingness of Eighth's leadership to adapt doctrine to reality." See Williamson Murray, "A Tale of Two Doctrines: The Luftwaffe's Conduct of the Air War and the USAF's Manual 1-1," *Journal of Strategic Studies*, December 1983, p. 85.

35. Elmer Bendiner, who flew as a B-17 navigator on both the 17 August and 14 October 1943 missions to Schweinfurt, has concluded that on both occasions Eighth's crews "were sent on a hazardous mission to destroy in a single day an objective that was vulnerable only to repeated assaults for which we [Eighth's bomber groups] had not the strength. Those objectives could not wait for the arrival of more bombers, of the promised Mustangs, of belly tanks and wing tanks, because we had to dramatize the importance of air power in the European Theater for the benefit of the public and the Navy." Emphasis added. See Elmer Bendiner, *The Fall of Fortresses: A Personal Account of the Most Daring—and Deadly—American Air Battles of World War II* (New York: G. P. Putnam's Son, 1980), p. 234. Eaker, as Bendiner notes, largely confirmed this assessment in 1977 during an interview with Albert Speer. See Ira C. Eaker and Arthur G. B. Metcalf, "Conversations with Albert

Speer," *Air Force Magazine*, April 1977, p. 56.

36. German Field Service Regulations, *Truppenführung (Troop Leading)*, Part I, translated by U.S. Army, Report No. 14,507, 18 March 1936, p. 1. For a fuller discussion of traditional German versus recent American air doctrine, see Murray, "A Tale of Two Doctrines."

37. Michael Polanyi, *Knowing and Being: Essays by Michael Polanyi*, edited by Marjorie Grene (Chicago: University of Chicago Press, 1969), p. 133.

38. John R. Boyd, *Organic Design for Command and Control* (Washington: Xerox reproduction of briefing slides, March 1984), p. 8.

39. Polanyi, p. 126.

40. The pilot who could "bomb everybody's eyes out" with his sight reticle turned off was Bobby G. Williams. When then-Lieutenant James Hale encountered him in 1971 at George Air Force Base, California, Williams was a major instructing in the F-4 replacement training unit. Williams's story is not unique. After the Korean War, Captain Cal Davey, while flying F-86s at Nellis AFB, Nevada, developed the same kind of eye-watering proficiency at dive bombing. Davey too explained his talent in terms of feel, often briefing other pilots that he simply pickled "when that guy taps me on the back of the shoulder."

41. Captain Don S. Genule, as told to Ira Wolfert, *One-Man Air Force* (New York: American Book-Straford Press, 1944), pp. 8-9.

42. Boyd, p. 15. "Orientation," Boyd says, "is an interactive process of many-sided implicit cross-referencing projections, empathies, correlations, and rejections that is shaped by and shapes the interplay of genetic heritage, cultural tradition, previous experiences, and unfolding circumstances."

43. As G. M. Stratton's work in the 1890s with vision-inverting glasses revealed, even perceptual feats as seemingly transparent as vision involve extensive information processing that is not accessible to the consciousness of the perceiver. See Polanyi, pp. 198-99.

More generally, large organizations and higher organisms exist effectively because of their ability to manage complexity through such techniques as delegating various subtasks to near-autonomous subsystems that are allowed "to go their own way and work on their own problems most of the time." See Paul K. Davis, "Rand's Experience in Applying Artificial Intelligence Techniques to Strategic-Level Military-Political War Gaming," Rand Corporation Paper P-6977, April 1984, p. 11.

44. *Fingerspitzengefühl* literally means fingertip feel but is more often translated as instinct, intuition, or flair. Like many German figures of speech, it tends to have metaphorical connotations that are difficult to capture in literal English translations.

45. Boyd, pp. 24-25 and 28.

46. Clausewitz, p. 120.

47. Clausewitz, pp. 119, 121, and 122.

48. Grady McWhiney and Perry D. Jamieson, *Attack and Die: Civil War Military Tactics and the Southern Heritage* (Tuscaloosa:

University of Alabama Press, 1982), pp. 7, 40, 57, and 146.

49. The American to whom this reply was addressed was Major Hale, who was part of an Air Force team that visited Israel in May 1983.

50. The military achievements of General Patton are fairly well known to American readers. *Generaloberst Heinz Wilhelm Guderian* created the *Panzertruppe* that proved so pivotal to Germany's swift conquest of Poland and France in 1939 and 1940. See Kenneth Macksey, *Guderian: Creator of the Blitzkrieg* (New York: Stein and Day, 1976), p. 63. Erich Hartmann is credited with 332 aerial victories on the eastern front during World War II, including seven against American-flown P-51s. See Edward H. Sims, *The Aces Talk: formerly Fighter Tactics and Strategy 1914-1970* (New York: Ballantine, 1972), p. 232.

51. Lieutenant Colonel Watts first encountered the maxim "Survive first, kill bogies second" at the Navy's Topgun Fighter Weapons School in 1975. The occasion was a syllabus lecture on "two-versus-many" by Alex Rucker.

52. S. L. A. Marshall, *Swift Sword: The Historical Record of Israel's Victory, June 1967* (New York: American Heritage, 1967), p. 133.

53. *General die Infanterie* Günther Blumentritt, as quoted by C. A. Leader, "The Kriegsakademie: Synthesizer of Clausewitzian Theory and Practice," unpublished paper, 30 July 1982, p. 42.

54. Captain Albert C. Wedemeyer, *The German General Staff School*, Report Number 15,999 from the U.S. Military Attaché, Berlin, 11 July 1938, National Archives Record Group 407, p. 139.

55. George S. Patton, Jr., quoted in Martin Blumenson, *The Patton Papers: 1940-1945* (Boston: Houghton Mifflin, 1974), p. 86.

56. Miyamoto Musashi, *A Book of Five Rings: The Classic Guide to Strategy*, translated by Victor Harris (Woodstock, New York: Overlook Press, 1974), p. 49. Musashi, known to his fellow Japanese as *Kensei* (Sword Saint), was a Kendo master who lived from 1584 to 1645.

57. Thomas J. Peters and Robert H. Waterman, Jr., *In Search of Excellence: Lessons from America's Best-Run Companies* (New York: Warner Books, 1982), pp. 63-67. As Peters and Waterman note, "Keep it simple, stupid!" is rooted in the psychological fact that humans are not good at processing large streams of new data and information; instead, they "reason with simple decision rules, which is a fancy way of saying that, in this complex world, they trust their gut."

58. Emerson, p. 40.

59. Manfred Freiherr von Richthofen, translated by Peter Kilduff, *The Red Baron* (Garden City, New York: Doubleday, 1969), p. 116. The quotation is part of the longer quotation: "The fighter pilots should have an allotted area to cruise around in as it suits them, but when they see an opponent they must attack and shoot him down. Anything else is absurd . . . The mastery of the air in war is won through nothing other than battle, that is, shooting down the enemy."

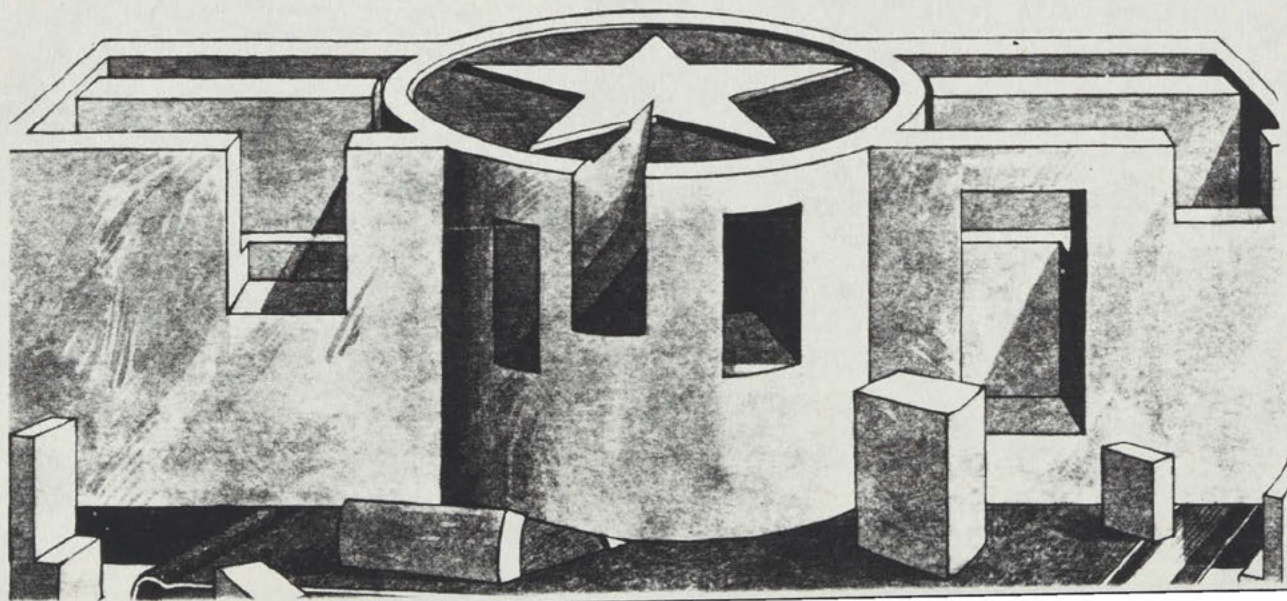
USAF DOCTRINE: AN ENDURING CHALLENGE

COLONEL CLIFFORD R. KRIEGER

THIS year the U.S. Air Force published two very important documents: Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force*,¹ and a reissue of *The Condensed Analysis of Ninth Air Force Operations in the European Theater of Operations* (hereafter referred to as the *Condensed Analysis*).² Study of these two documents by professional Air Force officers should both confirm their understanding of air power doctrine and lead to a better comprehension of how to employ air power.

The New Air Force Manual 1-1

In four short chapters, the new Air Force Manual (AFM) 1-1 addresses the employment of military forces, the specific employment of aerospace forces, the missions and specialized tasks of the Air Force, and the preparation of aerospace forces for war (organizing, training, equipping, and sustaining). Going beyond describing the classic missions and specialized tasks of air forces and their organization, training, equipment, and sustainment, this edition



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discusses the employment of aerospace forces as part of a unified military organization to win in war. This emphasis on aerospace power as part of a holistic approach to war represents a new level of conceptualization not previously achieved. It also presents an overall concept for the proper employment of air power, calling for the air commander to have a broad plan of employment and encompassing ideas delineated in World War II's FM 100-20.³ The commander's broad plan of employment provides a key to air power often missing in recent discussions. Our AFM 1-1 is, in many ways, the equivalent of the Army's FM 100-1, *The Army*⁴ and the Navy's NWP-1, *Strategic Concepts for the U.S. Navy (Rev A)*.⁵ However, the Air Force's AFM 1-1 delves deeper into warfighting than either the Army's FM 100-1 or the Navy's NWP-1.

The new edition of AFM 1-1, while covering the same ground as the previous edition (and more), takes a different approach. The manual begins with a chapter that emphasizes both the relationship of the military to the nation and the interrelationship among the military services. Aerospace forces are seen as having certain intrinsic capabilities. To exploit these capabilities fully, aerospace forces must be integrated and coordinated with land and naval forces. Thus, unity of command, the appointment of a single commander to achieve unity of effort in carrying out an assigned task, is critically important.

The second chapter examines the employment of aerospace forces. An important addition here is the concept of a broad plan of employment and, in particular, recognition of the importance of employing aerospace power as an indivisible entity, based on objectives, threats, and opportunities. The chapter emphasizes that the commander has a broad plan of employment and conducts simultaneous strategic and tactical actions utilizing all available forces. The importance of employing both offensive and defensive action, as well as employing aerospace operations for psychologi-

cal impact, is amply discussed. The basics of warfighting are covered in this chapter: that is, not only the principles of war (which now include both logistics and cohesion) but such important fundamentals as the need to gain control of the aerospace environment and to attack the enemy's war-fighting potential, to develop a coherent pattern for employing forces, and to take advantage of the wide array of unique capabilities that aerospace forces possess.

The third chapter focuses on missions and specialized tasks of aerospace forces. The long discussion of DOD-Directive 5100.1, which addresses functions of the Air Force, is much reduced from the previous edition. (The material in the DOD directive is covered elsewhere.)⁶ Rather than providing only a list of missions and a description of each, as in the previous AFM 1-1, the new manual covers each mission in terms of how it contributes to the achievement of the air component commander's objectives. For example, the discussion of air interdiction (AI), recognizing the fact that AI is normally flown "as part of a systematic and persistent campaign," stresses the need for the air component commander to consult with the surface force commanders in developing an AI campaign.⁷

The manual no longer includes space operations as an Air Force mission. Discussion of these operations was dropped based on the realization, expressed in AFM 1-6, *Military Space Doctrine*, that space is a place wherein the Air Force simply performs its classic missions in new and improved ways.⁸ On the other hand, aerospace maritime operations was added as a mission in recognition of the fact that maritime operations are "made unique primarily by the character of its objectives, the threat, and the forces involved."⁹ In addition, the specialized tasks of the Air Force have been updated and expanded in description.

The fourth chapter deals with organizing, training, equipping, and sustaining aerospace forces. Increased emphasis is placed on the ser-

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vices as providers of forces, while the unified and specified commanders and their functional (land, naval, and air) component commanders are viewed as the employers of forces. This distinction is critical to the proper employment of military power and of aerospace power in particular. Confusing the two responsibilities results in disrupting the effective functional employment of forces in order to maintain service command lines.

Finally, the historical discussion of air and aerospace doctrine that was an integral part of the previous manual has been moved to Annex A, and the bibliography (Annex B) has been updated. The bibliography now covers U.S. involvement in Vietnam, including books by Bernard B. Fall and Leslie H. Gelb.¹⁰ It also includes important works on World War II, such as those of Marshal of the Royal Air Force Lord Tedder and coauthors Wesley F. Craven and James L. Cate.¹¹ Some important books are still missing, such as Colonel Harry G. Summers's *On Strategy*, which examines our involvement in Vietnam from a Clausewitzian perspective.¹²

Notwithstanding the improvements in AFM 1-1, the manual is not complete in and of itself. It is a slender volume of only forty-seven pages, and it must be read within the context of other Air Force manuals on basic and operational doctrine (one- and two-series manuals) and against the backdrop of the history of air power. Including the historical background of air power in AFM 1-1 was not possible for two reasons. First, it would have run the volume to approximately 250 pages. Second, the detailed historical basis for its concepts is not of much interest to a large number of airmen, who are looking for the distilled doctrine. This exclusion of the historical background for Air Force doctrine should not be considered as a weakness in the product. Ours is a technical business, and many in our service must devote themselves almost exclusively to their areas of specialization, which are as important as doctrine in conducting successful air warfare.

While historical experience and modern capabilities must be woven together to formulate doctrine, distilled doctrine helps those involved in the technical end keep a focus on how we will fight.

The Reissued *Condensed Analysis*

Because AFM 1-1 does not include all of the historical basis for aerospace doctrine, the recent reissuing of the *Condensed Analysis* by the Air Force Office of History is an event worth noting. The *Condensed Analysis* discusses the employment of U.S. air power in France and Germany during 1944 and 1945. By coincidence, it is being published near the fortieth anniversary of the D-day invasion, the opening battle for Ninth Air Force's greatest campaigns. The historical account does not exist in isolation, however, but is linked to the early lessons of World War II—in particular, to the lessons learned by the Allies in North Africa. The historical chapters do not represent the definitive history of air operations in the European Theater, but they do present the official opinions of the American airmen who fought and helped to win the war there.

Printed as part of the Air Force Office of History's Project Warrior Series, this reissue is not expected to be a runaway best seller. However, it should find a receptive audience among Air Force officers attempting to learn more about how air power alters land (and naval) operations in war and why our doctrine is what it is. The reprinting of the *Condensed Analysis* is a faithful reproduction of the original issue, even to the very detailed maps and organizational charts that fold out of the book. It is not a popular history: it does not describe heroic events or technical points of particular aircraft. Instead, the book is an examination of World War II warfighting through the eyes of the commanders and staffs at the air component commander level and just below. This is a view often neglected, but one that we must study and

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An important feature of the *Condensed Analysis* is its discussion of the large-scale, effective cooperation between air and land forces. It was in the campaigns across France and Germany that U.S. and British air forces were able to support their land forces effectively on a massive scale. Their accomplishments, while limited by the aircraft and ordnance of the day, were a major factor in helping Allied land forces overcome German resistance.

The book contains fifty pages of conclusions and recommendations. Especially interesting to today's operations personnel are those related to the issue of control of air power. Emerging clearly in these pages is the rationale supporting today's Air Force concept of centralized control and decentralized execution, of the air war under the command of a single air component commander. Also of interest to operations personnel are a conclusion and recommendation concerning the training of replacement aircrews: noting that tactics in the theater were often ahead of what was being taught in Training Command, the book contributors recommend proper liaison between the groups involved, plus an in-theater "top-off" course. Similarly, comments about the Tactical Air Command-Army team make important, relevant points concerning collocation, round-the-clock operations, joint planning, and exchange of personnel that still apply today.

Other conclusions and recommendations are of interest to Air Force logisticians. Although the Allies could not have won World War II without the excellent work of the logisticians, there were some problems, particularly as a result of a less than adequate understanding between combat and support elements. As the *Condensed Analysis* puts it: "Service and combat commanders were, in general, not fully acquainted with one another's specific mission and functions."¹³

The *Condensed Analysis* even contains some

recommendations in the public affairs area. For example:

It is recommended that the air force policy on the availability of information to the PRO [public relations officer] section be as liberal as possible without compromising the security of planning or disposition of forces. It is further recommended that the PRO or his delegated representative be required to attend such operational meetings as are necessary to enable him to maintain a continuous picture of the immediate situation and future operations plans to the same extent as a wing commander or group commander.¹⁴

In good wings and groups today, the above practice is followed day in and day out.

This reissued version of the *Condensed Analysis*, along with other publications being reissued or updated by Air Force organizations, should be read by anyone hoping to understand the doctrine of the U.S. Air Force today. Among the important publications are two works by Dr. Robert Frank Futrell: *The United States Air Force in Korea, 1950-1953* (a reissue) and *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907-1964* (an updated revision).¹⁵ Dr. Michael Gorn and Dr. Charles J. Gross, two air power historians, have referred to the first of these studies as perhaps the best history written on air power in the Korean War, while naming the latter book as the best official history of the development of the U.S. Air Force.¹⁶ Certainly, both books merit our attention, in particular because they consider the problems of developing and employing air power not only at the tactical level but at the strategic and operational levels of war as well.

Air Power History and Lessons Learned

Certain threads run through the history of air power. Thus, someone reading the wartime diary of RAF Wing Commander Maurice Baring (who served as principal staff officer to General Hugh Trenchard, combat leader of the Royal Air Force in France during World War I)

would notice the same general categories of Air Force missions that we list today.¹⁷ Reconnaissance and surveillance, counterair, close air support, air interdiction, and strategic offensive and defensive missions were all conducted in World War I. In fact, it was the importance of the Royal Flying Corps mission of strategic defense, in opposition to a German strategic air offense, that led Jan Christiaan Smuts, a member of the Imperial War Cabinet and head of a parliamentary commission on home defense, to recommend a separate and coequal air force for Great Britain. All of the missions and specialized tasks of today can be found in World War II also, including the use of space as a combat environment (i.e., the German employment of V-2 strategic missiles).

In history we can also find some of the arguments that continue today. For example, some who read the most recent U.S. Army FM 100-5, *Operations*, believe that the manual says that air power should be made available to the corps commander for *his* synchronization as a part of *his* battle.¹⁸ This matter is a key issue for officers in all of the services, suggesting a tension between responsive support to individual land and naval force units and the need to employ air forces effectively to meet the overall needs of the theater CINC. In the past, efforts to meet the needs of every unit have resulted in such fragmentation of the air effort (i.e., breaking of air assets into penny packets) that air actions were not effective and our aircraft were, in fact, vulnerable to attack and destruction themselves. Only as professional airmen understand both their doctrine and their history will they be able to handle the tensions properly and make the best use of limited air assets.

Lessons learned in both our distant and our recent past are reflected in our new AFM 1-1. One of the first points that the manual makes is that it is of paramount importance to have the support of the American people when employing U.S. Armed Forces and committing them to a war. This is a lesson learned in our early history and relearned, at great expense, during

our involvement in Vietnam. Agreement among, and support from, three distinct groups is required to sustain a successful military policy: the government, the people, and the military. In Vietnam, enemy leaders realized that the American people were deeply divided by the war, and they played upon this division in their war effort. Additionally, it has been said that terrorism was used to undermine congressional support for our policy in Lebanon.

Another of the key points in the first chapter of the new AFM 1-1 is the importance of employing the military forces of the United States with the various services working as coequal members of an interdependent team. No one member of that team can win the war by itself; rather, all must work together. One of the lessons learned in World War II was that our military forces must be employed as an interdependent team of land, naval, and air forces commanded by one commander. This is a lesson that has been often forgotten in military action since 1945. Because of its speed, range, and flexibility, aerospace power in particular (more than land and naval power) must be employed as part of a unified command if it is to achieve its full effectiveness. This principle was not always followed in Korea or in Vietnam. It is a point often missed in many popular and acclaimed histories of World War II. For instance, Russell F. Weigley's *Eisenhower's Lieutenants*, despite the title, fails to address the majority of Eisenhower's lieutenants.¹⁹ Weigley takes the complex combined command structure of the Allies and slices it both horizontally and vertically. With one cut, he separates the land and air wars; with the other, he separates the British and American efforts. However, these cuts are not clean: although Dr. Weigley attempts to push the air effort and British participation into the background, both of these contributions had major effects on the American ground effort in France and Germany.

The concept of a coequal, interdependent relationship among air, land, and naval forces was a lesson learned in the Mediterranean

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Theater during World War II. In a theater where land and naval forces had equally important but competing demands for air power, the proper control and employment of that air power had to be worked out. The solution was centralized control of air power under a coequal air component commander. Although it was later ignored, this solution was initially applied in Europe also, as the *Condensed Analysis* describes:

In the campaign in western Europe, where the precision teamwork of the Allied air, ground, and naval forces accomplished battle miracles, the basic military conception that air, land, and sea power are coequal and interdependent was confirmed beyond all reasonable doubt. Interdependence being both strategic and tactical, any arrangement of our armed forces which might prejudice the equality of the three arms would similarly prejudice our success in war.²⁰

Based on this idea, the *Condensed Analysis* calls for coequal component commanders under a single supreme commander.

There existed a need at theater level for separate, coequal air and ground headquarters, which could closely coordinate their operations but remain independently responsible to the theater commander or the Supreme Commander, as the case might be.

If such operationally coordinated but independent air and ground theater headquarters had been maintained in the ETO [European Theater of Operations], the resultant gain in flexibility of decision and promptness of action by the theater level or air command would have materially aided the Ninth Air Force in the execution of its administrative and operational commitments.²¹

In both the Korean and Vietnamese wars, we had to relearn these lessons. In Korea, we fought with three separate air forces for a major part of the war. Because of good will, good luck, and air superiority, we did not have any major problems. In Vietnam, not only was control of air power divided between the Vietnamese Air Force and the U.S. forces (Air Force, Navy, and Marine Corps), but the U.S. Air Force itself was divided between Vietnamese-based air and Thailand-based fighter air and

Strategic Air Command air. Thus, there were six different air forces fighting in Vietnam. Even among U.S. forces, there were not just three components for the theater commander to coordinate but a number of disparate commands, each engaged in its own war. If the air war had started to go against us, this arrangement would have caused us major difficulties.

The problem is further complicated when the theater commander believes that he is in a position to act as one of the component commanders. This happened in the early days of the Korean War when General Douglas MacArthur elected to run the land war from his own headquarters. Only later, when General Mathew Bunker Ridgway became the United Nations Commander, was a separate land component organized. Writing about the responsibilities of command, Lieutenant General John H. Cushman, USA (Ret), says: "The primary interest of each such [senior] commander is, and must be, his mission."²² He then states:

The above proposition is of surpassing truth for the senior *multiservice/multinational* commander, who as will be addressed later, must use to its fullest the moral authority which stems from his complete mission orientation. The proposition however becomes difficult to assess when a multiservice or multinational commander is at the same time the commander of a single-Service or national command (known as "double hatting"). In peacetime, single-Service or national concerns may take up most of the commander's attention, to the detriment of his multiservice/multinational mission.²³

Today, there is dual hatting in several locations. In each case, it could be detrimental to our war-fighting capability. One area with dual hatting is Korea, where the senior U.S. commander is the Commander, Combined Forces Command (CFC), the land component commander, and the U.S. theater commander. This is the same arrangement that existed during the beginning days of the Korean War. In Korea today, the problem is complicated by the lack of coequal components: the current peacetime air component commander is a U.S. Air

Force three-star general (dual-hatted as Chief of Staff, CFC), while his land component commander equivalent is a U.S. Army four-star general. Military services being what they are, rank speaks—especially when previous assignments have not built up a bond of friendship and understanding. The *Condensed Analysis* refers to this specific issue in one of its recommendations, "Comparative Rank—Air Forces and Ground Forces," stating:

The air force and its components were at a disadvantage in the European Theater of Operations, because the commanders of air components were of lower rank than the commanders of their associated ground components. Three of the four tactical air commands were commanded (originally) by brigadier generals, while their three associated armies were commanded by lieutenant generals. This disparity extended throughout the TAC-Army staffs as well. Frequently air commanders and their staffs were required to deal with ground officers two grades higher but occupying comparable command and staff positions. This is not intended to imply that air-ground relations were not generally very amiable or that problems were not equitably worked out. However, differences in grade imposed considerable disadvantages on air components dealing with the ground forces.²⁴

The situation in NATO today is similar to that in Korea. The opposite situation exists in Alaska, where the theater commander is also the air component commander and outranks the land component commander by one or two grades. The issue of how many flag-rank officers the military should have is one often raised by those seeking to keep down costs or to return to the grade ratios of earlier years.²⁵ What is not often recognized is the danger of too much emphasis on economy and not enough on the effectiveness of one's command structure.

Even a casual reading shows that certain threads run through air power history. For professional Air Force officers, the problem is the lack of thorough histories that will allow us to learn more about those threads. Increased knowledge would translate into increased fighting effectiveness should war come. Gorn and Gross, in their previously cited article, state:

"Despite its enormous importance and popularity, military aviation has largely been ignored by most American historians."²⁶ The historical basis for study by higher-level commanders and their staffs is sadly deficient. Further, much of what is written as military or aviation history fails to examine the seam between air and land forces. Much writing is service-oriented, examining only the merits of one service. Most of us lack the academic credentials and the available free time to correct this situation, but we must be aware of it when we read history. We must constantly read with a critical eye—to avoid learning the wrong lesson. But we must continue to read.

Doctrinal Development: A Continuous Process

Air Force doctrine aims to integrate the lessons of air power history with ideas about how to employ the advances in technology not yet tried in battle. We study history to develop a context for doctrine development, we explore the capabilities of new technology, we conduct exercises, and we evaluate the way our units perform. What we learn from these activities must feed into our doctrinal development.

Since there is no *best* doctrine (only a *better* one), Air Force doctrine will never be complete or finished. Even though a new AFM 1-1 is on the street, we still have work to do. Some questions of interest to all of us remain unaddressed or unresolved. In a recent article in *Air Force Magazine*, General Bennie L. Davis stated that we should begin to think in terms of indivisible air power (the same idea is contained in the new AFM 1-1 statement that air power must be employed as an indivisible entity).²⁷ This is an area where our understanding of our doctrine must be refined. Another broad issue for airmen to examine is theater air warfare. For example, we must consider the problem of apportioning air effort in order to meet the competing requirements of land and naval commanders. In some theaters, such as the Central

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Region of Allied Command Europe, maritime support requirements are quite minor. However, in the Northern and Southern Regions, demands for maritime support could be substantial, and the issue may well loom large for the theater CINC and the air component commander. As airmen, we need to be thinking through these and other issues not yet resolved.

Professional Air Force officers who hope to command operational units or expect to be on operational staffs should be particularly aware of such matters and should be thinking about the directions that our doctrinal development must take. Air Force officers should not expect Headquarters USAF and major command personnel to do their thinking for them. Neither we on the Air Staff nor we in the Air Force as a whole have a *final* doctrine—one that we can simply memorize and then apply without judgment and modification. Continuously, commanders and staffs work on issues that could have far-reaching impact upon how we fight and whether or not we win the next war.

One such issue is whether aerospace power will truly be employed as an entity (as "indivisible air power," in the words of General Davis). To some extent, this issue revolves around the authority of the theater air component commander. If, for instance, SAC bombers are introduced into a theater where responsibility for integration into the overall air campaign is given to someone besides the air component commander, that basic unifying concept of aerospace power as an indivisible entity will be lost. If parceling out air power becomes commonplace, it will allow an enemy to defeat our air forces in detail.

Another such issue concerns Marine tactical aviation. The U.S. Marine Corps has worked out and articulated its doctrine for the employment of the Marine Air Ground Task Force (MAGTF) as a uniservice force in support of naval objectives. The MAGTF can make a major contribution operating on its own to protect the flank of a major land operation. The Air Force accepts and supports the em-

ployment of the MAGTF in such a manner. Where the Air Force differs with the Marine Corps is on the matter of how to handle Marine Tac Air in the unusual circumstance where Marines are fighting as one of several divisions, on line, in sustained operations ashore. This issue has been around since the end of World War II and is often discussed, but resolution is not in sight. Air Force officers must know and understand both the Marine Corps and the Air Force positions on employment of the MAGTF, so that they can act knowledgeably and responsibly when in a position to deal with this question.

Another doctrinal debate, which has surfaced only recently, is about the term *operational level of war*—a relatively new term in this country. Up until now, it has been used to describe Army operations and, in fact, has been adopted by the U.S. Army. However, there is much confusion as to what the term means. As used in FM 100-5, it appears to represent a level of war between the theater strategic and the tactical levels. Thus, division operations and below would be considered tactical; corps, field army, and army group would represent the operational level of war; and actions guided by the theater commander and land component commander would represent the theater strategic level. This view is not universally accepted. Some would argue that there is no strategic level within a theater.²⁸ In another view, military analyst Edward N. Luttwak states that the operational level is optional and is used when a military force is numerically outnumbered. He sees the operational level as a creative action that involves taking risks in order to win. He suggests that within the European Theater in World War II the Allies operated only at the strategic and tactical levels. However, he would credit General MacArthur with fighting at all three levels of war in the Southwest Pacific, as well as in Korea.²⁹ We in the Air Force need to ask ourselves if the operational level of war has any meaning for us. If it does, we need to begin thinking about it and

incorporating it in our doctrine.

An additional area where doctrine needs more attention is the space environment. The present AFM 1-6, which is currently under revision, states that all air force missions can be performed or supported from space.³⁰ It also notes that government policies preclude the conduct of some air force missions in space. Furthermore, other missions may not even be considered in the context of space, since, at this time, they can be performed effectively without going into space. An example is close air support (although even this type of mission may receive some support from space, such as that provided by space-based navigation or communications systems).

EFFECTIVE doctrine should be neither as solid as granite nor as shifting as the sands of the

desert. Rather, it must be reflective of past lessons learned, yet open to refinement and growth. Professional Air Force officers throughout our service should be contributing to the process of refinement and growth through their study, discussion, and writing. The ideas of Air Force officers should be surfacing in discussions at work, around the bar, and in the pages of our professional journals. Furthermore, the Hq Air Force Doctrine and Concepts Division welcomes any suggestions.³¹ Not every new idea is adopted, but each one is welcomed and considered carefully.

Air Force doctrine belongs to all of us. We must study to understand it thoroughly, but we must do more than that. As professional Air Force officers, we must help to shape and enhance it to meet the challenges of tomorrow.

Headquarters USAF

Notes

1. Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force* (Washington: Department of the Air Force, 1984).

2. The *Condensed Analysis* was originally published in March 1946 by the Office of Assistant Chief of Air Staff, A-2, Washington, D.C. In 1984, it was reissued by the Chief of Air Force History, Bolling AFB, D.C.

3. FM 100-20, *Command and Employment of Air Power* (Washington: War Department, 21 July 1943). This short Field Manual is reprinted in *Air Superiority in World War II and Korea*, edited by Dr. Richard H. Kohn and Joseph P. Harahan and published by the Office of Air Force History, Washington, D.C., in 1983 as part of its Project Warrior Studies.

4. FM 100-1, *The Army*, is currently under revision. It is expected that lessons learned about the relationship between the Army and the nation and the concept of three levels of war (strategic, operational, and tactical) will be incorporated in the new edition.

5. NWP 1, *Strategic Concepts for the U.S. Navy (Rev A)*, May 1978. Because of the way the U.S. Navy organizes, trains, and equips, its doctrinal development is quite different from that of the U.S. Army or the U.S. Air Force. Considerable authority is given to both CINCLANTFLT and CINCPACFLT in the development of doctrine and, in fact, much doctrinal development is assigned to one or the other or to commanders reporting to one or the other.

6. Currently, DOD Directive 5100.1 is addressed in AFR 55-18, *Functions of the DOD and Its Major Components*. This AFR will be superseded by AFM 1-4, *Missions and Functions of the U.S. Air Force*, which addresses the functions of the Air Force, both primary and collateral, and their relationship to Air Force missions. The new manual should be distributed by the end of 1984.

7. AFM 1-1, p. 3-3.

8. AFM 1-6, *Military Space Doctrine* (Washington, D.C.: Department of the Air Force, 15 October 1982), p. 8.

9. AFM 1-1, p. 3-6.

10. Bernard B. Fall, *Street without Joy* (Harrisburg, Pennsylvania: Stackpole, 1964); and Leslie H. Gelb and Richard K. Betts, *The Irony of Vietnam: The System Worked* (Washington, D.C.: Brookings Institution, 1979).

11. Arthur William Tedder, *With Prejudice: The War Memoirs of Marshal of the Royal Air Force, Lord Tedder* (Boston: Little, Brown, 1967); and Wesley F. Craven and James L. Cate, editors, *The Army Air Forces in World War II*, 7 volumes (Chicago: University of Chicago Press, 1948-1958).

12. Colonel Harry G. Summers, Jr., USA, *On Strategy: A Critical Analysis of the Vietnam War* (Novato, California: Presidio Press, 1982).

13. *Condensed Analysis*, p. 130.

14. *Ibid.*, p. 141.

15. Dr. Robert F. Futrell's *The United States Air Force in Korea, 1950-1953* (Washington: Office of Air Force History, United States Air Force, 1983) was originally published in New York by Duell, Sloan and Pearce in 1961. His *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907-1964* (Maxwell AFB, Alabama: Air University Press, 1984) was originally published by Air University in 1971.

16. Dr. Michael Gorn and Dr. Charles J. Gross, "Published Air Force History: Still on the Runway," *Aerospace Historian*, March 1984, pp. 30-37.

17. Wing Commander Maurice Baring, RAF, *Flying Corps Headquarters 1914-1918* (London: William Blackwood and Sons, 1968). First published in 1920 by G. Bell and Sons.

18. Field Manual 100-5, *Operations*, Headquarters Department of the Army, 20 August 1982.

19. Russell F. Weigley, *Eisenhower's Lieutenants: The Campaign of France and Germany, 1944-1945* (Bloomington, Indiana: Indiana University Press, 1981).

20. *Condensed Analysis*, p. 1.

21. Ibid., p. 96.
22. Lieutenant General John H. Cushman, USA(Ret), *Organization and Operational Employment of Air/Land Forces* (Carlisle Barracks, Pennsylvania: U.S. Army War College, 1984), p. 2-2.
23. Ibid.
24. *Condensed Analysis*, p. 98.
25. Thomas Lawson, *Officer Inflation: Its Cost to the Taxpayer and Military Effectiveness* (Washington, D.C.: Project on Military Procurement, June 1982, pp. 10-11).
26. Gorn, p. 30.

27. General Bennie L. Davis, "Indivisible Airpower," *Air Force Magazine*, March 1984, p. 46.

28. See, for example, *AirLand Battle 2000 (1982 Version with Functional Areas)* (Fort Monroe, Virginia: Headquarters TRADOC, 10 August 1982), pp. 9-10.

29. Edward N. Luttwak. Interview with author et al., Spring 1984.

30. AFM 1-6, p. 8.

31. The mailing address of Hq Air Force Doctrine and Concepts Division is: Hq USAF/XOXID, Washington, D.C. 20330.

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in our November-
December issue

- Technological Transfer and the Military Balance
- Strategic Modernization and Arms Control
- Moving into Space

R commentary

To encourage reflection and debate on articles appearing in the *Review*, the Editor welcomes replies offering timely, cogent comment to be presented in this department from time to time. Although content will tend to affect length and format of responses, they should be kept as brief as possible, ideally within a maximum 500 words. The *Review* reserves the prerogative to edit or reject all submissions and to extend to the author the opportunity to respond.

INFORMAL DOCTRINE AND THE DOCTRINAL PROCESS: A RESPONSE

Lieutenant Colonel Dennis M. Drew

WHEN one reads Major General I. B. Holley's article one begins to understand the enviable reputation of this remarkable man.* General Holley retired recently from the Air Force Reserve after a long and distinguished military career. But there is more to I. B. Holley than meets the eye. He holds the title "Professor," which accurately indicates his standing as a teacher at the highest academic level. But Professor Holley is also Doctor Holley, a scholar of the highest rank, known for his original research and numerous publications. In all three roles, he has been an inspiration to those in the military-academic community.

His well-thought-out article is concisely constructed and elegantly written. More important, he is absolutely correct: throughout the literature concerning military doctrine, semantic problems confuse readers and muddle issues. In Clausewitzian terms, semantic inaccuracies form a linguistic fog of war. Professor Holley's

article clears away much of the fog and makes a significant contribution to our understanding of doctrine and related subjects.

I believe, however, that Professor Holley does not place enough importance on what he calls "informal doctrine" and its place in the doctrine development process. Informal doctrine is the result of repeated experiences that produce similar results and subsequently produce beliefs—sometimes personal, sometimes broadly held—about what usually works best. One would assume, given the state of Air Force doctrinal publications, that these informal doctrinal beliefs are much more ubiquitous than officially blessed doctrines. One might also assume that these informal beliefs are more timely, more accurate, and more useful than officially sanctioned doctrine, which must suffer through the travails of bureaucratic coordination and compromise before publication.

On the other hand, informal doctrinal beliefs may not be accurate and useful. Those who hold such beliefs may have an experience base that is shallow (i.e., repetitions too limited

*Major General I. B. Holley, Jr., USAFR (Ret), "Concepts, Doctrines, Principles: Are You Sure You Understand These Terms?" *Air University Review*, July-August 1984, pp. 90-93.

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to draw accurate generalizations). The experience base might also be too narrow (e.g., combating only one kind of enemy aircraft) to be generalized. Unfortunately, those who hold informal doctrinal beliefs based on insufficient data will rarely realize the shortcomings of their beliefs until too late—a situation that can lead to excessive combat losses and eventual defeat.

This dual nature of informal doctrine (easily developed, but with a high possibility of error) puts the process of developing official doctrine and the importance of official doctrine in a new light. The doctrine development process must evaluate informal doctrine and separate the wheat from the chaff. Well-founded informal doctrinal beliefs must be sorted out from the plethora of half-baked ideas that permeate large and diffuse organizations. The official doctrine that results from the development process becomes the vehicle for inculcating well-founded beliefs throughout the force. Everyone must know, in Professor Holley's words, what "pattern of behavior *will probably* lead to the desired result." Thus, those who develop and publish official doctrine face a difficult task and bear a critically important responsibility.

Inherent in the process of turning informal doctrine based on field experience into official doctrine is the notion that official doctrine should "bubble up" from below rather than be imposed from above. I have argued elsewhere that there are various levels of doctrine, which are distinguished and defined by their levels of abstraction.¹ Although it is difficult to translate field experience and the doctrinal beliefs derived therefrom directly into the more abstract levels of doctrine, operational doctrine should issue directly from generalizations based on field experience.² To base it on anything else is to run the risk of producing ineffective and perhaps fatal dogma rather than doctrine.

How does one let doctrinal beliefs bubble up to be evaluated and officially blessed? The dynamic changes of German tactical doctrine

during World War I provide an excellent model.³ The development of elastic defensive methods in 1916-17 and the development of the so-called Hutier offensive tactics in 1917-18 were the direct result of the German High Command's solicitation of ideas from *battle-field units*. Although Germany was strategically unsuccessful in the war, both of these doctrinal changes were masterpieces of successful doctrine at the tactical level.

All of this leads us to a set of difficult questions. Do we recognize the pervasiveness of informal doctrine? Does our official doctrine bubble up from informal doctrine? Do we actually ask our warriors in *field units* for their beliefs about what usually works best? How do we sort out sound beliefs from those that are unsound? Who does the sorting, and what biases do they bring to the task? When our doctrinal beliefs are based on exercises, maneuvers, and war gaming rather than on actual combat, do we understand and consider the assumptions, biases, and limitations of those simulations that may have colored the results? Do we recognize that although our exercises have considerable value they are always poor imitations of actual combat—or do we seduce ourselves into thinking that mock combat portrays reality accurately? The answers to these questions will cast considerable light on the Air Force doctrinal development process and on the value of the official doctrine developed by that process.

Professor Holley has made a significant contribution to our understanding of a very complex subject. However, his greatest service has been to raise additional questions of considerable importance. Indeed, there is more to Professor Holley—and more to his article—than meets the eye.

Maxwell AFB, Alabama

Notes

1. For a more complete explanation, see Lieutenant Colonel Dennis M. Drew, "Of Trees and Leaves: A New View of Doctrine,"

Air University Review, January-February 1982, pp. 40-48.

2. Although the Air Force calls this level of doctrine "operational doctrine," the term "organizational doctrine" is used in "Of Trees and Leaves" (see note 1).

3. Timothy T. Lupfer, "The Dynamics of Doctrine: The Changes in German Tactical Doctrine during the First World War," *Leavenworth Papers*, No. 4, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, July 1981.

Leavenworth Papers, No. 4, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, July 1981.

Colonel Drew is Deputy Director for Research, Center for Aerospace Doctrine, Research, and Education, Air University.

ON SEEKING A FORUM FOR THE MITCHELLS

Colonel Paul F. Murphy

WHEN reading "Seeking a Forum For the Mitchells,"* I was struck by the logical fallacy it exposed. Major Denny Nelson makes the point that the Air Force of the '80s lacks a forum for the present-day "Mitchells" to air their views. However, the fellowship he holds and the publication of his views in the *Review* are clear evidence that such a forum does exist today as in the past.

The Air University is the one organization that has the facilities, people, and mission nec-

essary to stimulate, cultivate, and propagate the ideas, arguments, and controversy so vital to continued excellence. For those of us not at AU, the *Review* is our link to that process. Accordingly, I would like to see a few good arguments in each issue. There are two sides to every coin, and the *Review* could do us all a favor by tossing the coins and letting us see how they come up. It should also be fun!

Whiteman AFB, Missouri

*Major Denny R. Nelson, "Seeking a Forum For the Mitchells," *Air University Review*, July-August 1984, pp. 85-86.

Colonel Murphy is Vice Commander, Headquarters 351st Strategic Missile Wing (SAC).

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26 August 1984

Barry Watts

Col Tom Fabyanic

Dear Col Fabyanic,

In the wake of our phone conversation last week about General Leaf's request for thoughts on rewriting AFM 1-1, I sat down and carefully reread the 5 January 84 "draft" (especially the first two chapters). The comments that follow are rough and not well organized, but perhaps you can find one or two worthwhile ideas.

If I was given five minutes with General Gabriel to say anything I wanted about rewriting AFM 1-1, I'd limit myself to one point. That single point would be: "Look Boss, if you're really serious about developing a thoughtful, innovative 1-1, try an A-Team/B-Team/C-Team approach. Let XOIX -- the A Team -- take another hack at basic doctrine from within the Air Staff bureaucracy. But at the same time, hand pick two other small groups of individuals with **operational backgrounds** and **demonstrated** abilities to think creatively about doctrine; relieve these guys -- the B Team and C Teams -- from any other duties for three to six months and give them carte blanche to take a stab at basic doctrine from outside the institutional procedures and vested interests. Then, when all three teams are finished, compare their products and go with the elements that look best."

The hidden agenda in this suggestion is obvious. I personally believe that Air Force doctrine is in desperate need of some fresh ideas. As you know, there hasn't been much thinking at all -- fresh or stale -- among American airmen since the Air Corps Tactical School closed its doors. Yet dramatic changes have occurred in weaponry, American society, world economics, and geopolitics over the last four decades. So new thoughts seem long overdue. But how do you orchestrate innovation? General Gabriel and his fellow three- and four-stars don't have the time to rethink things. Indeed, save for General Chain, I can't think of a serving or retired Air Force general officer with character, operational savvy, sense of history, objectivity, and brainpower needed to break new ground. But with the right individuals in the B and C Teams, you could reasonably hope to come up with some fresh ideas. All General Gabriel would need the courage to jettison intellectual baggage that no longer appears viable. Of course, he would have to do this in manner that would not turn three-quarters of Air Staff and CINCs against him -- which is one of the reasons why three teams would be

considerably better than two (you'd diffuse the right/wrong polarity that two would generate).

Moving on the the Jan 84 version of 1-1 itself, let me begin by retracting my statement of last week that it's papably better than the 79 edition. On the surface, the worst manifestations of "cartoon doctrine" have been eliminated; the current manual looks more serious when you leaf through it. But the meat of the document -- chapters 1 and 2 -- strike me as an unthinking repetition of buzz-words and slogans from the 1940s (at the latest).

To more or less state my objections from the top, this version of AFM 1-1 does not speak to me as an operator. It remains **doctrine in the abstract**. By this I mean that it is (1) divorced from historical evidence bearing on the soundness of Air Corps Tactical School industrial bombardment doctrine, (2) any appreciation of the Soviets as an enemy, (3) any clear account of the nature of modern war (especially of war in a nuclear era), or (4) recognition that modern naval forces have ballistics missile and aircraft systems with many of the same inherent capabilities as "aerospace forces." Put another way, chapters 1 and 2 unequivocally reject Clausewitz's view of war as a contest between independent wills dominated by friction (see, for example, the line on pgs 2-8/2-9 about how extensive and meticulous peacetime planning will allow you to overcome friction). (Insofar as Frishkorn and company did reject *On War*, I would argue that the Jan 84 edition of 1-1 is simply indefensible. But then I think Clausewitz was right about a lot of things.)

Look, first and foremost, AFM 1-1 has got to be a document that speaks as profoundly and meaningfully about war to newly commissioned lieutenants as it does to seasoned generals in the twilight of their careers. Here the best example, for my money, remains the introduction to the Wehrmacht's *Truppenfuhrung*. I personally got to listen to Herman Balck talk warfighting for four days at a conference here in D.C. and let me tell you that the *Truppenfuhrung*'s introduction was burned in his brain. Its ideas about war's nature and the individual's role were the things he kept coming back to time and again. AFM 1-1 should shoot for no less. However, no edition of AFM 1-1 has come even remotely close since I've been in the Air Force.

Enough generalizing. Let me give some specifics:

Pg 1-1: What exactly is proper use of aerospace forces?

Pg 1-3: How do you reconcile saying that the basic objective of aerospace forces is to win the aerospace battle with all the talk in Chapter 2 (especially pp. 2-16, 2-17 & 2-21) about heartland attacks on the enemy's will to resist and the sources of his military power?

Pg 2-2: How in an age of nuclear aircraft carriers and Polaris/Trident submarines can one insist that naval forces cannot, like aerospace forces, attack the enemy's entire power structure?

Pg 2-3: How does a flight of F-16s manage to have more presence than, say, a tank division?

Pgs 2-4 to 2-10: There are at least two problems with traditional accounts of the principles of war. First, as Brodie and others have pointed out, they are far too general and abstract to have much utility to anyone except historians trying to explain outcomes after the fact. Second, insofar as they have any utility at all, they are outputs rather than inputs and AFM 1-1 should address the things you need to do to bring about surprise.

Pg 2-5: The discussion of the relationship of military means to political aims on this page is pathetic in comparison to Clausewitz's.

Pgs 2-6 & 2-21: Douhet's view of air strategy as target selection is endorsed lock, stock and barrel in this document. Can't we do better?

Aside: Where in chapters 1 and 2 are the Soviets (i.e. the main adversary we have to deal with today) mentioned? The enemy is always **abstract**, theoretical in 1-1.

Pg 2-6: "Aerospace forces have the power to penetrate to the heart of an enemy's strength without first defeating defending forces in detail." I seem to recall that a guy named Ken Walker used to push this line at the Air Corps Tactical School, but that there were some minor problems with it, later, over a town named Schweinfurt.

Aside: Where are discussions of proven warfighting concepts like *Schwerpunkt*, *Fingerspitzengefühl*, and *Auftragstaktik* in this document?

Pg 2-11: The strict categorization of war into **strategic** and **tactical** actions on this page ignores the operational level of war (in the Soviet sense). This is not only a grave intellectual failing of American military thinking in general, but also documents clearly that the Air Force has done little thinking since FM 100-20 was written in 1943.

Pg 2-12: Given the minor fact that the Soviets have lots of nukes, is it even responsible to say that an "air commander **must** seize every opportunity to execute heartland attacks"?

Pg 2-17: When did we last get an adversary to "sue for peace"?

Well, I've got some other things to attend to this weekend. Please keep me posted on your efforts to say something to General Leaf regarding 1-1. If anyone gets around to looking for a volunteer for a B or C Team, I'm available.

THOMAS A. FABYANIC

3 October 1984

HQ USAF/CVA
Washington D.C. 20330

Dear General Leaf

Thank you for giving me the opportunity to review and comment on the latest revision to AFM 1-1. By all measures of comparison, it is a major improvement over the 1979 version. The entire document, and the paragraphs on a Broad Plan of Employment in particular, represent a serious effort to grapple with the essence of doctrine, which in a word, is war. Regrettably, however, the discussion does not go far enough in that it is limited to what Clausewitz would call war on paper (theoretical war) as opposed to real war (i.e., war as it occurs). Moreover, it appears that the doctrinal thinking it expresses has not kept pace with the significant technological, socio-economic, and political changes that are occurring; these factors affect the probability of war, suggest its type, and will influence its outcome.

Unfortunately, our doctrine is attempting to cope with this new environment by working at the margins of a doctrine articulated at the Air Corps Tactical School during the 1930s. My view is that we should change our doctrinal focus in two ways. First, we must concentrate on real war and its attendant notions of friction, chance, and uncertainty. Second, we must place real war into context, primarily against the USSR but also against any number of states in the Third World; the former justifies our existence, but the latter will ultimately test our professionalism.

Following those introductory remarks, allow me to offer some general observations and concerns about 1-1, while relegating some specifics to atch. 1. First and foremost, I would argue that doctrine should express our basic views of war and our professional response to it. Toward that end, we should address (1) the nature of war, (2) our concepts for deterring and fighting wars, and (3) the role and limitations of aerospace power at various levels of conflict. This operational doctrine would erase the artificial distinction we make between strategic and tactical war and thus obviate the need for the 2-series manuals. Moreover, it would reclassify the 3-series for what they are, i.e., tactics.

My second observation is that the manual is sufficiently abstract to offer little to junior officers and nothing to their superiors. Needed is a level of expression and substance that says something to all of us. Clausewitz does that; we should do no less.

A major concern is that the current approach obscures the crucial relationships among doctrine, technology, and force structure development, acquisition, and deployment. Paragraph 4-4 makes a commendable but inadequate attempt, particularly given current and future force structure challenges. To digress on this vital point, our MX acquisition difficulties have occurred because we have fought the battle on technological grounds instead of presenting the case in terms of a doctrine in which real war is an intrinsic component. Likewise, we are allowing the SDI debate to be framed by technological arguments rather than the conceptual issues of real war. Trading technological arguments with civilian analysts (who have no responsibility for the security of the nation) is no way to fight the force structure battle. To win we must change the frame of reference by placing the force structure issue into the context of war.

On the all important issue of leadership the manual has far too little to offer, particularly if we accept the notion that real war is characterized by friction and uncertainty. Our first responsibility must be to outline the type of challenges that the combat leader will face; second, we must establish a set of assumptions about the conduct of war that will provide all of us with a common understanding of what must be done when we are enshrouded in the "fog of war."

My final general observation is that this manual, like its predecessor, is written as if Vietnam never occurred. As professional officers we should find that omission inexcusable.

These observations obviously make clear my concern about our existing doctrine and indicate my views about reformulation. Although I would not expect much support for my views about what doctrine should be, perhaps sufficient doubt exists about our current doctrine to warrant substantive inquiry and appropriate rewriting. Should you see sufficient justification for the latter, allow me to suggest an approach that can get the job done without, I trust, completely antagonizing the corporate leadership. Specifically, I would recommend a 3 team effort. Designate XOXID as the A-TEAM and task them to work within the Air Staff bureaucracy. Using operational experience and demonstrated ability to think creatively about doctrine as criteria, hand select B and C TEAMS from within the Air Force. Free them from other duties, direct them to forget organizational affiliation, and task them to write a doctrine based on their operational experience and their understanding of war. When they finish, use your own good judgment to select the best approach.

Allow me to close this already too long response with a quote from the late Bernard Brodie. "Soldiers," he said, "usually are

The following specific comments on AFM 1-1, dated 16 March 1984, are supplemental to the general observations presented in my 3 OCT 1984 letter to Lt. Gen. Howard W. Leaf, Assistant Vice Chief of Staff, USAF.

Preface

- Air Force doctrine should express our basic beliefs about war and our professional response to it; the friction and uncertainty inherent in war requires mental flexibility and dexterity in the use of force.
- There should be but one doctrine --operational doctrine. It would serve as a basis for all Air Force activity (e.g., education, training, force structure deployment, and force employment), and thus make the 2 series unnecessary; the discussion of tactics, as currently expressed in the 3-series, should be retained as tactical procedures manuals.
- Joint and Combined Doctrine should be replaced with Joint and Combined Procedures; Air Force doctrine would be implicit in those procedures.
- Strategic and tactical distinctions should be eliminated because aerospace power is indivisible. As our combat history makes clear (WW II, Korea, and Vietnam), we will use all elements of the force in the manner deemed most effective. In that respect, ingenuity must be matched with force structure flexibility.

Chapter I

- The discussion of objectives (paras. 1-2 and 1-3) should be expanded to demonstrate that, for various reasons, political objectives may not be clearly articulated and may change during the period of force application. The implications for force employment are obvious.
- The comments on deterrence (para. 1-3) are inadequate. With all due respect to individuals I respect, deterrence is more than capability and will; it includes, for example, notions such as credibility (reliability), targeting, and perceptions of risks and values. Likewise the issue of defense must be discussed in conjunction with deterrence.
- Much elaboration is necessary to distinguish between conflict and crises (para. 1-4), the levels of conflict, and the role and limits of military force.

Atch 1

Chapter 2

- Missing is a discussion of war. The distinction between theoretical war and real war and why it exists should be addressed with such clarity and forcefulness that it will never be forgotten. The causative factors of friction, chance, and uncertainty should stand out as the most crucial challenges that the combat leader will ever face. The discussion should also introduce and explain offense and defense as complimentary aspects of war. Potential adversaries should be made more explicit, and the different types of war should be identified and discussed.
- The views expressed on the relationship of means and objectives (p. 2-5) do not convey the vital aspect of this relationship. Clausewitz should be the guide.
- The statement (p. 2-6) that "Aerospace forces have the power to penetrate to the heart of an enemy's strength without first defeating defending forces in detail" is unsupportable.
- The need for surprise (p. 2-6) is obvious; less obvious is how to achieve it.
- Security (p. 2-6) appears to be used as a euphemism for defense.
- The discussion of simplicity (p. 2-8) completely ignores the meaning of Clausewitz's statement that "everything in war is simple, but the simplest thing is difficult."
- Broad Plan of Employment
 - --This is where we should make clear basic concepts for fighting across the spectrum of war. The current discussion draws little distinction among total, limited, and conventional war; moreover, it seems to suggest that never again will we need to cope with insurgency.
 - --The artificial categorization of strategic and tactical serves little purpose; more beneficial would be discussion of operational concepts at the theater level.
 - --The comments on aerospace superiority does not suggest how one attains it under modern conditions, i.e., the use of mobile IRBMs and SRBMs against NATO air fields.
 - --The discussion about warfighting potential (pp. 2-11 and 2-13) implies that all target sets are equally important; describing some as heartland targets clouds the issue further. If we expect to win a conflict, every Air Force officer must know our basic views about targeting to the extent that even the most junior among us can conduct meaningful operations in the absence of C³.

close students of tactics, but only rarely are they students of strategy and practically never of war." I suspect he is right; but we can prove him wrong.

Respectfully

Thomas A. Fabyanic

Colonel Thomas A. Fabyanic, USAF, Retired

1 Atch
Specific Comments
on AFM 1-1

The AOC-in-C Bomber Command had meanwhile acknowledged that his hopes had been frustrated by the German night-fighters. On 7 April, pleading for long-range fighter protection for the bombers, he told the Air Ministry that he had 'long foreseen ... that the strength of the German air defences would eventually reach a point at which night bombing with existing methods and types of heavy bomber would produce percentage casualty rates which could not in the long run be sustained'. He felt that 'we have not yet reached this point' but went on to say that 'tactical innovations which have so far postponed it are now practically exhausted'.⁷³ This was indeed the case, but not only on account of the inability of the Allies to prevent the increase in German fighter production. The success of the night-fighters had also rested on the development by the German Air Force of new and unsuspected air defence techniques. Bomber Command's doctrine of area bombing was bound up with the belief that though its bombers were big, vulnerable, lightly-armed and unescorted, they could in hours of darkness rely for survival on evasion. The German night-fighter force had confounded this belief by introducing since the autumn of 1943 new methods of interception which, circumventing the counter-measures which the British had introduced against its previous methods of interception, enabled it to inflict increasing casualties on the bombers.

For general early warning of raids the Germans relied on their radars, notably the long-range *Freya*. The British had successfully jammed *Freya* for a brief period from the end of 1942 with 'Mandrel', but for over a year from the spring of 1943 the Germans defeated 'Mandrel' by pushing up the frequency of *Freya* until it was out of reach.⁷⁴ 'Window', the next important British counter-measure, was introduced in July 1943 with the aim of jamming the main elements in the German defence system – the Ground Controlled Interception (GC1) Würzburg radars of the Kamhuber line, which vectored the night-fighters on to individual bombers until they were close enough to locate the bombers by Air Interception apparatus (AI); the AI apparatus (*Lichtenstein*) used by the night-fighters; and the gun-laying Würzburg radars used by the enemy's Flak and search-light batteries.* In the bombing raids on Hamburg and the Ruhr between 24 July and 2 August the Enigma decrypts and King's intercepts showed that 'Window's success was respon-

* See Volume II pp 252 et seq, 517 et seq.

73. Webster and Frankland, *op cit*, Vol III (1961), p 147.
74. *Bomber Command Counter-Measures*, p 41; AIR 20/1683, ASI Interim Report on the Effect of 'Window' on German Night Defences of 4 October 1943; Price, *Instruments of Darkness* (1967), p 129.

sible for Bomber Command's initially low rate of casualties.* But the British were disappointed in their hope that the Germans would take between six months and a year to overcome 'Window'. By the end of July, while it was clear from the Enigma that the enemy Flak had been forced to go over to pre-radar methods of barrage fire and sound ranging,[†] the Enigma and the R/T had also disclosed that some night-fighters, their box controls disrupted,[‡] were being told to freelance, that freelancing single-engined day-fighters were also operating above the bomber streams, and that ground stations were broadcasting on R/T a running commentary on the movements of the bombers.[§]

The Enigma had previously shown that the Germans had been experimenting in recent weeks with two new methods of ground-controlled fighting which would enable the controller to locate a fighter and direct it to a bomber stream without interruption from 'Window': one used the *Freya-AN* and the other (called *Benito* by the British) the *Y-Gerät* system.[§] Together with indications from the Enigma that the Würzburgs were still finding some gaps in the 'Window' cloud, that *Lichtenstein*, though greatly disturbed by 'Window', was still being used, and that night-fighters controlled by *Benito* were still operating in the box system, this intelligence at first encouraged the hope in Whitehall that radar ground-control rather than the new freelance visual tactics, which could not be disrupted by interference with the enemy's radars, would continue to be the backbone of the German night-fighter organisation.⁷⁶ At the beginning of August, however, in view of the fact that the defences had also been experimenting 'for the last few weeks' with the freelance operation of both night-fighters and single-engined fighters, ADI (Sc) warned that they might 'permanently adopt this tactic when possible' unless they could be discouraged by such measures as an increase in the RAF's intruder patrols.⁷⁷ But intruder patrols were unable to counter the freelance system, which enabled the German fighters to fall back to bases beyond the range of Fighter Command's Beaufighters, and during the next few weeks it became all too plain

* An agent at a German night-fighter station also reported on 'Window's success, using the previous service operated by the RAF and the SIS to do so; his report made it possible to circulate the news to Bomber Command's crews.

† For 'Window's success against the enemy's Flak defences, see Appendix 18.

‡ For the box control system see Volume II, pp 255–256.

§ For the *Y-Gerät* system see Volume I, p 559 et seq.

75. AIR 20/1661, ASI Report No IV of 3 August 1943; *Bomber Command Counter-Measures*, p 51; *Air Ministry Intelligence*, pp 163, 310; RV Jones, *Most Secret War* (1978), pp 279, 300–301, 305; Price, *op cit*, p 141.
76. AIR 20/1661. 77. *ibid*.

that the Germans were making extensive use of the new tactics and had 'discarded almost entirely their box-control system'.⁷⁸

Without foreknowledge that the British were preparing to resort to 'Window', the Germans had paved the way for their prompt response to that development by experimenting since the early summer with new methods of operating their night-fighters. In the first place, utilising the fact that most of the fighters were by then equipped with AI (*Lichtenstein*), they had reduced the rigidity of the box system of control in the Kamhuber line by operating several fighters simultaneously, one fighter being under control and the others freelancing. At the same time – and this represented a bigger step towards independence from ground control – they had tested a system called *Wilde Sau* in which single-engined day-fighters sought out the bombers over their targets and attacked them from above. To begin with, the fighters, making frequent landings for refuelling and rearming, had relied on the light of the fires and Pathfinder flares in the target area, but after achieving some success over Cologne on 3 July they had co-operated with Flak and search-lights over Hamburg to still greater effect at the end of that month. From that point *Wilde Sau* underwent rapid development. By the time of the raid on Peenemünde on 17 August*, against which it was used on a large scale, the Germans had begun to expand the number of single-engined fighters available for night-fighting, had decreed that all twin-engined fighter squadrons were to resort to *Wilde Sau* when they could not use other methods of interception, and had further improved the system by installing beacons, first visual and then radio, around which the fighters could congregate until they received on the R/T running commentary such information about the imminence of a raid and about its likely target as was obtained from early-warning radar and the visual and aural observations of the Observer Corps (the Flugmeldedienst).⁷⁹ And by the end of September the new system, which so effectively circumvented 'Window', had become established as the standard night-fighter procedure.

Although *Wilde Sau* effectively circumvented 'Window', and was proof against any other counter-radar measures that might be developed, it was vulnerable to tactical counter-measures. Since it was used to summon fighters from all over the Reich to the assembly beacons selected by the controllers in the light of their plots of impending raids,⁸⁰ the running commentary was broadcast on

* See below, p 382.

78. AIR 20/1683.

79. AIR 41/10, pp 276–277; Price, op cit, pp 145–147, 167.

80. AIR 41/10, pp 277–278; Price, op cit, p 168.

high-powered transmitters.* Intercepted regularly by Kingsdown from the middle of August, this soon disclosed that the forecasts of the likely targets made by the *Wilde Sau* controllers were sometimes inaccurate. During the Peenemünde raid the intercepts showed that, because the controllers first thought that the target was to be Berlin, the fighters had arrived late; but that they had nevertheless inflicted heavy casualties. In the three deep penetration raids against Berlin between 23 August and 3 September, the R/T showed that *Wilde Sau* had worked to great effect, fighters being drawn in from as far afield as northern Denmark and central France, and that Bomber Command's casualties, higher than it could afford for long, would have been still higher if the controllers had not been mistaken in calculating the return route chosen for the bombers after the second raid. During a raid on Mannheim on 5 September it became clear from the commentary that bomber losses were kept down because the controller made the mistake of first sending the fighters to Nuremberg.⁸¹ It was as a result of these experiences that Bomber Command, whose first response to the introduction of *Wilde Sau* had been to try to jam the running commentary,[†] brought into force from the night of 22–23 September, with what ADI(Sc) was later to criticise as undue delay, those tactical counter-measures – deceptive routing and diversionary raids to confuse and mislead the German controllers – which down to the end of the war were to be of some assistance in reducing its casualties.⁸²

Bomber Command's operations staff was guided in its use of these counter-measures mainly by the intelligence obtained from Kingsdown's interception of the R/T running commentary, which was prolific and uninhibited, the Germans paying no regard to radio security. The staff received the intelligence both in the form of current information, teleprinted from Kingsdown, and in the daily analyses of the enemy's activities in the previous twenty-four hours (the BMPs) which the Air Section at GC and CS produced

* It also called for a higher level of control, the controllers of the individual GCI boxes being replaced by control from the HQs of Germany's five Jagd divisions. The subordination of most night-fighter units to the Jagd divisions and their deployment were known from the Enigma; this showed that a large reorganisation took place at the end of October, when Fliegerkorps XII became Jagdkorps I and its subordinate Jagd divisions were re-numbered. Early in 1944 it disclosed the creation of two further Jagdkorps and the subordination of the Jagdkorps to a new Luftflotte Reich.⁸³

† See Appendix 19 for details of the jamming efforts.

81. Air Sunsets 115 of 31 October 1943, 464 of 6 February 1944.

82. *Bomber Command Counter-Measures*, p 67; Webster and Frankland, op cit, Vol II, pp 159, 164–165; Price, op cit, pp 168–169, 171.

83. *Bomber Command Counter-Measures*, pp 58, 69; Webster and Frankland, op cit, Vol II, p 202.

after interpreting the R/T in the light of intelligence obtained from the Enigma and such low-grade codes as those which transmitted radar plots and the reports of the enemy Observer Corps.* Once the positions of all the German assembly beacons had been located – a piece of research that was accomplished during September and October, partly by comparing bomber crew reports and DF bearings with the running commentary, but primarily with the aid of documents seized by a Belgian agent of the SIS from the pilot of a crashed night-fighter⁸⁴ – Bomber Command appears normally to have made efficient use of the intelligence when planning routes and diversionary raids.† Certainly the R/T commentary disclosed that on many nights the deception measures had been of some value in containing Bomber Command's losses.⁸⁶ But from the beginning of December, when the losses began to rise to the prohibitive level which was to force Bomber Command to withdraw from the Battle of Berlin, it became clear that further major changes in Germany's night-fighter system were making the deception tactics progressively less effective.⁸⁷

One of the improvements the Germans introduced had been foreseen by ADI(Sc) in October.⁸⁸ He had then concluded that if

* These GAF low-grade codes were now exploited at GC and CS, and not at Cheddle, because work on them interlocked with work on the Enigma, but Cheddle continued to contribute by working on other low-grade traffic, notably that of the W/T Safety Service which transmitted reports of night-fighter landings and threw much light on fighter movements.

† There were occasions when Bomber Command's planning was criticised, particularly for routing bombers close to the fighter beacons (as, for example, in the costly raid on Nuremberg on 30–31 March 1944).⁸⁵ It is difficult to be sure whether the criticisms were justified. It was not easy to avoid both the beacons and the Flak-defended areas. On the other hand, there is some evidence that maximum use was not made of the conclusions built up by the BMPs. The Air Section at GC and CS complained that Bomber Command regarded the daily BMP narratives as too academic, and that although GC and CS produced from November 1943, at the suggestion of Group Captain Winterbotham, a quicker and briefer version of the daily BMP and longer term analyses of the R/T traffic over two monthly periods, the Air Ministry did not allow these papers (as opposed to the daily BMP narrative) to go to Bomber Command until February 1944 when, following a visit to GC and CS from the Deputy C-in-C of Bomber Command, arrangements were made to send the brief daily report to Bomber Command by despatch rider and a GC and CS representative was attached to Bomber Command so that it could be given the main details of the enemy's reactions to raids by telephone. GC and CS also criticised Bomber Command's earlier reliance on Kingsdown's teleprinter reports on the R/T intercepts which, it claimed, contained 'startling inaccuracies of interpretation'. But GC and CS may not have made enough allowance for the difficulties encountered by operational staff in operational conditions.

84. *Bomber Command Counter-Measures*, p. 54 (n); *Air Ministry Intelligence*, p. 311; Jones, op cit, p. 383.

85. *Bomber Command Counter-Measures*, pp. 54, 69; Webster and Frankland, op cit, Vol II, pp. 164, 208–209.

86. *R 41/43*, p. 125 and Appendix X, p. 48; Webster and Frankland, op cit, pp. 199–209, 203.

87. Frankland, op cit, Vol II, p. 204.

88. *AIR 20/1683*.

the present counter-measures – deceptive routing and diversionary raids; the jamming of the R/T – succeeded in hampering the defences, the enemy would try to reduce the scope for evasive routing and increase the time available to the fighters by intercepting the bombers at points farther away from their targets and nearer to their bases. This was, indeed, one feature of the new system, called *Zahme Sau* by the night-fighters, which had largely supplanted *Wilde Sau* by the late autumn of 1943; by February 1944 the fighters were sometimes flying out to meet the bombers over the North Sea.⁸⁹ ADI(Sc) had at the same time believed that such tactics would not greatly profit the defences 'as long as we can keep the German detection equipment neutralised...'. But it was another feature of *Zahme Sau* that, after obtaining early warning of raids from the plots of the long-range radars and information about the course of the bomber streams from the Observer Corps, the controller inserted into the stream a night-fighter controlled by *Benito* (and, after February 1944, by *Egon*).⁹⁰ This fighter enabled the controller to direct other fighters to the stream, either by emitting a DF note for other fighters to home on to⁹¹ or by announcing that it was in contact so that the controller, knowing its position from *Benito* or *Egon*, could inform the waiting fighters by R/T.

Even more important, the fighter was helped in making and retaining contact by a new AI set, SN2,† which was immune from 'Window'. SN2 was the prerequisite for the introduction of *Zahme Sau*, and the key to its success, in that it made interception possible even though it was now taking place in darkness, away from the illumination provided by flares, searchlights and fires at the bombers' target. And before long the new system incorporated yet a third advance. For early warning of raids and plots of the bomber streams the Germans had hitherto relied mainly on their long-range radars, *Freya*, *Mammul* and *Wassermann*‡, whose frequencies had been moved out of reach of jamming by the summer of 1943, and on the sound locators and visual range-finders of the Observer Corps.§ They now introduced into service new detection devices which picked up the radiations emitted by the equipment used by the

* See Appendix 23.

† See Volume II, pp. 251–252.

‡ See Appendix 20.

§ They were also alerted frequently by interception of the tuning signals which the bombers made before take-off, and sometimes by interception of the J-beams which Bomber Command switched on before a raid as a means of concealing the 'Gee' navigation system from the Germans.⁹² (see Volume II, pp. 266–268).

89. Webster and Frankland, op cit, Vol II, p. 205, Vol III, p. 129.

90. *Air Sunset* 135 of 4 January 1944.

91. *AIR 41/10*, p. 27; Irving, op cit, p. 229; Price, op cit, p. 179.

bombers for the purposes of protection, navigation and communication – their Identification Friend or Foe equipment (IFF); their H2S centimetric ground-scanning radar; 'Oboe', their precision-navigation and bomb-aiming aid; and 'Monica', which gave them radar warning of fighters approaching from astern. Together with SN2, these passive radar devices, which could not be intercepted and jammed, were the essential basis of *Zahme Sau*, the method of route-interception which constituted 'the ultimate counter to the bomber tactics' and was to remain so 'as long as the German fighter force lasted as an effective operational weapon'.⁹²

The date at which the Germans brought SN2 into force is stated by different accounts to have been August, September or October 1943.⁹³ Not until February 1944, however, did it become clear from occasional references by the intelligence sources to new equipment that *Lichtenstein* was being replaced by a new AI set, and that this must go some way to account for the increase in British bomber losses. The search for the frequency of the new set was then begun but it met with no success until July 1944, when an SN2 set was recovered from a German night-fighter which landed intact and by mistake in East Anglia. SN2 had by then operated without interference and to great effect for some nine months. Various radiation detection devices, the earliest of which were ground-based, for exploiting the Allied bombers' radar emissions were also coming into use by October 1943. In that month the Germans began to create a tracking organisation in which the plots obtained by the new devices were at first collated by a selected GCI station in the area of each Jagd division.⁹⁴ This organisation, which was eventually amalgamated with the Observer Corps into a single service called the *Flugwegverfolgung* (route-tracking) service, enabled the Germans to replace the *Wilde Sau* system with the *Zahme Sau* system before the end of the year. But the existence of this service was apparently not suspected by British intelligence until the summer of 1944, when, on the basis of Enigma decrypts, ADI(Sc) recorded that the Germans had formed a widespread raid-tracking organisation thought to be following H2S and H2X.^{95*}

* H2X, the next advance on H2S, worked on a wavelength of 3 cm and was used by the USAAF. (For details of H2S see Volume II, p 513, and Webster and Frankland, op cit, Vol IV, Annex I.)

92. Webster and Frankland, op cit, Vol III, p 129.

93. AIR 41/10, p 27; Jones, op cit, p 393; Price, op cit, pp 179, 195; Irving, op cit, p 229.

94. *Bomber Command Counter-Measures*, pp 55–57; Price, op cit, p 175; Irving, op cit, p 239.

95. AIR 20/1652, ASI Report No 73 of 13 July 1944.

The scale on which Germany had developed radiation detection devices, both airborne and ground, had meanwhile also gone largely unsuspected. Enigma decrypts of some unidentifiable plot reports began to be received in October 1943. In December ADI(Sc), who had already recognised some of these as plots of Mark I (non-centimetric) 'Oboe', deduced that the others were plots of the transmissions of the bombers' IFF sets; and in January he warned that the Germans would 'probably try other radiations should we now thwart them on IFF and we shall therefore need to be even more circumspect than before in our use of all radio equipment which involves continual transmissions from our aircraft'.⁹⁶ Later in January 1944, when the Germans' exploitation of IFF had been confirmed by a proving flight, Bomber Command forbade the use of IFF over enemy territory; at the same time it brought into force Mark II (centimetric) 'Oboe'. But the bombers did not entirely relinquish the use of IFF over Germany until March, and, despite ADI(Sc)'s January observation, it was not until May that Bomber Command could be given definite proof that its bombers were being tracked with plots obtained from their 'Oboe', H2S and other transmissions.⁹⁷ This discovery, made on the basis of Enigma fragments, was confirmed in detail by documents captured in Normandy in June; in July, when the recovery of equipment from a night-fighter had provided further evidence, ADI(Sc) reported that the enemy was plotting no less than eight different types of transmissions from the bombers, including W/T and R/T as well as centimetric radar.^{98*}

This delay owed something to the fact that, while it was accepted that the Germans could listen to centimetric radar, having recovered the apparatus from the many bombers that had crashed, the British technical experts were reluctant to acknowledge that they could, within a few months, have learned to exploit the centimetric transmissions for plotting and homing.[†] But it must also be stressed that it was extremely difficult to obtain firm intelligence about the enemy's detection devices. The devices were passive radar receivers, not active radar transmitters working on frequencies that might have been intercepted. No relevant documents were captured before June 1944. No equipment could be recovered in the United Kingdom until the night-fighter landed there in error in July 1944. POW

* See Appendix (21) 1 for further details.

† As late as April 1944 RAF night-fighters equipped with a centimetric AI homing device, were forbidden to operate over enemy territory.

96. AIR 20/1668, ASI Report No VI of 8 January 1944; *Air Ministry Intelligence*, p 334.

97. AIR 20/5804, ADI (Sc) Minute to Bomber Command, 4 May 1944.

98. AIR 20/1652.

and agents' reports, mostly vague or wild on such matters as radar, were unhelpful unless they could be assessed and corrected in the light of more reliable sources; and Sigint, the only reliable source in the absence of captured material, was sparse and difficult to understand. On the other hand, so great was Bomber Command's reliance on radar and jamming for reducing its casualties, and for accuracy in navigation and bombing, that it could not curtail or abandon the use of them without firm evidence that they were as much a liability as they were an asset. It was not for nothing that the scientific and technical intelligence authorities preferred to pronounce 'only . . . when a reasonably complete or important picture is obtained' and regarded this as 'the best way of stimulating action'.⁹⁹

The discovery at the end of June that the German defences were making effective use of a wide range of detection devices, and that 'the only way to deny this information to the enemy is to stop all transmissions from our aircraft',¹⁰⁰ did, indeed, present Bomber Command with a dilemma. At the end of February it had briefly reduced its casualties by diverting much of its effort to less well defended target areas well south of Berlin, but the German night-fighters had quickly filled the vacuum there. In March Bomber Command had again obtained temporary relief while some of its operations were directed against *Overlord* targets in France; but before long the night-fighters had begun to intercept over France. During April, May and June, when it was in any case increasingly engaged in shallow-penetration raids in support of *Overlord*, it had kept its casualty rate down. But it had done so by departing from the aims and tactics it had adopted since early in 1942, and at the expense of reduced pressure on Germany. Only 25 per cent of its sorties were over Germany in May, only 10 per cent in June, as compared with 40 per cent in April. From the end of June it knew that, if it was to avoid heavy casualties in the absence of any effective means of countering the night-fighters, it had either to abandon the concentrated area bombing offensive altogether or stultify it by denying the bombers the assistance of their indispensable radar aids.

This dilemma was short-lived. In August 1944, not long after it was recognised, the problem was resolved by other developments. After devoting much of its effort to daylight bombing in June and July* despite its inexperience in this type of operation, Bomber Command was then able to return to large-scale night-bombing – and, more than that, to establish night-time air superiority over

* See Volume III Part 2.

99. *Air Ministry Intelligence*, p 308.

100. *AIR* 20/1632

Germany and make full use of the capacity for accurate night-bombing which it had been developing since the end of 1943 – primarily because the German night-fighter defences were collapsing as a result of inadequate training of pilots and shortage of fuel, as well as from the loss of their network of early warning ground radars to the advance of the Allied armies.

□

Indications to the effect that deficiencies in the training of pilots and a shortage of fuel were handicapping the German Air Force, if not as yet its night-fighter operations in defence of the Reich, had appeared in the intelligence sources before the end of 1943. These earlier indications – which included the fact that reconnaissance flights had been reduced¹⁰¹ and the disclosure that test-pilots and ferry-pilots were being called on to operate fighters against the USAAF's daytime raids¹⁰² – had been followed in January 1944 by the news, disclosed by the Enigma, that Hitler had ordered a cut-back in the meteorological service and a reduction in the period of recuperation allowed to the wounded. Thereafter, while the Enigma showed that the Germans were combing-out GAF non-combatants, in an effort to provide more fighter pilots as well as to meet the needs of their land forces,¹⁰³ the USAAF had exploited and intensified the GAF's deficiencies so effectively, and particularly its shortage of trained pilots, that by the beginning of April it had established daytime air superiority over western Europe.

The USAAF had resumed its deep-penetration raids in the second week of January, and had extended them as its long-range Mustang fighters became available in increasing numbers. By the middle of February the Enigma had shown that its raids were imposing a high wastage rate on the German single-engined fighters and that in combat with its P 51 Mustangs the enemy's twin-engined rocket firing aircraft were having to be escorted by single-engined fighters.¹⁰⁴ During 'Big Week', a programme of accurate precision attacks on an unparalleled scale on which the USAAF embarked on 20 February, it claimed to have destroyed 600 fighters. The claim was greatly exaggerated,* but that German losses were

* One authority states that Luftflotte Reich lost 225 fighters in daylight operations in February, 236 in March and 343 in April. In addition, Luftflotte 3 in France and the Low Countries lost 338 fighters between the beginning of February and the end of May.¹⁰⁵

101. CX/MSS/T44/38, T60/55; *Air Ministry Intelligence*, p 77.

102. *Air Sunset* 119 of 14 November 1943.

103. *Air Sunset* 142 of 6 February 1944.

104. *Air Sunset* 146 of 18 February 1944.

105. *AIR* 41/49, *The Air Defence of Great Britain*, Vol V, pp 295, 297.

rising was so clear, from Sigint as well as from combat reports, that the USAAF decided to give greater priority to the destruction of German fighters in direct combat. Beginning with a major attack on Berlin on 4 March, it suspended attacks on the aircraft production industry, ceased to route its raids with a view to avoiding the defences, and chose targets and routes with the aim of forcing the enemy fighters to do battle.

In the next four weeks it was estimated that the Germans lost at least 10 per cent of the fighters they committed against the USAAF's attacks, and that the wastage sometimes rose to 40 per cent. It also became clear that, though still offering determined opposition from time to time, the enemy's fighters were abstaining from all-out combat,¹⁰⁶ and the Enigma confirmed that this policy of conservation was being imposed by a critical shortage of fighter pilots; it referred to 'the present lack of men and material' and showed that bomber and transport pilots were being transferred to fighter units as a matter of emergency.¹⁰⁷ On 6 June the Japanese Naval Attaché, summing up the recent daylight attacks, reported that they had achieved considerable success: daylight attacks on Berlin indicated that the Germans were 'being crushed by overwhelming superiority'; the wastage of German fighters was 10 per cent of those engaged; mass German counter-attacks had been greatly reduced by the scale of the American attack; Allied claims that 20 per cent of German fighter production had been destroyed by the end of April were reasonably accurate.¹⁰⁸ By the beginning of April the USAAF had established that daytime air superiority over western Europe, including the Reich itself, which the Allies were to retain for the remainder of the war.

In the course of gaining this victory, which has been accounted 'one of the most decisive in the war in the air',¹⁰⁹ the USAAF commands were assisted by three types of intelligence from which, on account of the different nature of its operations, Bomber Command derived little benefit.

For help in studying and identifying their targets they relied on the target intelligence organisation under AI 3(c) at Hughenden Manor near High Wycombe, whose 'integrated' staff of 80 officers and 300 clerical assistants included US officers. It collated the product of research in the Service departments and MEW with all the information that it could collect from other sources – ISTD,

106. W Craven and J Cate, *The Army Air Forces in World War II*, Vol III (Chicago 1951), pp 46–48.

107. *Air Sunsets* 156 of 30 March, 165 of 24 April 1944.

108. SJA 287 of 10 June 1944.

109. Webster and Frankland, *op cit* Vol III, p 131.

CIU, POW, refugees, learned societies and professional associations, technical journals, insurance companies and other private firms – and carried out the elaborate process of turning the results of its labours into target maps and target illustrations for distribution to briefing officers and bomber crews.¹¹⁰ Its work did not influence the selection of targets, which was settled by the planning and intelligence staffs at the commands in the light of priorities laid down by Whitehall and the US authorities in London.¹¹¹ But it ensured that, whatever targets were selected for attack, Bomber Command, Eighth Air Force and Fifteenth Air Force (to which AI 3(c) sent its material by air) could be provided at short notice with the means of recognising and locating them. This kind of assistance was of far greater value to the USAAF's daylight precision raids than it was to Bomber Command's area bombing.[†]

In selecting their targets and planning their raids the commands found that, though it was supplemented by others, notably excellent PR, the GAF Enigma was the most important source of intelligence. The US Strategic Air Force, which was set up at the beginning of 1944 to command both the Eighth and Fifteenth Air Forces, recorded after the war that it was 'the root of our target intelligence' while the primary object was to destroy the GAF and establish air supremacy, in that it provided invaluable information on the enemy's order of battle, dispositions, production, wastage, casualties, serviceability and reserves.¹¹² The Enigma also regularly supplied reliable weather reports for the European area, the value of which to the planning of operations may be judged from the fact that the

* The scale of its activities may be judged from the fact that for each of over 3,000 individual strategic targets 7,000 sets of material had to be made available for distribution to bomber crews and 1,500 sets for distribution to briefing officers, and that all the material had to be kept up to date by amendments. The production and distribution of material on tactical targets was an even more complex operation.

† But Bomber Command, whose selection of targets was made in the light of operational considerations rather than of MEW's priorities, took detailed target intelligence into account when selecting the bomb-aiming points within its targets; and it relied on it as heavily as did the USAAF when it was required to operate against such special targets as Peenemünde, the *Tirpitz*, the *Crossbow* sites, the Ruhr dams, U-boats pens and the communications network in France.

‡ Until the beginning of 1944 the US Strategic Air Force had received the Enigma only in the form of appreciations from the Air Ministry. Thereafter, having moved its HQ to the SHAEF building at Bushy Park, it received the decrypts direct from GC and CS, though it continued to assess them in close consultation with the specialist sections of the Intelligence Branch in the Air Ministry.

110. *Air Ministry Intelligence*, p 242 et seq.

111. W Rostow, *Eisenhower's Pre-Invasion Bombing Strategy* (1981), Chapter 1.

112. R Lewin, *Ultra Goes to War* (1978), p 297.

forecast of a few days of suitable weather entirely determined the time chosen for the launching of 'Big Week' in February.^{113*}

The Enigma was especially valuable to the USAAF's offensive against aircraft on the ground, at airfields, depots and training stations, which was perhaps even more important than the attempt to reduce the German fighter force by direct combat. The intelligence that was most useful in combat, on the other hand, as distinct from that which helped in the selection of targets and planning of raids, came from the R/T of the German day-fighters. The potential value of this traffic for the information it provided on such matters as the take-off times of the fighters, the routes they followed when assembling, their intentions to intercept and their tactics in combat was established by GC and CS's daily BMPs. Eighth Air Force's Fighter Command had received these since April 1943; its Bomber Command had received them from a still earlier date. In the summer of 1943, after much trial and error following the first attempt to turn the intelligence to operational account during the Dieppe raid,† the Kingsdown Hook-up had been set up. This met a need which did not exist for Bomber Command but which was of great importance for the American fighter-escorted daylight operations – the need to pass the intelligence to the fighters while they were airborne.‡ During 1943 Eighth Air Force had derived only limited operational benefit from the Hook-up and the BMP analyses of the R/T traffic. It had made use of the R/T intelligence about the rendez-vous points used by the German fighters to develop a relay-escort procedure which prolonged the length of time its bombers would be given fighter protection. This had been of some value in countering the practice by which the German fighters normally held back from attacking the deep-penetration raids until the short-range US fighters had come to the end of their endurance and the US bombers were without fighter protection. But it had not enabled the USAAF to avoid the heavy losses which forced it to

* The Enigma was by no means the only source of weather intelligence. The Meteorological Section at GC and CS derived its weather forecasts from a wide range of Sigint sources, and weather reports were received regularly from the Polish resistance.¹¹⁴ But some of the best reports, such as those covering the whole of Europe that the SS regularly issued from Cracow, came from Enigma decrypts.¹¹⁵

† See Volume II, pp 273, 695–704.

‡ The Hook-up used four inter-communicating telephone circuits to co-ordinate the work of the R/T intercept stations, to assemble their intercepts and DF bearings at Kingsdown, to discuss the interpretation of this raw material and to pass considered operational assessments as fast as possible to the controllers at the HQs of Eighth Air Force and other users – some Fighter Command Groups, Coastal Command and, from December 1943, Bomber Command's No 100 Group. (For the establishment of No 100 Group RAF see Appendix 19.)

113. Craven and Gate, op cit, Vol III, pp 31–32.

114. Lewin, op cit, p 295.

115. *ibid*, p 384.

abandon deep-penetration raids and confine itself to attacks in north-west Germany from October 1943.* From that date, however, the USAAF planned for the resumption of deep-penetration raids from the beginning of 1944, when its long-range Mustang fighters would become available, in close consultation with the BMP party in the Air Section at GC and CS; and at the same time GC and CS and the Air Ministry took measures to improve the service given to Eighth Air Force through the BMPs and the Hook-up. In November GC and CS's analyses of the activity of the German day-fighters, as of the night-fighters, were tightened up, the daily BMP being supplemented by a special bulletin after each major operation and by condensed surveys of the latest developments which were teleprinted to Eighth Air Force HQ and all its fighter formations after every six operations.¹¹⁶ In December the head of GC and CS's day-fighter section was transferred to Kingsdown to be the chief intelligence officer of the Hook-up.

These improvements bore fruit when the US deep-penetration raids were resumed in earnest with the Mustang fighters in February 1944. Everything that was known from the BMPs about the procedures and probable reactions of the German fighter controllers was applied to the planning of the operations carried out in 'Big Week'. On 24 February, for example, Eighth Air Force used the intelligence in its plan for co-ordinating major attacks in Poland, on Gotha and on Schweinfurt with raids against Dutch airfields, timed to hit the German fighters when they were preparing to intercept, and with a diversionary and costly raid by Fifteenth Air Force against the important ball-bearing factory at Steyr in Austria.¹¹⁷ From the beginning of March the German defences testified to the efficiency of Eighth Air Force's use of this intelligence by ceasing to use R/T when assembling their fighters; but the intelligence parties at GC and CS and Kingsdown worked out a new method of timing the Mustang sweeps which enabled them to catch the German fighters as they were assembling, and which contributed a good deal to Eighth Air Force's success in its policy of deliberately seeking out the German fighters and forcing them to accept combat.¹¹⁸

By the end of March, in the course of winning daylight air superiority, Eighth Air Force had driven the enemy fighters from bases that were within R/T range of the United Kingdom. It is further evidence of the importance the US controllers attached to the R/T intelligence that steps were at once taken to meet this loss.

* See above p 296 and Volume II, pp 520.

116. *Air Ministry Intelligence*, pp 91, 93.

117. Craven and Gate, op cit, Vol III, pp 32, 52.

118. *Air Ministry Intelligence*, pp 92–93.

From April airborne R/T operators – German-speaking Americans – were flying with the American raids to intercept raw material for analysis at GC and CS and Kingsdown,* and preparations were made for establishing an advanced Y centre on the continent, stalled from Kingsdown, after the Allied armies had landed in France.† But the US Strategic Air Force was deprived of tactical intelligence between April and the Normandy landings – when most of its operations were concentrated against *Overlord* targets and, from 15 May, against Germany's synthetic oil production.‡

* US Fifteenth Air Force, which could not profit at its bases in Italy from the Kingsdown Hook-up and the BMP service, had made use of airborne operators since the previous February. Nevertheless Fifteenth Air Force was able to analyse the nature and scale of German resistance – sometimes extremely fierce – from pilots' reports, airborne R/T, PR and Ultra signals from GC and CS.

† Though make-shift arrangements were made from November 1944, this centre did not function until March 1945.¹¹⁹

‡ See Volume III Part 2.

119. *Air Ministry Intelligence*, p 93.

CHAPTER 38

The German Air Offensive against the United Kingdom January to June 1944

BETWEEN April 1944, when the Allies achieved daylight air superiority over Germany, and August 1944, when they finally established virtually total control of the air, by night as well as by day, the German Air Force had withdrawn from what was to be its last bombing offensive against the United Kingdom. It embarked on this offensive with about 500 bombers and fighter-bombers, a scale of attack much larger than any it had attempted since 1941, in January 1944. But the last raid of the war against London with piloted aircraft took place on the night of 18–19 April; and except for a few intruder raids in East Anglia in March 1945, an intruder raid against East Anglian airfields on the night of 27–28 June 1944 was the last major piloted attack of the war against the United Kingdom.

German daylight bombing of the United Kingdom had virtually come to an end after the transfer to the Mediterranean in June 1943 of 60 per cent of Fliegerkorps IX's fighter-bombers and 50 per cent of the long-range bombers.¹ It had ceased altogether before the end of the year. Small-scale night raids by fighter-bombers and bombers, including the new high speed Me 410 in its fighter-bomber role,² had continued against coastal towns, against London and against Allied air bases in East Anglia – indeed, they had increased

* See Volume II, pp 510–511.

† The Me 410 was a development of the Me 110 which had been the GAF's basic twin-engined fighter since 1939. AI 2(g) first reported on it in May 1943, shortly before it entered service, having obtained details of some of its outstanding characteristics from POW interrogation.³ AI 2(g) expected it to be a fast day-fighter, but when it first appeared over the United Kingdom – in July 1943 – it was as a fighter-bomber.⁴ Its use in this role had been foreshadowed in decrypts from the Enigma which disclosed at the beginning of that month that the Me 410 was likely to supplement other fighter-bombers in night operations and intruder raids over eastern England.⁵ When a Me 410 was captured intact in Sicily AI 2(g) was able to report several characteristics hitherto unknown.⁶ Enigma decrypts later disclosed that, with the Me 110, it was being used, armed with the 21 cm rocket projectile, against American bomber formations.⁷

1. Air Sunset 70 of 20 June 1943.
2. AIR 20/2166, AI 2(g) Report No 2175 of 20 May 1943.
3. AIR 41/49. *The Air Defence of Great Britain*, Vol V, p 205.
4. Air Sunset 73 of 5 July 1943.
5. *Air Ministry Intelligence*, p 362.
6. Air Sunset 93 of 3 August 1943.

AOC-in-C Bomber Command seized on this conclusion to complain of MEW's earlier assertion that the industry was vital to the German war effort; had that been correct, a reduction of output of over 50 per cent would have been a fatal blow to the enemy, and MEW should 'be called upon to account for their overweening enthusiasm over the enemy's ball-bearing position'.⁸ MEW replied in July that it had never claimed more than that an offensive against the industry was the best practical way 'directly to impair the enemy's ability to fight' and that the results obtained had had that effect – though 'whether fatally or not, would of course depend on the military situation, whilst the speed with which it would be felt at the front would depend on the rate of wastage'.⁹

In the next three months evidence obtained from POW who had worked in the industry, from an important refugee from Aachen, from German records captured in Paris and from records and statements of French manufacturers supported the conclusion that reduced output of ball-bearings remained 'a strongly limiting factor' in Germany's production of war equipment.¹⁰ This was despite the fact that the decline in the weight of attack on the industry since the spring had permitted the repair of damaged works and the opening of new factories. Commenting on this at his interrogation and in his memoirs, Speer claimed that 'the Allies threw away success when it was already in their hands. Had they continued the attacks of March and April [1944] with the same energy we would quickly have been at our last gasp. As it was, not a tank, plane or other piece of weaponry failed to be produced because of lack of ball-bearings even though such production had been increased by 10 per cent from July 1943'.¹¹ He thought the Allies had failed to press home the attacks because they had either assumed the industry had been dispersed or had overrated the effects of the damage they had achieved.¹² In fact, MEW had correctly assumed that dispersal would have done little to off-set the damage done to the industry,¹³ and its estimates of that damage were near the mark, but it could not even attempt to assess the effects of the reduction of the output of ball-bearings on Germany's industrial production.

8. *ibid.* p 253.

9. *ibid.* pp 253–256.

10. AIR 20/5815, Report of 24 October 1944.

11. Webster and Frankland, *op cit*, Vol IV, p 374; Speer, *Inside the Third Reich* (Sphere books 1971), p 392.

12. Speer, *op cit*, p 392.

13. FO 837/20, MEW Weekly Intelligence Report 134 of 31 August 1944.

APPENDIX 18

The German Flak Defences

The introduction of 'Window' in July 1943 forced the German Flak and searchlight organisation to revert in the first instance to box barrages in which the guns and searchlights were guided by aural and visual observations. By making modifications to the gun-laying *Würzburg* radars and developing an improved radar ranging set called the *Mannheimgerät*, and by increasing resort to alternative frequencies, the Germans subsequently overcame the effects of the jamming to the extent that some batteries were again able to fire with considerable accuracy. But the night Flak defences as a whole never regained their earlier technical efficiency.¹

Germany compensated for this decline by increasing the number of guns and searchlights deployed in the Reich. During 1942 a great deal of Flak had been sent to other fronts, much of it to Italy, but from the end of that year the intensification of Bomber Command's offensive and the greater concentration of its raids had been countered by a reversal of this trend. After the introduction of 'Window' still greater priority was given to the reinforcement of the Reich. This development was reflected in a contemporary intelligence estimate which gives the following figures:²

January 1943	Flak guns	Searchlights
Germany and Western front	14,949	3,796
Other fronts	8,030	660
January 1944		
Germany and Western front	20,625	6,880
Other fronts	9,569	960

Bomber Command felt the effect of these reinforcements from the beginning of 1944, when exceptionally heavy gun and searchlight defences combined with the night-fighters to prevent it from achieving against Berlin the concentration of attack that it had achieved against Hamburg in the previous summer.³ From the same date the

1. AIR 20/1656, ASI Report No 101 of 6 March 1944; AIR 20/1657, ASI Report No 103 of 25 April 1944; AIR, 41/10, *The Rise and Fall of the German Air Force*, p 285; AIR 40/2392, M1 15 Periodical Intelligence Summary No 12 of 24 May 1944.

2. Webster and Frankland, *The Strategic Air Offensive against Germany*, Vol II (1961), pp 295–296 (n).

3. *ibid.* pp 195, 204, 207, 210, 211.

USAAF also encountered heavier and more accurate Flak. From the spring of 1944 Flak accounted for more American losses than did the German fighters.¹

Against the Flak concentrated in their target areas the Allied bombers had no assistance except what 'Window' could provide.* But the proliferation of the German defences and the need to avoid Flak whenever possible meant that intelligence about the deployment and performance of the German guns and searchlights acquired increasing importance as a factor determining the routing of the Allies' raids. The intelligence was collated by MI 15, an inter-Service and inter-Allied body in which US officers worked alongside staff drawn initially from the RAF and later mainly from the anti-aircraft branch of the Royal Artillery, and was distributed directly to the Commands, which used it for planning purposes and the preparation of Flak maps for bomber aircrew. The sources included PR, operational reports from the Allied bombers themselves, and the GAF Enigma – both the mainly static Flak for the defence of the Reich and the mobile Flak provided for the German Army came under GAF control.⁶ In the autumn of 1943 GC and CS set up a new section to make a special study of Flak 'in view of its increased importance'. It has left no record of its researches, which were presumably incorporated in MI 15's periodical summaries.

* When the US bombers operated in clear weather, as they tried to do, the Flak could be ranged against them visually, but when they were bombing in cloud conditions, as they were often forced to do, they encountered Würzburg – controlled Flak. Against this, they made use of 'Window' and also of an American jamming device called 'Carpet' from the autumn of 1943.⁵

4. Craven and Cate, *The Army Air Forces in World War II*. Vol III (1951), p. 50.
5. Price, *Instruments of Darkness* (1967), pp. 243–244.
6. Mockler-Ferryman, *Military Intelligence Organisation*, p. 26.

APPENDIX 19

Intruder Operations and Radio Counter-Measures against the German Night-Fighters

Against the German night defences Bomber Command relied mainly on tactical counter-measures (evasive or deceptive routing and diversionary raids). It derived some, though less, benefit from the only other measures available to it, intruder operations and radio counter-measures.

Intruder operations were resumed in the spring of 1943, for the first time since 1940, Fighter Command planning them with the help of intelligence from Cheadle's W/T intercepts about the bases, movements and landing-times of the fighters and from Kingsdown's R/T intercepts about their routes and times of take-off.¹ From June 1943 Fighter Command's operations were also assisted by an airborne device ('Serrate') which was designed to enable its fighters to home on to the *Lichtenstein* AI of the German fighters. The operations did not meet with much success, and in September, when the enemy fighters were adopting the *Wilde Sau* system of interception and withdrawing to bases beyond the range of Fighter Command's Beaufighters, they were suspended.²

At the end of September the realisation that in the form of *Wilde Sau* the Germans had developed an effective system of defence against Bomber Command's concentrated raids prompted the decision to establish No 100 Group RAF, a special formation incorporating No 80 Wing and other units, to be responsible under Bomber Command for investigating further enemy radar developments and co-ordinating the application of all possible radio and tactical counter-measures against them, including intruder operations.³ No 100 Group became operational in December 1943 and received some of the resources of Air Defence of Great Britain (ADGB), as Fighter Command was called for almost a year from October 1943.⁴ Together with aircraft of that command, it carried

1. *Bomber Command Counter-Measures*, p. 43.
2. Webster and Frankland, *The Strategic Air Offensive against Germany*, Vol II (1961), pp. 140–151; Price, *Instruments of Darkness* (1967), p. 170; Jones, *Most Secret War* (1978), p. 384; AIR 41/46, No 80 Wing RAF Historical Report, pp. 92–93, 113.
3. *Bomber Command Counter-Measures*, pp. 59–60.
4. Webster and Frankland, *op cit*, Vol III, pp. 145–146.

out offensive patrols against enemy night-fighters over north-west Germany, northern France and the Low Countries on the nights of Bomber Command's raids. No 100 Group's patrols with 'Serrate' Mosquitoes were directed mainly against night-fighters round their assembly beacons and Bomber Command's target areas, while those of ADGB were aimed principally at night-fighter bases and training schools.⁵ Both types of operation depended on the supply of operational and background intelligence from GC and CS, the RAF Y organisation, ADI (Sc) and other Air Ministry intelligence sections. Together they destroyed about 70 aircraft on the ground and in the air, mostly night-fighters, in the first five months of 1944.⁶ Bomber Command regarded operations on this scale as having little more than a nuisance value.⁷ This limited result – though recent evidence suggests that the nuisance value was considerable – sprang from material shortcomings and, to a less extent, from inexperience of enemy night-fighter tactics. More particularly – since everything depended on interception of the enemy – the 'Serrate' patrols, of which well over 500 were carried out between January and May 1944,⁸ met with decreasing success from the autumn of 1943 when the Germans began to equip their fighters with the new AI set, SN 2,⁹ with a maximum range of four miles, double that of its predecessor.¹⁰

With the introduction of *Wilde Sau* the attempt to interfere with the system's running commentary had in any case been given priority over the value of its tactical intelligence for operational purposes. Under the system the German fighters could adopt free-lance tactics only after the controller had informed them by R/T of the position, course and probable target of the bomber stream; for this purpose he used a high-powered transmitter on HF with a frequency which was changed daily. Airborne and ground-station jamming of his transmissions began at the end of August 1943.

The airborne jamming was done by the bombers with a device called 'Special Tinsel'†, which they resorted to on being informed

* See Appendix 20.

† This was a variant of 'Tinsel' which had been developed as an airborne device for jamming the HF R/T ground-to-air instructions of the Kammhuber box system. At the end of 1942 VHF had replaced HF in that system and a new airborne jammer, 'Cigar', had been developed against the VHF transmissions. After the introduction of *Wilde Sau* the Germans continued to use VHF for directing the *Benito*-controlled night-fighters to the bomber stream, and 'Cigar' continued to be used in the bombers against the *Benito*-controlled fighters.¹¹

5. AIR 41/49, *The Air Defence of Great Britain*, Vol V, p 315.

6. *ibid.*, p 320; AIR 41/56, *The RAF in the Bombing Offensive against Germany*, Vol VI, p 30, fn 2.

7. Webster and Frankland, *op cit*, Vol III, p 147.

8. Gebhard Aders, *History of the German Nightfighter Force* (1979), p 202.

9. AIR 41/56, p 30.

10. Price, *op cit*, pp 69, 179.

11. *Bomber Command Counter-Measures*, p 49; AIR 41/46, pp 94–95, 98.

that Kingsdown had identified the day's frequency. The Germans responded by introducing more frequent and more irregular changes of frequency and by using multiple transmissions. Bomber Command responded in its turn by equipping specialised bombers with a higher-powered jamming device; known as 'Jostle', this came into service in 1944.¹²

Ground-station jamming of the running commentary with high-powered transmitters, under a system called 'Corona', was combined with attempts to confuse the German pilots by inserting bogus instructions and false weather reports into the running commentary. Initially these surprised the enemy who took various steps to counteract them, but their effect was wearing off by December 1943.¹³ By then, moreover, in their efforts to counteract the jamming, the Germans were taking advantage of the replacement of *Wilde Sau* by *Zahme Sau*, under which it was necessary to transmit to their fighters only the course and height of the British bombers and the code-name of the chosen fighter assembly beacon, to abbreviate the running commentary. For a few days early in December they used a high-powered public radio transmitter at Stuttgart to broadcast short messages to the fighters. When these broadcasts were jammed, the British using a high-powered Foreign Office transmitter ('Aspidistra') for the purpose, the Germans resorted to a system by which what purported to be a German Forces Programme, *Anne Marie*, issued the fighters' instructions by broadcasting dance music; the Reich having been divided into eight zones, the types of orchestra or of popular music relayed indicated in which zone the fighters had to assemble, and the other information they required was included in coded form in the radio announcer's introductions. It was quickly realised that *Anne Marie* was broadcast only at night, and only when Bomber Command was operating, but because legal objections were raised against the jamming of this kind of programme, the Germans were able to use it with little or no interference from the middle of December 1943 until it was superseded in the middle of February 1944.¹⁴

By the middle of February 1944 the Germans had completed their preparations for transmitting instructions to the fighters in morse by W/T, a form of transmission that was more difficult to jam than R/T. The W/T commentary was monitored and jammed from Cheadle with such success, however, that from February the Germans were forced to broadcast their orders simultaneously on a number of channels. Eventually they were using both R/T and

12. Webster and Frankland, *op cit*, Vol III, p 23.

13. *ibid.*, Vol II, p 202; *Bomber Command Counter-Measures*, p 63.

14. *Bomber Command Counter-Measures*, pp 63–65; Price, *op cit*, p 188.

W/T and transmitting the W/T on medium, high and very high frequencies.¹⁵

From their efforts to counter the jamming of their communications it is clear that the German night defences were inconvenienced by it, but there is no reason to believe that Bomber Command's casualties were greatly reduced by the confusion and delay that the jamming may have caused.¹⁶ A GAF authority has said that although the jamming created problems, the gist of the commentary always got through.¹⁷ Moreover, while the intercepted running commentary commonly disclosed that the tactical counter-measures had delayed the enemy by keeping him guessing about Bomber Command's targets, neither it nor any other intelligence source ever disclosed that the enemy's fighter reactions were delayed by successful jamming. Nor is this surprising when it is recalled that the German fighters needed only brief instructions to tell them where to assemble and that from before the end of 1943 they could increasingly rely on their radar and radar-detection sets to find their way to a bomber stream once they had received some indication of its approximate position and course.

Against the airborne and ground-based radar detection devices which the enemy used for plotting and homing on to the British airborne radar no radio or any other counter-measures were devised before his night-fighter defence system collapsed in the summer of 1944, for the reasons discussed in Appendix 20 and Appendix 21. No 100 Group RAF did develop during the first few months of 1944 a new 'Mandrel' jamming screen for blanketing the enemy's ground-based early-warning *Freya* network. To ensure that it achieved maximum effect when *Overlord* was launched, this was not brought into use until June. From July it was used regularly and to great effect in conjunction with other forms of jamming and with the various tactical counter-measures that had been developed since September 1943; the latter included sorties by Mosquitoes to simulate major raids by dropping large amounts of 'Window', a form of deception which No 100 Group had introduced from the beginning of 1944.¹⁸ These operations accelerated the decline in the efficiency of the German night-fighter defences, but the collapse of the defences in August was above all due to shortages of fuel and trained manpower and the retreat of the early-warning network in the face of the advance of the Allied armies.

15. *Bomber Command Counter-Measures*, p 66; Price, op cit, p 189.

16. Webster and Frankland, op cit, Vol II, p 208.

17. M Middlebrook, *The Nuremberg Raid* (1975), p 61.

18. Webster and Frankland, op cit, Vol III, pp 145 et seq; *Bomber Command Counter-Measures*, p 75 et seq; AIR 41/43, *The RAF in the Bombing Offensive against Germany*, Vol V, p 131.

APPENDIX 20

Lichtenstein SN2 Air Interception Set

Lichtenstein SN2 (FuGe 220) was an Air Interception (AI) set employing a frequency range from 80 to 85 M/cs which was immune from 'Window'. It began to replace earlier *Lichtensteins* in the equipment of the German twin-engined night-fighters, the only fighters big enough to mount its unusual aerials, sometime between August and October 1943.¹ In a crash programme, the Germans had produced 200 sets by February 1944 and 1,000 sets by May 1944.² SN2 enabled its fighter to make early contact with the bomber stream once it had been given a general idea of the enemy's whereabouts by other warning and location devices* and then enabled it to keep contact. This took place in total darkness, without the help of searchlights, flares and fires. With the help of *Benito* (and later *Egon*)† the German controller could direct other fighters to the shadowing fighter. Furthermore, as RAF Y soon revealed, SN2 night-fighters sometimes emitted a DF note while maintaining contact with the bomber stream, thus making it possible for other night-fighters to home on to the SN2 aircraft and find the bombers.³ In these ways SN2 was essential to the process by which *Wilde Sau* was replaced by *Zahme Sau*, and it made a great contribution to Germany's biggest victories against Bomber Command. That ADI (Sc) could derive some comfort in March 1944 from evidence suggesting that not many night-fighters were fitted with SN2 shows that *Zahme Sau* was not yet understood by the RAF, since the system worked effectively with comparatively few SN2 aircraft.⁴

The possibility that a new *Lichtenstein* was being introduced was raised in February 1944, after No 80 Wing RAF had noticed a decline in *Lichtenstein* transmissions.⁵ By the beginning of March No 80 Wing had failed to find any unfamiliar signals, but the increase in bomber losses had made it 'painfully obvious' that the enemy was using a new AI set, and occasional references by agents and

* See Appendix 21 (i).

† See Appendix 23 for the use of *Benito* and *Egon* by German bombers.

1. AIR 41/10, *The Rise and Fall of the German Air Force*, p 279; Price, *Instruments of Darkness* (1967), p 179; Irving, *The Rise and Fall of the Luftwaffe* (1973), p 229.

2. Price, op cit, p 213.

3. Air Sunset 135 of 4 January 1944.

4. AIR 20/1656, ASI Report No 101 of 6 March 1944.

5. AIR 41/45, No 80 Wing RAF Historical Report, pp 92-93.

POW and in Enigma decrypts to new equipment under code names *Neptun* and SN2, and to such type-numbers as FuGe 216* and FuGe 220 had suggested to ADI (Sc) that SN2 was one of three types of *Lichtenstein* AI now in service, that 'fortunately it only exists on a small scale at present', and that one of the urgent problems was to establish its wavelength, which might be 80 M/cs and thus immune from 'Window'.⁶ Unfortunately, this frequency was in that part of the radar frequency spectrum that was already cluttered with the transmissions of the latest *Freya* and other early-warning sets, and the search for it had still not succeeded by the middle of April.⁷ Equally unfortunately, an agent had by then supplied a rough sketch of a new aerial array, seen in the nose of a night-fighter, which suggested that the array belonged to a wide-angle search AI on a frequency of about 150 M/cs.⁸ On 25 April ADI (Sc), noting that SN2 was 'rapidly increasing in service', urged the importance of finding the frequency and developing counter-measures; he suggested that the frequency might be vulnerable to the new 'long' 'Window' that was then being introduced,[†] but accepted that the frequency might be about 165 M/cs.⁹

No further progress was made until June, when the Air Ministry's Technical Intelligence Section noticed in the film of a combat between a US fighter and a Ju 88 night-fighter that the Ju 88 was fitted with an aerial array similar to the rough sketch supplied by an agent in April; this had suggested a frequency of about 150 M/cs. The photographs were very good and they established beyond doubt that this was the SN2 and that its frequency was less than 100 M/cs. On 13 July an intact SN2 was taken from a Ju 88 which landed at Woodbridge and it emerged that the frequency was 85 M/cs.¹⁰

It was at once recognised that SN2 could indeed be jammed by 'long' 'Window'. Bomber Command brought this counter-measure into force within ten days, but by then SN2 had operated to great effect without interference for nearly nine months.

* *Neptun* (FuGe 216) was a rear-facing radar (see Appendix 23).

† 'Long' 'Window' was a form of 'Window' developed for use against the German naval *Seetakt* and the *Freya* ground radar sets on the Channel coast before the invasion of Normandy (see Volume III Part 2). These sets used a much longer wavelength than the *Würzburg*.

6. *ibid.*, pp 92-93; AIR 20/1656, ASI Report No 101 of 6 March 1944; Jones, *Most Secret War* (1978), p 393.

7. Price, *op cit.*, pp 213-214.

8. *Air Ministry Intelligence*, pp 384-386.

9. AIR 20/1657, ASI Report No 103 of 25 April 1944.

10. AIR 20/1658, ASI Report No 107 of 29 June 1944; *Air Ministry Intelligence*, p 386; Price, *op cit.*, p 214.

APPENDIX 21

(i) Intelligence on the Radiation Detection Devices of the German Night-Fighter Organisation

FLAMMEN

In the first half of 1943, in the course of raising the *Freya* frequency to avoid jamming by 'Mandrel', the Germans accidentally reached the point at which *Freya* challenged the transmissions of the IFF sets in the British bombers. They regularly monitored these over distances of up to 350 km under the codeword *Flammen* from October 1943 with ground sets normally attached to their GCI stations, which used them to direct the night-fighters equipped with *Benito*.¹

The fact that the enemy was reporting unidentifiable plots called *Flammen* was disclosed by decrypts of the Enigma key of the GAF Experimental Signals Regiment. GC and CS having resumed the decryption of this key (Brown) in the autumn of 1943, when other decrypts had shown in April that radar equipment was being despatched to Peenemünde, it was discovered that, while the signals of the 14th Company of the Regiment were reporting plots of the flying bomb trials in the Baltic, those of the 15th Company had in October begun to report *Flammen* plots from stations in Holland and Germany; GC and CS concluded that they were plots of British bombers. In December 1943 they were investigated by ADI (Sc) who, already aware that 'Oboe' was being plotted under the code-name *Bumerang* (see below), deduced that *Flammen* were plots of the bombers' IFF sets.² In January this deduction was confirmed by a proving flight by No 192 Squadron RAF, and this evidence persuaded Bomber Command to forbid the use of IFF over enemy territory; but the Enigma decrypts showed that IFF plotting continued until Bomber Command sealed the bombers' IFF sets in March.³

1. AIR 20/1656, ASI Report No 101 of 6 March 1944; Price, *Instruments of Darkness* (1967), p 171.

2. AIR 20/1668, ASI Report No VI of 8 January 1944.

3. AIR 20/1657, ASI Report No 103 of 25 April 1944; *Air Ministry Intelligence*, p 323; *Bomber Command Counter-Measures*, p 72; Jones, *Most Secret War* (1978), pp 389-390.

KORFU, NAXOS AND NAXBURG

All three were devices for detecting, homing on or plotting the centimetric radar emissions of Allied heavy bombers. *Korfu* was a ground receiver and direction finder developed against the centimetric radar, H2S, which the Germans had recovered from a British bomber in January 1943, very soon after it had come into service. *Korfu* was in operation by September 1943, from which date it plotted radiations from Bomber Command's H2S sets which for many months remained switched on from take-off to the end of a raid.⁴

Originally designed as an airborne search receiver against H2S, *Naxos* was from September 1943 developed into an airborne detector which could home on to H2S transmissions and also into a search receiver for use by U-boats against centimetric ASV.* It was used operationally by the German night-fighters for the first time on 28 November 1943; it could pick up a bomber stream at a distance of 60 miles. Thereafter it became capable of locating individual bombers and, in conjunction with SN2, was chiefly responsible for Bomber Command's heaviest losses.⁵

The *Naxburg* ground receiver combined the *Naxos* search receiver with the directional aerial dishes of the *Würzburg*. It determined the source of H2S transmissions with great precision; the first *Naxburg* registered H2S transmissions from an individual bomber at a distance of between 100 and 160 miles on 22 September 1943. In October, when the Germans began to set up a *Naxburg* network, the receiver was picking up H2S aircraft at distances of 250 and 300 miles.⁶

No evidence was obtained about the existence of *Naxburg* until December 1944, when it was mentioned in Enigma decrypts for the first time.⁷

When reporting on *Flammen* early in January 1944 ADI (Sc) gave the general warning that the Germans 'will probably try other radiations should we now thwart them on IFF and we shall therefore need to be even more circumspect than before in our use of all radio equipment which involves continual transmissions from our aircraft', and he mentioned, among that equipment, 'Oboe' and 'Monica'.⁸ But he did not refer to H2S. A few days before this the naval

* See above, p 225.

† See below, pp 563-564.

4. Price, op cit, pp 135, 175; Webster and Frankland, *The Strategic Air Offensive against Germany*, Vol IV (1961), p 22; Irving, *The Rise and Fall of the Luftwaffe* (1973), p 237.
5. Price, op cit, pp 135, 143, 175, 179, 185, 195; Price, *Luftwaffe Handbook* (1977), pp 27, 29.
6. *Bomber Command Counter-Measures*, pp 55-57.
7. AIR 20/1654, ASI Report No 83 of 26 March 1945.
8. AIR 20/1668.

Enigma had confirmed something of which there had been 'strong indications' – also in the same traffic – in November. On 3 January the Admiralty had informed the operational authorities that the enemy now possessed information on the frequency and essential operating details of ASV Mk III (ie 10 cm) and had issued a search receiver – *Naxos* – to cover this waveband.* In the GAF Enigma traffic there was no reference to enemy knowledge of H2S or of centimetric radar until March 1944. It was assumed by the British that the GAF was in possession of this knowledge from equipment recovered from a Halifax of Bomber Command which had crashed near Rotterdam in March 1943 and from other bombers since then. The British scientists who had designed H2S did not believe, however, that the Germans could exploit their knowledge to help their night-fighters by furnishing them with plots and bearings.⁹†

Arrangements existed for informing ADI (Sc) of naval technical intelligence, but it is not known how soon the information reached him on this occasion.¹¹ It is true that as early as January 1943, in an attempt to avert the use of H2S over enemy territory, he had warned the RAF authorities that possession of the equipment would allow the Germans to devise receivers able to listen to centimetric transmissions, to use the technique for their own purposes and to devise jammers for it. But as 1943 wore on with none of these things happening the views of the British radar specialists must have seemed to be vindicated. There is no evidence that they changed their views when the naval Enigma revealed that the Germans had designed a search receiver to cover the 10 cm band, presumably because it was easier to listen to the transmissions than to use them for location and homing.¹² Whether or not ADI (Sc) was aware of this naval development, there is no reference to German knowledge or exploitation of centimetric radar in his routine reports on enemy radar developments until that of 6 March 1944. Here he mentioned that 'H2S [had] greatly surprised the Germans' and, for the first time in these reports referred to the existence of a German naval

* The German Navy started to issue this device to U-boats at the end of October 1943 (see Appendix 10).

† It is noteworthy that when the German naval radar specialists first learned in September 1943 of GAF possession of H2S they rejected the idea that the Allies would be able to use the centimetric technique to locate U-boats,¹⁰ see above pp 515-516.

9. ADM 223/186, Ultra signal 1317/25 November 1943; ADM 223/188, Ultra signal 0317/3 January 1944; Naval Headlines Nos 865 of 16 November 1943, 918 of 8 January 1944.
10. ADM 234/68, BR 305 (3), p 4.
11. *Handling of Naval Special Intelligence*, pp 88, 101.
12. AIR 20/3062, ADI (Sc) minute to the VCAS of 23 January 1943; Jones, op cit, p 320.

search receiver, *Naxos*. In March he regarded modifications to the early-warning radars – *Würzburg*, *Freya*, *Mammuf* and *Wassermann* – rather than the development of radiation detection as being ‘the main German reaction to our counter-measures’.¹³

ADI (Sc)’s next report, dated 25 April 1944, again concentrated on the latest German counter-measures to ‘Window’ and to jamming; these were now known to include anti-jamming modifications to *Freya* and *Würzburg*, a new early-warning radar (*Würzburg*), and SN2, which was stated to be Germany’s ‘main hope’ for evading ‘Window’. The report noted, on the evidence of the Enigma, that *Flammen* had helped to destroy 210 bombers during January and February, and that plotting of the bombers’ IFF had since been stopped; but in its list of the main problems remaining to be solved it did not mention other radiation detection devices.¹⁴ Indeed, the report said that ‘all the present counters to “Window” are now understood’. It has been claimed that POW had by then referred to *Naxos* as equipment in use by the German night-fighters,¹⁵ but it is clear that they said nothing that carried conviction with the British technical experts. It was not until May that firm evidence that the Germans had centimetric radar, and were using H2S for detection and homing, was obtained from Enigma references to *Naxos* and *Korfu* which disclosed that they were an airborne and ground receiver respectively, for tracking H2S.¹⁶ Not until after the war was it discovered that *Korfu* had been in service since September 1943.¹⁷

ADI (Sc)’s report of 29 June announced that ‘a long foreseen phase of the war has now arrived when a serious effort [by the Germans] is being made to utilise the fact that a radiating aircraft thereby compromises its position’. The evidence, first received fragmentarily in May, had been confirmed in detail by documents captured in Normandy; these showed that before adapting it for use by U-boats the Germans had developed *Naxos* for the detection by their night-fighters of H2S from British bombers.¹⁸ As late as August 1944 the British radar experts, still doubting whether the Germans could be exploiting H2S, attached one of their number to ADI (Sc)’s staff to examine the Enigma evidence.¹⁹

In the report of 29 June 1944 ADI (Sc) also circulated for the first time intelligence about *Bumerang* and *Flensburg*.

BUMERANG

This was a procedure based on the interception by ground receivers of the frequency used by ‘Oboe’, Bomber Command’s navigation and bomb-aiming aid. ‘Oboe’ was first used in December 1942, but the Germans did not discover it until November 1943, when they tried to jam it. Bomber Command responded by introducing a centimetric frequency for ‘Oboe’ in January 1944, but transmissions also continued on the old frequency for some time. It has been said that this helped to prevent the Germans from discovering the new frequency until July 1944.²⁰

An Enigma decrypt of 28 January 1944 disclosed that early warning obtained from ‘Oboe’ plots by *Bumerang* ground stations had helped to frustrate a bombing raid over Holland; at this time the old ‘Oboe’ frequency may still have been in use alongside the new one. As no further intelligence was received before May, it was presumably assumed that the centimetric ‘Oboe’ was safe. But an Enigma decrypt of 25 May 1944 congratulated the experimental Air Signals Regiment which operated the *Bumerang* on obtaining early warning of a raid at a range of 100 kilometres, and on having distinguished the main raid from a diversionary one. This leaves no doubt that the Germans were plotting the centimetric ‘Oboe’ before July 1944.

The discovery that ‘receivers are being used on the ground for tracking Oboe Mark II’ was reported in ADI (Sc)’s report of 29 June 1944.²¹

FLENSBURG

Flensburg was an airborne device for homing on to the rear-facing radar (‘Monica’) which gave the British bombers warning of night-fighters approaching from behind them. The Germans had developed it by the end of 1943, having recovered a ‘Monica’ set from a crashed bomber within a week of its introduction by Bomber Command in the spring. It could detect ‘Monica’ signals from a range of 130 miles and home with great accuracy on to individual bombers.²²

Some time after the beginning of 1944 POW referred to *Flensburg*, together with *Naxos*, as devices fitted in night-fighters but gave no useful intelligence about them.²³ The Enigma first referred to *Flensburg* at the end of February, disclosing that it had been installed in

13. AIR 20/1656.

14. AIR 20/1657.

15. Price, *Instruments of Darkness*, p 213.

16. AIR 20/5804, ADI (Sc) minute, 4 May 1944.

17. Price, *Instruments of Darkness*, p 175.

18. AIR 20/1658, ASI Report No 107 of 29 June 1944.

19. Jones, op cit, p 392.

20. Webster and Frankland, op cit, Vol II, p 95 (n); Price, *Instruments of Darkness*, pp 189–190, 218–219.

21. AIR 20/1658.

22. Price, *Instruments of Darkness*, pp 139, 165, 215; Price, *Luftwaffe Handbook*, p 27.

23. Price, *Instruments of Darkness*, p 213.

two types of long-range maritime aircraft. In the light of this information it was assumed that it might be a type of ASV active search radar, whereas it was a passive detection device; and so much so that ADI (Sc), who had in January canvassed but dismissed the possibility that the *Flammen* plots were plots of 'Monica', did not associate *Flensburg* with 'Monica'.²⁴ As late as 29 June 1944 he believed that it was another new AI set with a considerably longer range than SN2, possibly 19 miles, which could also be used as an ASV.²⁵ Nor was it till July that captured documents, without revealing that *Flensburg* was the equipment used, established that the Germans were detecting 'Monica' radiations.²⁶

On 13 July an intact *Flensburg* was recovered from the Ju 88 that had landed at Woodbridge. Its characteristics and capabilities were quickly established and 'Monica' withdrawn from all aircraft in Bomber Command.²⁷

APPENDIX 21

(ii) The Nuremberg Raid, 30 March

1944

We summarise here existing accounts of the Nuremberg raid. We do so because, although it was exceptionally ill-fated, the raid illustrated particularly well the state of intelligence about the enemy's night-fighter defences in the first half of 1944.

The decision to make a raid with all available heavy bombers (in fact 795 took part) was prompted by the AOC-in-C's realisation that time was running out for the hope that the bombing would bring about a German collapse; it would soon be too late in the spring to go deep into Germany, and increasing demands were about to be made on Bomber Command for pre-invasion bombing.¹ As for the choice of target, the initial meteorological reports, which always exerted a major influence on such decisions, dictated that it should be in south Germany, where they forecast the possibility of cloud cover; and in south Germany the AOC-in-C preferred Nuremberg to the six priority targets listed in the current Air Staff directive, and particularly to Schweinfurt or Regensburg for which the weather forecast was equally favourable, primarily because Nuremberg had not yet been seriously damaged, because its Nazi associations made it a 'political target of first importance' and because it was believed that 'morale was always particularly shaky in Nuremberg'.² Such was the importance the AOC-in-C attached to these considerations, as also to the decision to make a raid in the first place, that although the weather forecast became less favourable in the afternoon of 30 March, and so much so that his staff expected him to cancel, he did not do so.³ In the event the bombers had to make most of the outward flight not only without cloud cover and in moonlight but also in freak atmospheric conditions, unforeseen by the latest weather reports, which caused them to make long white condensation trails.⁴

It has been argued that the raid was handicapped not only by the weather but also because it was routed carelessly, perhaps with bravado; the route incorporated a long straight track which went

24. AIR 20/1668.

25. AIR 20/1658.

26. AIR 20/1652, ASI Report No 73 of 13 July 1944.

27. Price, *Instruments of Darkness*, p 215.1. Middlebrook, *The Nuremberg Raid* (1973), pp 84-85.2. *ibid.*, pp 85, 87.3. *ibid.*, pp 100, 102, 282.4. Webster and Frankland, *The Strategic Air Offensive against Germany*, Vol II (1961), pp 208-209; Middlebrook, *op cit*, p 168; Price, *Instruments of Darkness* (1967), pp 197-198.