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The West has traditionally relied on force multipliers such as higher-quality aircraft and superior aircrew ability to redress quantitative disadvantages in considering the nonnuclear air battle between NATO and Warsaw Pact forces. Reduced warning time and increasingly unfavorable force ratios lead to differing net assessments. These assessments are made here and several specific suggestions and recommendations are offered to improve our counter-air capability.

HOW MUCH IS NOT ENOUGH?

THE NON-NUCLEAR AIR BATTLE

IN NATO'S CENTRAL REGION

by

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Introduction. During the past two decades Warsaw Pact weapons modernization and increasing force levels have created significant numerical asymmetries in conventional forces in the central region of NATO. This situation is magnified by a three dimensional quality/quantity relationship. First, with the emergence of U.S.-Soviet strategic "parity," it has ceased to be credible to bank on the threat of nuclear weapons to provide an ultimate offset to any ground force advantages the Pact might accrue. Thus NATO's conventional capabilities have become far more critical in deterring war and, should deterrence fail, in overcoming more numerous Pact ground forces than in the days of American nuclear superiority. Second, the Western Alliance has never really tried to match Pact armies tank for tank and division for division. Instead, the hope during the 1970s was increasingly that the West's technically superior air forces could compensate for growing numerical inferiority on the ground. Finally,

regarding the pivotal task of gaining adequate control of the air to permit NATO's air forces to defeat a Soviet blitzkrieg, the stratagem has been to rely on force multipliers in the guise of technologically advanced aircraft and more capable aircrews to prevail quickly and decisively. In a sense, therefore, NATO's current air superiority situation is the result of past efforts on three levels to substitute quality for quantity. The present situation has required that we ask the question, How much is not enough? When do we squarely face the prospect that the tide has turned against us, and that our "qualitative" superiority is no longer a match for Pact numbers and modernized equipment?

Several general approaches, coupled with a number of specific recommendations are suggested and, if implemented, could overcome our present and future asymmetrical disadvantage. These suggestions are concerned with additional force posture improvements, revised air strategy-doctrine and reductions in present U.S. Air Force vulnerabilities in

the central region. While these suggestions are not offered as individual or agglomerated panaceas, they should improve the prospect of winning the air battle.

Assumptions. It is impossible to mention all of the interrelated elements that affect the outcome of a major NATO/Warsaw Pact conflict in central Europe. While recognizing that events on the ground and at sea would undoubtedly influence the conduct of the air battle, this paper focuses on the air superiority portion of the campaign. The presumption is that the air superiority battle can be treated meaningfully in comparative isolation from the rest of the war.

The second major assumption is that the war is fought with conventional means. We agree with the assessment of Gen. Pierre Gallois, the French strategist, and leading U.S. defense analysts that the Soviet Union has the capability, if it elects to use it, to destroy the NATO air assets by a preemptive tactical nuclear strike using SS-20 mobile medium-range ballistic missiles within the first 10 minutes of the war.¹ Thus it makes little sense to consider the traditional air battle under nuclear war conditions.

Another assumption is that the conventional war will be intense, of short duration, and initiated by the Warsaw Pact under circumstances that afford NATO little warning. Thus, the battle will probably be fought with the forces in place. This assumption generally mirrors current Defense Department thinking. Adopting it, however, is not meant to suggest that ultimate NATO victory is contingent on winning the first phase or first battle of the air war. If the Pact has the advantage of initiating the conflict, a well-executed Soviet air operation could easily hand NATO an opening round defeat in the air.

Consideration is given primarily to those aircraft in the NATO and Pact

inventories that are likely to be germane to the air battle either as air-to-air machines or as strike aircraft capable of reaching enemy airfields and related targets. Thus we will consider, on the NATO side, the F-15s, F-16s, F-104s, Tornados, and F-4s; conversely, the A-10, which would be allocated almost entirely to close air support, will be excluded.

A final assumption is that of deep skepticism about proposals for rapid deployment of tactical air assets earmarked for NATO. This skepticism is not related to the question of whether we can move 60 tactical fighter squadrons to Europe, but rather what we do with them when they reach the theater. There is considerable doubt that the Alliance can support upwards of 1,000 additional fighters in the sort of high intensity conflict envisioned. In particular, the situation in the Federal Republic of Germany is likely to be so confused and dynamic initially that many units intended for there will instead end up in the United Kingdom, Norway, or Italy, with little prospect of getting the support necessary for combat operations.

Capabilities. NATO. NATO's air forces in the central region are designed to support ground forces and to conduct air superiority missions including long-range airfield interdiction. Today the United States contributes a significant percentage of NATO's in-place tactical air assets in the central region. This percentage increases dramatically when more than 60 additional tactical fighter squadrons augment Alliance air forces.

The United States is modernizing and upgrading its forces with some of the "... world's most sophisticated and deadly warplanes."² F-15 squadrons have been activated at Bitburg and Camp New Amsterdam; F-16s are slated to replace older aircraft; and two full wings of F-111Es and Fs are stationed

at Upper Heyford and Lakenheath in England.

Warsaw Pact. Fifteen years ago, Soviet Frontal Aviation (FA) largely consisted of short-ranged day fighters and point interceptors, such as the MiG-17, -19 and -21. Compared to the F-4s and F-105s that then formed the mainstay of the U.S. tactical inventory, these Soviet machines had very limited ground attack and deep strike capabilities even under VFR conditions. As judged by capabilities, therefore, Soviet frontal air forces of the early 1960s were almost wholly defensive in orientation.

Since that time, however, the Soviets have deployed an entire family of new tactical aircraft that give FA credible capabilities not only for the close support of troops, but for offensive counter-air operations and strikes deep inside enemy territory as well. True, the Soviets have continued to deploy late-model MiG-21 *Fishbeds*, presumably for use over Pact territory as a point interceptor, but the interceptor version of the *Flogger* (MiG-23) has given FA the sort of front-aspect, radar missile capability that NATO's *Sparrow*-equipped F-4s have long enjoyed. As for battlefield interdiction and deep strike, the ground attack variant of *Flogger* (MiG-27), the Su-20 *Fitter C/D* and the Su-19 *Fencer* aircraft possess performance, avionics and weaponry capabilities that are loosely comparable to those found in NATO's F-4s and F-111s.

How do the latest Soviet fighters stack up against NATO aircraft? Direct comparison of the F-15 with the MiG-23 suggests that the Western Alliance retains a considerable edge. The MiG-23 embodies roughly the technology level of the F-4, and our own mock air combat experience indicates that the F-4 is not very competitive with the F-15 in isolated, one-on-one dogfights.

Nevertheless, for a number of reasons, this sort of machine-to-machine

comparison is dangerously superficial. First of all, the MiG-23 does not appear to have been optimized for free-play dogfighting. While U.S. fighter designs tend to reflect a certain preoccupation with "MiG Alley" situations, Soviet designers seem to think more in terms of pure interceptor missions. Second, "the Soviet Union has been turning out about 1,150 fighters annually, of which 25 percent are exported to its Warsaw Pact Allies. By contrast, the U.S. has been building only 500 such planes each year, and 30 percent have been sold to other nations."³ Also, Pact air forces devote over half their assets to the air defense role, whereas NATO only allots 20 percent of its aircraft to this mission. Thus, the Pact could expect to have a significant numerical edge in dedicated air-to-air assets. Third, one-versus-one engagements would almost certainly be the rare exception in a conventional European conflict. There is mounting evidence from such sources as the ACEVAL (Air Combat Evaluation) test and Red Flag, that even though one *Flogger* is not competitive with one F-15, five or six *Floggers* may well be competitive with a similar number of F-15 *Eagles*.

This evidence supports the International Institute for Strategic Studies (IISS) conclusion that "... NATO still has superiority in sophistication of equipment but this technological edge is being eroded as the newer Soviet aircraft are brought in."⁴ Loosely speaking, this judgment is a fair one. In the words of Brig. Gen. John T. Chain, Jr., Air Force Deputy Director of Plans, Soviet equipment is "... damned good."⁵ But one-on-one comparisons of the performance or sophistication of opposing aircraft provide very little insight into the likely outcome of a major air battle between forces flying these same machines against one another. Actual combat interactions are considerably more complicated and airplane-versus-airplane comparisons offer

no more than a starting place for thinking about the problem.

Trends. This review of the capabilities of NATO and Pact tactical air forces drives home the fact that both sides have been investing heavily in "tacair" modernization over the last 10-15 years. NATO's goal throughout this period has been to sustain an edge in offensive strike capabilities, as in 1968 when NATO superiority was readily apparent. Defense Secretary McNamara, for instance, could persuasively represent it in the following manner:⁶

Capability Index	NATO	Warsaw Pact
Payload	100	35
Loiter Time	100	20-40
Crew Training	100	55

The rub, of course, is that these comparisons were calculated at a time when the bulk of Pact air assets deployed in Eastern Europe (over 80 percent in fact) consisted of MiG-15s, -17s, -19s and early-model MiG-21s, none of which had very impressive range-payload capabilities compared to the F-4s that are then entering NATO fighter squadrons. Today, however, the picture looks much different, and precisely because a major Soviet goal in the 1970s has been to develop an offensive strike capability against NATO ground force elements, airfields and other targets. The frontline Soviet fighters now in production are not only approaching the technical sophistication of the F-4s and F-104s that, throughout the last decade, comprised around half of NATO's tactical inventory on the continent, but over the years 1973-1977 their average radius doubled and payload to a range of 300 nautical miles increased five times.⁷ Indeed, the number of Pact *Floggers* and *Fitters* now based in East Germany, Czechoslovakia and Poland roughly equals the number of NATO F-4s and F-104s stationed on the continent.

Thus, even ignoring Long Range Aviation (LRA) medium bombers and FA *Fencers* located in the western U.S.S.R., the Pact has acquired impressive interdiction and strike capabilities compared to those possessed in 1968.

This development inevitably brings us to the issue of Pact numbers. Close scrutiny of IISS balance sheets for NATO and Pact tactical aircraft in Western Europe and England versus those in Eastern Europe reveal that NATO has long been outnumbered. The 1968 IISS *Military Balance* gave the Pact an advantage in deployed aircraft of almost 2 to 1 (5380 to 2800).⁸ The 1980 IISS balance reflects roughly the same aggregate force-ratio. In counter-air fighters and interceptors Pact superiority now approaches 4 to 1.⁹

The preeminent "tacair" trends in the central region of Europe, therefore, are twofold: (1) Excluding reinforcements from either the United States or the U.S.S.R., the Pact has enjoyed a numerical edge of about 2 to 1 since the late 1960s, and (2) NATO's traditional advantages in aircraft performance, avionics, payload-range figures, and technology have been greatly reduced over this same period.

These two trends, in turn, bring us to the central concern of this paper: the quality/quantity issue or, "How much is not enough?" Before embarking on a detailed discussion, however, it seems appropriate to offer some perspective on the problem. Gen. Lew Allen, Air Force Chief of Staff, has noted that fundamental technology trends are depriving the United States of its longstanding advantage over the U.S.S.R. While in the past, he has stated, the qualitative superiority of our men and airplanes have more than made up for superior Pact numbers, as of late

... both our analyses and our operational tests have shown that as our margin of technological superiority erodes, it is no longer sensible to try to overcome

increased numbers with increased sophistication [emphasis added]. This means that in meeting any expansion of the Pact threat—or in negotiating mutual limits to constrain this threat—we must pay more attention to the numbers as well as the quality of forces in the balance.¹⁰

Counterbalancing Factors. In spite of the numerical advantage of Pact air forces over NATO's, Western defense analysts and Administration officials have remained optimistic about the outcome of a conventional East-West air battle. This optimism has been largely based on subjective estimates of the force multiplier value of the West's superior technology and better-trained, more experienced aircrews. For years these two qualitative factors have provided justification for accepting numerical inferiority in Europe while, at the same time, predicting a successful outcome in the air. The following sections critically examine these longstanding linchpins of Western air strategy.

Technology. NATO still enjoys a technological advantage over Pact aircraft, even though the margin of superiority has diminished over the past 10 years. Several new NATO fighters are multipurpose, and all of the current generation aircraft have good mission-profile performance, especially in terms of range, payload and all-weather capabilities.¹¹ In addition, U.S. designs have excellent radars and highly advanced weaponry. Looking ahead, even more impressive weapons such as the Advanced Medium-Range Air-to-Air Missile (AMRAAM) are scheduled for deployment.

Nevertheless, despite the apparent advantages associated with advanced combat aircraft and their weaponry, recent operational test and deployment experience argue with increasing force that technology is a two-edged sword.

For a variety of reasons, high technology does not appear to offer the easy panacea that some, such as the Boston Study Group, would lead us to believe.¹²

Perhaps the most obvious drawback lies in the rapidly escalating costs associated with more complex aircraft. Given existing constraints on U.S. defense budgets, contractors have considerable incentive to underestimate unit costs in bidding on major aircraft programs. Then, after the contract has been won, unit costs begin to rise with the result that fewer aircraft are purchased than originally anticipated. Finally, small lot purchases trigger program extensions that drive up costs even more. The F-16, which represents the low-cost end of the present Air Force fighter modernization effort, costs almost \$11 million each and the F-15 is approaching \$20 million. These prices can be compared with an F-4 unit cost in the mid-1960s of \$2.4 million. Of course, some of the rise in aircraft costs since the F-4 is owed to inflation. The F-4 that sold for \$2.4 million in 1965 would cost about \$6.6 million in FY 1980 dollars. But even after adjustments for inflation, today's F-16 costs nearly twice as much as the F-4, and the F-15 is roughly three times more expensive. Most of these after-inflation cost increases can be attributed to the modern avionics subsystems that give current fighters much of their presumed qualitative combat superiority. "The 'avionics' system of radar and electronics for a modern fighter costs 1000 times as much as in World War II; engines cost 50 times as much, all in constant dollars."¹³

Another drawback of advanced technology systems is their tendency either to work 100 percent or not at all. In the F-16, for example, if the computer associated with the Stores Management System (SMS) is programmed incorrectly or malfunctions, then no weapons release is possible. Naturally

this computer is designed to be so redundant that it can never fail. Nevertheless, one F-5 "Aggressor" pilot, who recently spent a week fighting F-16s in mock air combat, reports that on two occasions during that week, F-16s were unable to "fire" missiles at him because their SMS computers had failed "...and thence would not provide them with ANY form of gunsight or release capability (except jettison)."¹⁴

More generally, reliability and maintainability appear to be qualities that simply tend to get insufficient attention when systems are built with "leading edge" technology. Examples of problems in these areas abound. However, the most telling from the Vietnam era may stem from the stresses that day-to-day carrier operations in the Gulf of Tonkin imposed on the Sparrow missile. Although the Sparrow-Phantom combination was intended from its inception as a primary fleet air defense weapon, the missile proved to be virtually unmaintainable aboard carriers during sustained combat operations. As one instructor at the Navy's TOPGUN Fighter Weapons School put it, "...after 100 traps (carrier landings) a Sparrow seldom works."¹⁵ Consequently, by the time of the Linebacker operations over North Vietnam, Navy F-4 fighter crews had come to depend almost exclusively on *Sidewinders* during MiG encounters.

More contemporary examples of reliability and maintainability problems in "state of the art" aircraft are provided by the F-111D and F-15. In the first case, the F-111D's Mark II avionics system turned out to be so unreliable that, by 1978, actual mean time between failure was averaging less than 3 hours (in contrast to the 63 hours originally specified). To further compound this problem, the inherent complexity of the Mark II avionics package was such that troubleshooting could only be done with automatic fault isolation equipment. However, over half

the time the automatic test equipment could not duplicate the reported faults. Maintenance in the F-111D wing at Cannon AFB, New Mexico, has proven capital and labor intensive in the extreme. In fact, early mothballing of this aircraft has been seriously considered within DOD during the last year or so despite its virtually unique all-weather delivery capabilities.

In the case of the F-15, the problems that have recently been reported in the press concentrate on the airplane's Pratt and Whitney F-100 engine. The crux of the matter seems to be that the Air Force tried to wring too much performance out of the engine. The result was a design that indeed gave the pilot every possible ounce of performance. However, the last few ounces were purchased at the price of persistent stagnation stall problems and engine operating temperatures so high as to degrade considerably the F-100's durability. As a result, operational F-15 units have been experiencing growing readiness problems. The Bitburg wing typifies what has been happening. Bitburg was the first NATO air wing to be equipped with the F-15 and, as such, has been a showcase for the latest American fighters. However, as of 5 October 1979, 16-18 F-15s grounded for maintenance in the Bitburg wing were down for engine-related problems, and the unit's maintenance man-hour backlog has been growing alarmingly.¹⁶ Senator Howard Cannon, who recently presided over a Senate Armed Services Committee hearing on the F-100, now estimates that more than \$1.1 billion will be required to correct the engine's deficiencies.¹⁷

The overzealous pursuit of high technology has also induced a variety of largely unforeseen side effects. For instance, in some cases we have paid for capabilities that had no combat use. In others we have removed capabilities that were in fact still needed. The F-4 illustrates both pitfalls. There is machinery in the airplane (variable inlet

ramps, variable engine bellmouths, etc.) whose sole function was (and is) to get the Phantom from roughly Mach 1.7 to 2.0. These items, of course, added to the weight and cost of the F-4 while making it harder to maintain. Yet the harsh reality is that no American F-4 pilot ever had occasion to use this upper portion of the aircraft's speed range in actual combat with MiGs. The reason is simple: in representative combat configurations the F-4 will run out of fuel long before it gets to Mach 2.0.

As for the problem of eliminating still needed capabilities, the absence of an internal gun in the first three models of the F-4 amply illustrates this pitfall. Interestingly, however, the kind of misconception that led to this particular mistake is evidently still with us. As General Allen has pointed out,

... academic arms analysts—usually more policy than technologically-oriented, and unable to devote their full energies to the task—often fall into the trap of confusing technology projections with current capabilities. This leads to an unfortunate pro-technology bias in their attempt to set the balance, which leads to recurrent predictions of the demise of... the fighter aircraft at the hands of precision-guided munitions despite the abundant—and wartime—evidence that such a demise is simply not at hand today.¹⁸

To this observation the authors would simply append the comment that even designers have not always been immune from jumping to the hasty conclusion that the latest piece of advanced-technology weapon would change the fundamental nature of combat.

A final drawback of technology is that overzealous advancement approaches a point of diminishing marginal value when the added capability is not commensurate with the additional development, testing production and

maintenance costs. Attempts to control these costs often result in decreased quality as attested by a recent General Accounting Office (GAO) Report. In an interesting twist, GAO suggests that the Defense Department has had to reduce the quality of some of its systems below what military experts say is required. The two primary reasons given for this phenomenon are first, the military's preference for complex technological weapons over more conventional systems, and second, budget constraints set by Congress that lead to uneconomical procurement and production practices.¹⁹ This led one senior defense official to lament that he is "not anti-technology, just anti-complexity."²⁰

Training. The quality of NATO aircrews is the other force multiplier advanced by defense analysts and government officials as an offset to greater Pact numbers. Generally stated, the argument is that the superior training and experience of our people can redress even highly adverse force-ratio disadvantages.

Without question, aircrew training and experience have been important in past air combat. The improved performance of Navy fighter crews late in the Vietnam war provides one of the more convincing historical examples. Over the course of *Rolling Thunder* (1965-68), Navy aircrews recorded a kill/loss ratio against North Vietnamese MiGs of 2.42-to-1 (29 kills for 12 losses).²¹ However, two trends during the final months of *Rolling Thunder* gave rise to acute concern. For one thing, in 1968 the U.S. exchange-ratio dropped to 1.4-to-1 (14 kills for 10 losses); for another, Navy crews experienced a period in which they fired more than 50 missiles in anger without hitting a single MiG.²² As a result the Navy initiated a study of the problem under Capt. Frank Ault that led to the establishment of "... a graduate course in dogfighting" (TOPGUN at Miramar) and the

exposure of most Navy F-4 crews to several "dissimilar aircraft" training programs.²³ So when the "out-country" air war heated up again in 1972, the Navy was ready for the MiGs as the performance of its aircrews amply demonstrated. For 1972-73 the Navy recorded a 12-to-1 exchange-ratio (24 kills for 2 losses); even more impressive, the kill-per-engagement ratio of Navy crews jumped to 1.04-to-1 (roughly five times the Southeast Asian average): statistically, every time Navy fighters engaged MiGs during 1972-73 they scored at least one kill.²⁴

The role of experience in fighter pilot performance is somewhat harder to document—particularly if one tries to separate experience from training. Nevertheless, there is some evidence to suggest that "experience" in the sense of a pilot having survived some small number of combat encounters does correlate statistically with a greatly improved likelihood of his being able to survive subsequent air-to-air engagements. The classic study on this point was done by Herbert Weiss. Defining a "decisive combat" as an encounter in which a pilot is either killed or adds to his score,²⁵ Weiss examined the records of those who flew with Richthofen's *Jagdgeschwader 1*, Americans who served with the French in the First World War, and Germans who had combat tours in *Jagdgeschwader 26* during World War II. What he found was quite unexpected. Whereas fewer than 15 percent of these pilots had a better than even chance of surviving their first decisive combat, pilots who had lived through five decisive combats were twenty times as likely to survive later encounters.²⁶ As Weiss himself observed, it does not seem very plausible to attribute such a dramatic improvement entirely to learning experiences during so small a number of combat encounters; to some extent, the numbers suggest a "... survival of the fittest."²⁷ Nevertheless, one expressed

purpose of current Tactical Air Command training programs such as the "Aggressors" and Red Flag has been to provide our aircrews with some portion of the skills and tactical savvy believed to be vital in determining whether they will survive their first eight or ten combat missions.²⁸

The issue that we want to explore, however, is not the effect of training and experience on past combat. The question is: How much of a qualitative offset are more capable aircrews likely to afford NATO in a future conventional conflict in central Europe? On this matter, obviously, we cannot help but get involved in perceptions, subjective estimates and other factors that are simply not quantifiable with precision. Nevertheless, it does seem necessary to compare, as best we can, the quality of tactical fighter pilots in the Soviet and U.S. Air Forces as evidenced in their training and experience.

At the undergraduate pilot training (UPT) level, both the United States and the U.S.S.R. do a reasonably good job of training jet-qualified aircrew members. The main difference is that the USAF single-track UPT program focuses on producing a generalist capable of transitioning to any aircraft type—fighter, bomber or transport—whereas Soviets in higher aviation schools concentrate on a narrower range of tasks and may subsequently spend their whole flying careers in a single aircraft type. Thus, Air Force UPT training does not emphasize producing a fighter pilot *per se* and, hence, cannot fully realize individual potential for this specific mission role.²⁹ In recent years, however, this problem has been recognized and Air Training Command has undertaken a number of initiatives aimed at correcting this deficiency.

Turning to training in operational units, the evidence still demonstrates an overarching and highly pervasive Soviet emphasis on strict, one might say absolute, control and supervision. In

contrast, U.S. pilots generally get more intensive training under conditions that more closely approximate combat. Overall our crews fly more practice events in their primary, secondary and tertiary mission specialties than do their Soviet counterparts; aggressiveness and individual initiative is encouraged far more seriously in American training; and in realistic preparation for free-play dogfighting between significant numbers of dissimilar performance fighters, Western training is thought to be vastly superior to anything regularly occurring in Soviet Frontal Aviation.³⁰ Even though the West enjoys certain aircrew quality advantages, it is questionable whether NATO can rely very heavily on the leverage associated with this force multiplier. To begin with, Pact ground forces are less dependent on help from the air than NATO's forces—both in terms of airborne firepower requirements and their ability to defend against enemy air attacks. For example, if a Pact breakthrough on the North German Plain suddenly compels NATO to achieve local air superiority, the West's fighters could be forced to fight in places where Pact interceptors would have at least a 4-to-1 numerical advantage and be able to operate within the sort of integrated, closely controlled air defense network that is their strong suit. In other words, the superiority of Western pilots and aircraft in free-play air combat can only be decisive if Pact aircrews have to fight the critical air battles on NATO's terms rather than their own.

Next, there are several observable trends that suggest that the Pact is improving the relative quality of its aircrews. For some years now, Soviet writings on fighter tactics have shown increasing concern with such subjects as the importance of pilot initiative and imagination in modern combat.³¹ Moreover, there is recent evidence that these concerns have been translated into more realistic, more sophisticated and more

offensively oriented training activities—particularly within Soviet FA regiments stationed in East Germany. At the minimum, therefore, Soviet aircrew training is improving.

Since the 1973 oil embargo, the average number of monthly flying hours and sorties being logged by Air Force tactical fighter crews has declined. In addition, USAFE aircrews face a variety of local constraints—adverse weather, airspace and range limitations, conflicting air traffic and noise abatement requirements—that are dramatically less severe around fighter bases in the United States.³² Added to these problems, the availability of training aircraft, shortages of maintenance spares, and renewed emphasis on flight safety at the expense of training realism have further hampered operational readiness in USAFE.³³

Finally, there is the fact that Soviet fighter pilots stay in the cockpit far longer than their American counterparts. This asymmetry inevitably confers Pact fighter regiments some edge in terms of aggregate experience. Until about 1977, the U.S. Air Force was characterized by a significant number of fighter pilots in operational units with Southeast Asian combat experience. However, few of these individuals now remain. True, programs such as Red Flag are doing much to preserve many of the lessons learned the hard way over North Vietnam for today's tactical aircrews. In recent years, however, an increasingly major problem for the U.S. Air Force has been the retention of its experienced aircrews, particularly those with 6 to 11 years of service. Some estimate the loss rate has been as high as 70 percent. This trend is dangerous in the most literal sense because their replacements often turn out to be very junior crewmembers not far removed from undergraduate pilot and navigator training, because accidents are strongly related to pilot experience, and because highly seasoned Soviet pilots are faced

by relatively junior ones in USAFE units. Indeed, so pronounced has been the trend towards inexperience in the USAF aircrew force over the last decade that the Air Force has gradually redefined its concept of an experienced fighter pilot by scaling down the standards used to confer this designation. It is now the case that an American fighter pilot can be considered experienced with significantly less flying time than before, and also with fewer hours than Soviet 2nd, 1st and "sniper" class pilots. Whereas all the evidence is still not in either to support or debunk the relevancy of NATO aircrew quality advantage, the reliance on this factor to achieve air superiority while being outnumbered, raises some very serious concerns.

Implications. If NATO's air strategy is to offset greater Pact numbers with superior hardware and more capable aircrews, then the trends are certainly disquieting. For when all is said and done, the Soviets are clearly catching up with the West in both areas—harsh facts that inevitably bring us right back to the issue of numbers versus quality.

Do numbers count, and if so, how much? These questions are very hard to answer in general. Nevertheless, recent air intercept missile evaluation and air combat evaluation tests (AIMVAL/ACEVAL) do offer some sobering insights.

In a mid-1979 *Tactical Analysis Bulletin* Lt. Col. George Dvorchak, who was part of the AIM/ACE data management team throughout the test, discussed some of the more important lessons learned. The first two mentioned are that "NUMBERS COUNT" and that "INCREMENTAL WEAPONS IMPROVEMENTS WASH OUT IN THE LONG RUN." As Dvorchak remarks,

We really didn't like the first one, because it says there isn't any way to out-technology the other guy. If he has some good basic capa-

bilities, numbers are a basic driver. The reason that incremental weapons improvements wash out in the long run is that people learn to adjust to them . . .³⁴

Focusing on ACEVAL, the tactics portion of the test, he goes on to note that the lesson about numbers counting

... [w]as not the conclusion of only several reports, but of every ACEVAL report I know of. The reason that numbers predominate in the long run is that people aren't perfect, and they make mistakes with the tendency to goof it about as often as they do something brilliant.³⁵

Does this pattern then imply that people do not count for much in the modern air combat arena? Not at all. In the first place, the aircrews on both sides that participated in this test "... were among the best the operational forces could offer and by the time that AIMVAL commenced were probably the best trained crews in the world."³⁶ Moreover, on a short term basis numbers only accounted for "... about 10 to 20 percent of the variation in results."³⁷ Thus Dvorchak's third major lesson learned is that "PEOPLE ARE VERY IMPORTANT," specifically in terms of how well they plan for the situations they anticipate, how well they set themselves up as they go into the fight, how well they adjust to what they encounter so as to make the opposition predictable while preserving their own options, and how well they execute. Dvorchak adds:

We do have some data that indicates that this kind of tactical interplay has more than five times the effect on results than such things as force ratio or whether somebody does or doesn't have GCI. Usually this is the way we saw it. You could give one side every advantage, they would make a fundamental mistake, and then get blown away.³⁸

Now it must be reiterated that AIM/ACE was a test, not actual combat. Moreover, its focus was strictly air-to-air. Thus it is impossible to transfer its lessons directly to such things as interdiction and deep strike operations in a central European conventional conflict. Nevertheless, in the context of the NATO/Pact hardware and aircrew quality trends already examined, two general conclusions seem to emerge. First, NATO has for too long been pursuing "leading edge of technology" equipment without paying adequate attention to the real operational costs of this approach. The authors do not mean to imply that the Air Force can be satisfied with second- or third-rate fighters. But if we are to *exploit* technology rather than be hamstrung by it, then we are simply going to have to make some fundamental changes in the way we design, build and procure military equipment. Second, it is beginning to look as if NATO has been leaning too heavily on force-multipliers.³⁹ To quote Senator Sam Nunn: "At some point, numbers do count. At some point, technology fails to offset mass. At some point Kipling's 'thin red line of heroes' gives way."⁴⁰ Have NATO air forces reached this point relative to the Pact? Without running a "practice war" it is impossible to say for sure, but if we have not actually reached the point at which the "thin red line" begins to give way, we are surely getting close.

What Is To Be Done? Having reviewed the sobering trends in technology, training, and force ratios, one is led to ask: "What is to be done?" Certainly, one possible approach is to redress the numerical imbalance by providing more tactical fighter aircraft in the central region. In any case, more aircraft must be procured and made available to make up combat losses so that the air battle can continue after the initial exchange.

However, given the present reality

that the numerical weapons gap with the Warsaw Pact cannot be substantially closed in the foreseeable future, the U.S. must devise strategies for winning the air battle with the numerically superior Pact forces. The air superiority battle, however defined, is of critical importance to the overall outcome of a full-scale conventional confrontation between NATO/Pact forces in the central region. Effective employment of close air support, battlefield interdiction, intratheater air transport, and aerial resupply, upon which our overall ground strategy depends, are all impossible without first achieving local or theater air superiority. As previously mentioned, U.S. reliance on the traditional force multipliers of technology and training may no longer be viable approaches. Consequently, the time has come for us to reconsider our basic approach to the air battle to identify some alternative strategies.

In searching for approaches that can be decisive in swinging the air battle in our favor, we should seek to encompass something that is fundamentally simple in concept, inherently flexible, and easy to implement. Three elements seem to satisfy these conditions: (1) to exercise the initiative where possible; (2) to conserve U.S. forces; and (3) to exploit Soviet vulnerabilities. Each of these approaches springs from a position of initial weakness with the eventual objective of gaining the upper hand.

History is replete with examples of how the element of surprise, seizing the initiative, doing the unexpected, has turned the fortunes of war to the inferior force. The conservation of forces is almost axiomatic whenever forces are limited. Defensive measures, selective usage, and reconstitution are possible means to produce this desirable result. Striking the enemy at his weakest point, denying him the initiative, and capitalizing on his errors are all traditional methods for achieving victory in a position of numerical inferiority.

How successfully has the United States taken these strategies into account? What more might be done? Are we adjusting our strategy to the gradually changing dynamics of the central front forces or are we mired in our conventional wisdom, satisfied with placating ourselves with obsolescent arguments? These questions and more will be discussed in the following sections.

Political Considerations. NATO has always been a political as well as a military alliance; to suggest otherwise would be naive. Robert Osgood's description of it as an entangling alliance in his seminal work of almost 20 years ago still reflects the reality of NATO today.⁴¹ Many of the specific recommendations offered here are ensnared in political ramifications that no doubt override sound military judgment. Certainly one must hope that political and military concerns not be mutually exclusive but where they are, military judgment will almost assuredly be the bartered coin. The authors realize this linkage and are cognizant that several of the suggestions offered to redress the current problem areas require some fundamental political decisions that may simply be in the "too hard" category. Policymaking will always be difficult in a democracy, as was pointed out by De Tocqueville almost 150 years ago. De Tocqueville, of course, could not foresee the compounding of this difficulty in an alliance of sovereign democracies. This should not, however, negate the necessity for developing an overall framework for redressing the numerical force imbalance between NATO and the Warsaw Pact.

Conservation of Forces. Western airpower in the central region of NATO suffers from having too few airfields.⁴² Moreover, those available are subject to overcrowding. The geography of the

Federal Republic of Germany and the Benelux states have made the airbasing issue particularly acute, and vulnerable to a concerted Soviet interdiction effort. Dispersal of air assets would appear to be the most obvious answer, but there is little real, meaningful movement in this direction because of geographic and political constraints. Certainly the easiest way to reduce U.S. vulnerability would be to move the tactical fighters out of these fairly exposed forward positions. This solution, however, is unthinkable from a political standpoint. Therefore, while modernization of U.S. air assets should continue in West Germany, no increase in the numbers of aircraft deployed there should be encouraged unless more than five main operating bases are made available for their support.

Increases in tactical air forces are essential, but any new aircraft wings should be based in the United Kingdom. It is important to put at least one F-15 wing in the United Kingdom because of the uniqueness in this aircraft and the attractiveness of Bitburg Air Base for a major Soviet attack. Presently, the only other F-15 facilities in Europe are the very limited resources that support the F-15 squadron deployed to Camp New Amsterdam, Netherlands. If Bitburg is rendered inoperable, any surviving F-15s from the 36th Tactical Fighter Wing would have little likelihood of effectively participating in the continuing air battle without adequate support in the United Kingdom.⁴³

There are a number of airbases within the United Kingdom that could be upgraded to support an F-15 wing. Airbases in the United Kingdom are less vulnerable to Soviet conventional air attacks than those in the Federal Republic of Germany for several reasons; increased warning time, United Kingdom air defense capabilities, reduced bomb loads on Soviet ground attack aircraft, increased distance to target and finally British (RAF) point

defenses around airbases using *Rapier* surface-to-air missiles. Missions to attack U.K. airbases would be particularly hazardous to the Soviet FA pilots. Attrition would be extremely high with pilot morale and motivation inversely proportional.

Basing longer range F-15s and lower cost F-16s in the United Kingdom highlights another area requiring considerable improvement for effectively waging the air battle, namely tanker support. Of all the weapon systems that have been double-counted in USAF planning, the KC-135 force is certainly the most maligned. Its assumed availability to support every mission—strategic offensive, strategic mobility, and tactical air requirements—is postulated by almost every mission planner. These assets are treated as a virtually infinite resource, possibly because key decisionmakers assume that their own needs would take highest priority. The present force of 615 KC-135s and the projected 20 KC-10s does not appear adequate to do everything that will be asked of it. The air battle in Europe's central region will require extensive tanker support if the allies, especially the United States, are to prevail. It is an advantage that we enjoy over the Soviet's, as aerial refueling pays great dividends in flexibility of operation.

The SAC decision to reopen RAF Fairford and to station tankers in the United Kingdom was a step in the right direction; however, more tankers than just a single squadron are required. At a minimum a second squadron should be allocated to the central front. This suggestion requires that a key decision be made between increased purchases of KC-10 ATCAs or a reengining of the KC-135 fleet. Present tanker assets will be committed to maintain the strategic deterrent, as they must be. The introduction of B-52G cruise missile carriers could easily lead to too few tankers to support the Single Integrated Operating Plan (SIOP). This development would

be dangerous for the maintenance of strategic essential equivalence, would certainly denude our tactical air forces in the central region of tanker support, and hence result in a significantly degraded conventional capability.

Related to conserving U.S. air capabilities in the central region is a need for more fighter bases in the United Kingdom. These bases to be identified as collocated or auxiliary operating fields should be equipped with prepositioned war reserve materials and other stocks to support rapid deployment. In order to avoid the proximity to the front and the concentration of stores at a few locations, the United Kingdom is seen as the only real alternative, given the dim prospect of French reintegration into the NATO military command structure. The bases should also have improved, active and passive defensive systems to reduce their vulnerability. These improvements should include sheltering, "toning down," and installation of RAF *Rapier* air defense missiles. This suggestion would be expensive, especially in the short term. Nevertheless, it is essential if we are to avoid mortgaging our future.

The U.S. Air Force and Army must reduce the vulnerability of the main operating bases in the Federal Republic of Germany. This will require additional funding and manning, but most importantly a change in emphasis and approach. The Air Force's responsibility for reduced airfield vulnerability will be partially met by increased warning as a result of deployment of NATO Airborne Early Warning (AEW) and U.S. AWACS aircraft. These platforms are capable of looking into the German Democratic Republic and detecting major raids and will be able to alert our quick reaction conventional forces of an impending attack. This warning should permit our Air Force to launch its readied aircraft so that they are not caught on the ground or reduced to immobility as a result of a knocked out

runway. The NATO AEW may be especially useful in providing such warning.

Another area in which the U.S. Air Force can reduce its vulnerability is in the requirement for rapid runway repair. Unlike many Soviet fighters, such as the *Flogger* with balloon tires, mud flaps and screens over air intakes, sophisticated U.S. aircraft cannot fly out of short airfields or dirt runways. They require a hard surface runway of substantial length, if they are carrying any kind of payload, to operate effectively. All the NATO partners have positioned equipment and material to repair damaged runways.⁴⁴ The U.S. Air Force must continue to emphasize and exercise this aspect of airbase defense in order to generate high sortie rates which are a *sine qua non* for winning the air battle in the central front. The United States is improving in this area, but it is extremely difficult to get an unclassified appreciation of just what our present capabilities are. It is not, however, too difficult to surmise that we still have some way to go before being satisfied.

The final area that can be improved substantially to reduce airfield vulnerability is our antiaircraft air defense posture. This mission of point defense as well as HIMAT (High-Medium Altitude Defense) is now performed by the U.S. Army. There is an attitude within the Army that this mission is somehow less than the essence of the Army mission. In the battle for priority of funding and manning it has been difficult for the Army to upgrade its air defense systems because this mission is viewed as a stepchild; or at least this is the perception of many within the Army's air defense community.

In Europe we have decided to operate what must be termed a thin barrier approach of air defense through a forward deployed *Hawk* belt. The modified *Hawk* is an excellent low to medium altitude system and the *Patriot*

will be an excellent replacement for these systems. However, they are so spread out that they can be saturated or breached in short order, and there is very little defense in depth to continue to engage Soviet air attacks. It is beyond the scope of this paper to offer a full discussion of the barrier strategy, but it is an issue that needs some serious rethinking because too many Soviet attack aircraft will penetrate deep into the Federal Republic of Germany and strike NATO fighter bases and other critical targets. The point defenses or short-range air defense around American airbases is now provided by *Vulcan* gun and *Chaparral* missile systems. These systems are getting old and there are not enough of them.

Our dependence on the Air Force to be a major link in the defense of the forward area demands that we do everything possible to support the point defense requirement. In no other area are we more able with present-day and near-future systems to do this, than in heavy, overlapping and murderous air defense systems. Each airbase should be defended with a *Hawk* belt of its own. This belt should have extensive batteries with upgraded full wartime "load outs." This system should be supplemented by *Roland* missile systems around the base perimeter, as well as on the airbase proper. In order to be effective, there must be a significant number of these very mobile systems. Finally, the *DIVAD* gun should be integrated into the point defenses of the airbase.

The present situation is evidently not seen as a major deterrent or risk averting issue for the Soviet Union; our proposal would add another element of concern to their calculations. A sidelight of this proposal is the mitigation of an expressed concern by certain defense analysts that the most likely spectacle of the air battle in the central region is the U.S. Air Force doing most of its fighting to protect its own airbases. Resources necessary to help decide the

outcome of the land battle will be unavailable because of an intense parochial concern with defending its own investments or supporting facilities. Using interceptor aircraft to defend USAF airbases would be an unacceptable allocation of scarce resources and would be much less effective than the alternative proposed. One hopes that the present cooperation between TRADOC and TAC, and the forceful direction by their respective commanders to promote closer battlefield interchange and support, will result in some positive action on this critical problem.

We have suggested several ideas for the conservation of forces. However, none is so intrinsically emotion-laden as our final suggestion: avoid engagement whenever the odds are overwhelmingly unfavorable. Our thought is that there are occasions when it is better to avoid combat, even though one may be able to damage the enemy if one engages, should the price entail losing too many of one's own. In other words, unless there is a reasonable chance of blunting Pact initiative in the air and inflicting great losses, it may be wiser to delay and harass rather than to wade in and mix it up.⁴⁵ There are two specific aspects of ACEVAL that appear to support this suggestion. First, much of the hope within NATO fighter units is to stay BVR (beyond visual range) and avoid dogfighting as much as possible. This plan is a good one in theory. Unfortunately, the all-aspect weapons capabilities seen in ACEVAL simply resulted in the need to start maneuvering at BVR ranges.⁴⁶ The dogfight arena, in short, was considerably enlarged by all-aspect weapons and, in general, became much harder to avoid. Moreover, once inside, the superior Blue machines (the F-14 and F-15) were only able to exact exchange-ratios high enough to justify their much greater price tags in one-on-one fights. But

... when it was four-on-four, the results were much more equal. In

massed fighting, similar to the swarm warfare everyone says would be likely in European battle, confusion plays a much larger role and exotic weaponry a much smaller one; most of the kills came from visual sightings, as they had in the dogfights in World War II (and Vietnam), rather than from the elegant, computerized systems.⁴⁷ High performance capabilities, so impressive on paper, are blunted by the disorderly circumstances of war.⁴⁸

In the long run knowing when to avoid combat may prove as important for aircrews as knowing what to do once engaged.

Exercising the Initiative. One of the assumptions made at the outset of this paper was that Pact forces would be the aggressors. From a military standpoint, this premise clearly restricts NATO's options. To appreciate the merits of preemption, one need only compare Israeli losses in October 1973 with June 1967. Preemption can be considered only if the correlation of forces in the central region ever becomes so imbalanced in the Pact favor that it is NATO's only viable military option, of course. This would be tantamount to admitting that the *raison d'être* of NATO was no longer valid and that the Alliance has failed.

However, to suggest that preemption is not an option for the West does not mean that NATO must concede the initiative. If preemption is not an option for exercising the initiative then the question is, what is left? There are at least two major areas in which the allies can take the offensive and disrupt Soviet/Pact capabilities. The first is to carry the war to the rear of the enemy. In order to do this we need to take full advantage of NATO/U.S. technology. This will require a concerted effort to match capabilities with doctrine and daring. There should be a dedicated

effort to disrupt the enemy's air capability by a vigorous prosecution of attacks on his key airfields in East Germany.

U.S. air forces have a distinct advantage over their Soviet counterparts in flying in all weather conditions. In conditions of reduced visibility, which is the normal nighttime condition and in Europe it is often the rule during the day as well, large airstrikes should be flown against Soviet Frontal Aviation bases. U.S. capabilities to accomplish this mission need to be upgraded in three areas. First, F-111 assets should be added to the theater because these aircraft have the primary mission of attacking in poor weather and at night. Presently there are two wings of F-111s stationed in the United Kingdom and two in the continental United States. The F-111s stationed at Mountain Home AFB, Idaho should be assigned to the two wings in the United Kingdom. This should add at least one additional squadron to the present forces to create two superwings. These two bases have the necessary supporting facilities and equipment to integrate these airplanes without major new constructions. These forces are required because elements of the F-111 force in the United Kingdom are probably earmarked for nuclear strike. This situation is unlikely to change until NATO Theater Nuclear Force (TNF) modernization takes hold with Ground Launched Cruise Missiles (GLCM) and *Pershing II* deployments in 1983-86. The addition of two full F-111 squadrons ready to strike in adverse weather or at night would be a significant improvement to our present capabilities.

Besides the F-111A additions there should be increased initiative to develop and deploy low cost harassment drones designed for the antiradiation strike role. The technology exists to support this mission and it should become an integral part of our interdiction forces. The view of a recently interviewed

USAF fighter pilot is that "drones are fearless."⁴⁹ His point is especially germane given the anti-aircraft and surface-to-air missiles defenses of Soviet airbases. Drones should be used in large numbers to immediately precede the attack to either force the systems off the air or to home in and attack the air defense radars if they are radiating. These weapons systems should use cluster bomb unit fractionating munitions to increase the likelihood of shredding the radar systems of the Soviet air defense unit. This is one area in which the Soviets are particularly vulnerable because many of their antennas are exposed and "soft."

The use of remotely piloted vehicles (RPVs) for the defense suppression role does not mean that F-4G *Wild Weasel* aircraft are unnecessary for airfield interdiction strikes. The only real problem with the present and projected *Wild Weasel* force is its paucity. These high value, short supply weapons systems cannot be expected to accomplish the defense suppression mission by themselves. They must work in tandem with the RPVs. During the attack itself *Wild Weasel* escorts will be expected to attack the Soviet systems that are activated and radiate. It is somewhat unrealistic to expect RPVs to be as responsive to the requisite coordination during actual attack.

A final ingredient that is absolutely necessary to insure success in the offensive air attacks described above is the use of EF-111s to provide high-power jamming. The effectiveness of the soft kill is just now beginning to be fully appreciated tactically. The U.S. Air Force projected buy of 42 EF-111 standoff and penetrating jammers was long in the making. It has been several years since the Air Force has had a powerful tactical electronics warfare capability. Indeed, the EB-66s were phased out in the first part of the 70s. This has been an unfortunate shortcoming but one that will be fully

redressed when the EF-111 enters the force. This aircraft should be assigned in squadron strength to either Upper Heyford or Lakenheath in the United Kingdom at the earliest opportunity.

Selected airfield interdiction raids should be undertaken in adverse weather because this works to our strength and nullifies certain Soviet interceptor capabilities. These strikes should be focused on the four or five Soviet airfields in East Germany that base the most sophisticated Soviet ground attack aircraft. A deliberate effort will be required to disrupt or destroy these airfields, but the risks can be mitigated and the benefits multiplied. A profile for this mission might be that these airstrikes be staged out of the United Kingdom with F-15s flying cover in the fighter sweep role. The strike should include all the elements mentioned in the preceding paragraphs. The munitions carried by the F-111s should include iron bombs, anti-personnel bomblets, delayed action fused cluster units and available precision guided munitions to crater the runways and the nuclear storage areas. The AWACS would be airborne and could be expected to vector the CAP F-15s to Soviet fighters getting airborne. The F-15s would be cleared to fire as soon as they acquire the enemy on their radars and a fire control solution is computed. The great advantage of the F-15 standoff capability will be most important and deadly in this form of counter-air engagement. In fact, it is probably in this type of engagement that the attrition models projected for the F-15 will come to fruition.

A sensitive issue directly related to the question of attrition advantages of U.S. sophisticated tactical aircraft and weaponry is the rules of engagement. AIM 7F Sparrows and AMRAAMs are designed to be fired beyond visual range. This tactical advantage should be exploited to the greatest possible extent in central Europe. The NATO AEW

aircraft can give advance notice of Soviet Frontal Aviation movements which, in theory and one hopes in practice, will allow USAF F-15s to strike these aircraft at significant stand-off distances. This advantage, essential for high attrition rates, will be obviated if we continue to require rigid positive identification of hostile aircraft. This is particularly true if we hamstring our air forces by making them have visual identification before they are allowed to shoot. This eventually would effectively negate our advantage and in fact we would be severely disadvantaged. Rules of engagement in the central region air war should be as flexible as possible. NATO fighters should be permitted to fire on radar contacts that do not squawk the proper IFF code. There should also be a provision for adopting a concept normally associated with land forces, that is, a free fire zone. NATO AEW aircraft could declare an area as hostile, all radars within this sector would be considered as hostile and subject to attack. Prior to the reconsolidation of central region air command and control this suggestion would have been particularly difficult; however, AAFCE is the perfect forum in which to perfect this doctrine and reach accommodation.

Exploiting Soviet Vulnerabilities. It is difficult to separate the discussion of exercising the initiative from that of exploiting Soviet vulnerabilities. There are, however, a couple of considerations not included in the previous discussion that are aimed specifically at trying to exploit Soviet vulnerabilities. The suggestions offered have only an evanescent relationship to winning the air battle except as part of the larger war. Specifically, in order to split Pact/Soviet air forces we should attempt to dissuade Pact members from actively prosecuting the war. This will be a difficult task, but its payoffs are worth a try. The U.S. Air Force has reduced its psychological

operations capabilities to almost a pure counterinsurgency or foreign internal defense role. There could be a role for active propaganda activities using leaflet drops to sow possible dissension among the Pact forces and Soviet troops. There should be inducements offered to East German and Czech air force elements to defect, by selective targeting and repatriation if these forces fly to the West. While this might seem to be purely illusionary, it might be successful if Soviet successes are immediately checked and an aggressive air offensive could be mounted over Pact territory to demonstrate graphically Soviet vulnerability.

Soviet success requires that second echelon forces be able to move forward and exploit breakthroughs. Soviet Frontal Aviation will have to be resupplied and moved forward if the front is to move forward at a high rate of advance. This extended logistic trail will be vulnerable to a concentrated bombing effort by a heavy B-52D saturation raid. Recent exercises of B-52s in the central region are evidence that the United States will attempt to exploit Soviet advances, possibly to include attacks of forward deployed aircraft. Such an attack should be executed against Soviet airfields because of the great psychological effect, as well as the expected destruction of the target area.

Certainly there are many other specific improvements that can be made concerning how NATO air forces are structured and employed to improve the probability of winning the air battle. Fighting a war of attrition against superior numbers by depending on advanced technology and superior aircrew quality, however, no longer holds the promise it once did. A new approach is essential if NATO seeks to achieve air superiority in any future conflict with the Warsaw Pact in central Europe.

Summary. For more than a decade NATO's approach to fighting the con-

ventional air war in central Europe has been to offset greater Pact numbers with superior quality aircraft and aircrews. The evidence presented in this paper indicates that the Pact is narrowing the gap in both areas. Consequently, the present strategy of using force multipliers to engage and destroy numerically superior forces is rapidly losing its effectiveness. The time has come when NATO must either redress this numerical force imbalance or rethink its overall air superiority strategy.

BIOGRAPHIC SUMMARY



Major Charles L. Fox holds degrees in Political Science from Seattle University and in International Relations from the University of Washington. He has served in Aide and Intelligence billets in Europe and Vietnam and was Assistant Professor of Political Science at the U.S. Air Force Academy. His papers include *The Future of the Land-based ICBM* and *The Role of the Military in Arms Limitation*. He is now a faculty member of the Management Department, U.S. Naval War College.

BIOGRAPHIC SUMMARY



Lieutenant Colonel Dino A. Lorenzini, an Air Force Academy graduate, holds advanced degrees in Business Administration and Management from Auburn University and Astronautical Engineering from MIT, receiving his Doctorate of Science degree from the latter. He has served in several Air Force engineering, research, and program management positions. His papers include *NAVSTAR Field Testing and Analysis of Joint Service Acquisition Programs*. He is now serving on the Management Department faculty of the Naval War College.

This paper offered a revised framework for structuring force choices and employment options. The primary elements of this new approach suggest ways to conserve NATO air forces, to exercise the initiative, and to exploit certain Soviet and Warsaw Pact vulnerabilities. Specific recommendations for incorporating these ideas include improved airfield interdiction capabilities, revised airbase point defense systems, increased reliance on mobility, revised rules of engagements, increased prepositioning of equipment and munitions at airbases in the United Kingdom and renewed interest in psychological operations.

None of these recommendations is easy to implement in light of political realities and resource shortages. However, recognizing the necessity for doing something different, now, is essential if we hope to escape the changing dynamics of Pact capabilities. Arguing the merits of sophisticated aircraft equipment and the capabilities of air combat pilots will no longer suffice. Either we undertake some basic changes in the way we design, structure and employ our air forces, or else we end up with little more than hope. As Sir Francis Bacon commented centuries ago, "Hope is a good breakfast, but a bad supper."⁵⁰

NOTES

1. Pierre Gallois, interview for the television documentary on the European decision to buy the F-16 fighter in lieu of the SAAB Viggen and Mirage F-1. BBC Documentary, *The Selling of the F-16*.
2. "The Price of Power," *Time Magazine*, 29 October 1979, p. 28.
3. *Ibid.*
4. *The 1979-1980 Military Balance*, reprinted in *Air Force Magazine*, December 1979, p. 123.
5. "The Price of Power," p. 28.
6. International Institute for Strategic Studies, *The Military Balance 1968-1969* (London: 1969), p. 53.
7. *Air Force Magazine*, March 1978, p. 100. An RAF assessment of the Fencer SU-19 formed the basis for this overall conclusion.
8. International Institute for Strategic Studies, p. 53.
9. *The 1979-1980 Military Balance*, p. 123.
10. Edgar Ulsamer, "New Critical Defense Deeds," *Air Force Magazine*, February 1979, pp. 27-28.
11. *The 1979-1980 Military Balance*, p. 123.
12. For an excellent exposition of this view see Philip Morrison and Paul Walker, "A New Strategy for Military Spending," *Scientific American*, October 1978, pp. 48-63.
13. James Fallows, "Muscle-Bound Superpower and the State of America's Defense," *Atlantic Monthly*, October 1979, p. 165.
14. Letter from A. Lee Harrell, 3 October 1979.
15. Lecture presented by Mike Garland during TOPGUN Class 04-75, 24 June 1975.
16. David R. Griffiths, "Navy Forms Engine Task Force," *Aviation Week & Space Technology*, 22 October 1979, p. 23.
17. "Balky Engines Ground Air Force Jets," *Washington Star*, 28 November 1979, p. 7.
18. Ulsamer, p. 28.
19. "GAO: Weapons Costs Rise Perils Quality," *Air Force Times*, 17 December 1979, p. 15.
20. Fallows, p. 66.
21. "Southeast Asia Air-to-Air Combat," *Armed Forces Journal International*, May 1974, p. 38.
22. *Ibid.*, pp. 25 and 38.
23. *Ibid.*, p. 34.
24. *Ibid.*, p. 25. What makes this case so convincing, of course, is that between *Rolling Thunder* and *Linebacker*, the Air Force did not upgrade its air-to-air training and, for 1972-73, its exchange-ratio against North Vietnamese MiGs showed no improvement from 1965-68. (For the *Linebacker* period USAF fighter crews scored 45 kills while losing 23 for a 1.96-to-1 kill-ratio,

the 1965-68 figure is 2.25-to-1 based on 81 kills and 36 losses.) There was, however, one bright spot in the USAF's 1972-73 record. The 432nd Wing at Udorn downed 33 MiGs in 1972 while losing only 5 F-4s to the MiGs (letter from Scott Smith, *Armed Forces Journal International*, October 1973). But ironically the 432nd's 6.6-to-1 exchange-ratio only serves to reinforce the case for training. The individuals who led this wing in killing MiGs were generally seasoned veterans. Steve Ritchie, for example, was not only on his second Vietnam combat tour when he scored his fifth kill, but earlier, between combat tours, he had participated in a Navy dissimilar ACT program as a USAF Fighter Weapons School instructor pilot (Donald Carson, "Dissimilar Aerial Combat Tactics: New Techniques in Battle Training," *Air Force Magazine*, March 1973, p. 58).

25. Herbert K. Weiss, "Systems Analysis Problems of Limited War," *Annals of Reliability and Maintainability* (New York: American Institute of Aeronautics and Astronautics, 1966), pp. 305 and 306.
26. *Ibid.*, pp. 306-307.
27. *Ibid.*, p. 306.
28. Terry Arnold, "Red Flag," *Air Force Magazine*, January 1977, p. 41.
29. *Net Assessment of USAF-SAF Fighter Pilot Training* (U) (Washington: Headquarters U.S. Air Force, 15 November 1978), pp. 162, 163 and para. d on p. 164.
30. The only reported combat encounter during the last decade between Soviet and Western fighter pilots occurred in the Mideast. According to the Israelis, on 30 July 1970 about 16 Soviet-flown MiG-21s jumped a flight of Israeli Phantoms that were conducting an air strike near the Suez Canal. In the ensuing melee, which also involved the Israeli Mirages that had been flying high cover for the F-4s, five Russian planes were downed with no Israeli losses (see "Against the Red Pilots," in *Born in Battle*, issue 2, *The Air War in the Mid East* (Hod Hashorn, Israel: Eshel-Dramit, Ltd., 1978), p. 50).
31. See, for example, V. Dubrov, "How Has Air Combat Changed?" *Soviet Press: Selected Translations*, No. 78-12, December 1978; also Dubrov's "Modeling of Combat Actions," *Soviet Press: Selected Translations*, No. 79-8, August 1979.
32. Some Nellis "Aggressor" pilots have observed quite substantial deterioration in the air-to-air proficiency of individual F-15 pilots after 5 or 6 months in Europe. The point is that the skills needed to cope with modern air combat are so time-sensitive that even a week or two without a good ACT (air combat tactics) training hop can be enough to necessitate several training sorties just to regain previous proficiency levels.
33. Interview with James J. Winters, F-15 pilot student at the Naval War College, 29 December 1979.
34. George Dvorchak, "Getting It on in the All-Aspect Arena," *Tactical Analysis Bulletin*, 25 July 1979. All quotes are from pp. 3-4.
35. *Ibid.*
36. John Boyd and George Burkley, PA&E Memorandum to Mr. Murray dated 29 December 1977, p. 2.
37. Dvorchak, p. 3.
38. *Ibid.*, p. 4.
39. One of the great ironies of the West's current "force-multiplier" strategy is that during World War II, victory in Europe especially in the air was not based on superior equipment; rather we buried the Germans in numbers. Striking evidence of this fact can be found in comparative sortie rates for the last 8 months of the war. During that period the American and British Air Forces in the West averaged something on the order of 35 fighter sorties (air-to-air and air-to-ground) for every one the Luftwaffe was able to put up. Joseph Reinberg, "Air-to-Air Combat in World War II: A Quantitative History," Research paper, Institute for Defense Analysis, Arlington, Va., p. 16.
40. "Quantity has a Quality All Its Own," *Allied Interdependence Newsletter* No. 13 (Washington: Center for Strategic and International Studies, 21 June 1979).
41. Robert E. Osgood, *NATO, the Entangling Alliance* (Chicago: University of Chicago Press, 1962).
42. *The 1979-1980 Military Balance*, p. 123.
43. Without the F-15's associated avionics test equipment (AIS) the AIM-7F missile system cannot be maintained.
44. "Air Power on the Central Front," *The Economist*, 17 December 1977, p. 19.
45. Erich Hartman, who shot down more aircraft than any other ace in history, was generally content to get one kill a day. His view was that in the face of Soviet numbers, it was more important to survive than to kill a couple extra bogies. See Raymond F. Tolver and Trevor J. Constable, *The Blond Knight of Germany* (Garden City, N.Y.: Doubleday, 1970), pp. 110-111. More recently, the same lesson was seen in ACEVAL. A lot of times during the test aircrews tried

to wade in and "duke it out" head to head. The result was predictable: if the other side was willing to accept a one-for-one trade, that is exactly what resulted from "duking it out" (Dvorchak, p. 9). The rub in central Europe, of course, is that we cannot afford many one-for-one trades.

46. Dvorchak, p. 9.

47. In point of fact, there was not a single ACEVAL 4 v 4 trial in which the Blue side managed to target a missile against all four Red machines at the outset of the fight. This outcome is rather sobering given the high costs of F-15/F-14 avionics together with the fact that air combat in a future war in central Europe is likely to be more on the order of 50 v 20.

48. Fallows, p. 65. The reason that the Blue machines could not do as well in multiparticipant engagements is with 6 or 8 planes in the arena, they no longer had the time needed to cycle through the basic maneuver patterns that usually decide 1-v-1 contests. Instead, the multiparticipant scraps tended to dictate a "look shoot-break look" style of fighting, with threat arrays changing very rapidly. Thus, sustained maneuvering against any given adversary even for just 20 or 30 seconds only served to give some other adversary an easy shot. Or, in Clausewitz' language, the *Friction* is much greater in multiparticipant air combat than it is in isolated 1-v-1.

49. Interview with James J. Winters, 27 December 1979.

50. Sir Francis Bacon, *Apophthegms*, Line Number 36

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"I Have Returned"*

When Doug MacArthur at last went back,
 "I have returned,"
 He followed the fox-hunting, pig-boats's track,
 "I have returned."
 Oh, the carrier planes were overhead
 And the battleship turrets spouted lead
 So the general could go ashore, it's said, singing
 "I have returned."

Cincpoa**divisions were at his side,
 "I have returned."
 And Phibspacfor***provided the ride
 "I have returned."
 Oh, the subs went up to the sea of Japan,
 And the carriers ranged from Saipan to Bataan,
 So the general could land, according to plan, singing
 "I have returned."

MacArthur petitioned God by prayer,
 "I have returned."
 But God decided He couldn't be there,
 "I have returned."
 But to help . . . God went to the utmost limits,
 For God sent Kinkaid, Halsey, and Nimitz
 And MacArthur went along to kibitz . . . singing
 "I HAVE RETURNED."

MACARTHUR AS MARITIME STRATEGIST

by

Clark G. Reynolds

Such is the image, portrayed by an unknown wartime wag, that the U.S. Navy had of "Dugout Doug" during the Pacific war—a publicity hound and strutting blowhard who reckoned himself second only to the Almighty, a landlubbing soldier with no real appreciation of the Navy and its Marine Corps; guilty, more or less, on all counts. But these superficial trappings must be peeled away from the aura surrounding Douglas MacArthur if we are to discover the essence of his strategic thinking, his maritime strategic thinking.

Maritime strategy is not naval strategy. Naval strategy may be defined as the employment of Navy forces to a specific end. Maritime strategy has a much broader scope: the combined use

*Anonymous. Sung to the tune "When Johnny Comes Marching Home" by members of Air Group Three in Yorktown (CV-10), December 1944.

**Commander in Chief, Pacific Ocean Area.

***Amphibious Forces Pacific Fleet.

FM 100-5 "OPERATIONS", JULY 1976

Defense: Covering Force.

"Corps and division commanders in the defense may use strong covering forces, at least in the initial battle. The chief mission of these forces must be to fight with sufficient strength and tenacity to force the enemy to disclose the size and direction of his main attack, and to buy time while defending forces concentrate in front of the main thrust. Reinforced cavalry is well suited for employment as covering forces."

Defense: Main Battle Area.

"In mounted warfare, armored and mechanized elements must be set in motion toward battle positions in the path of the enemy thrust. Artillery must be concentrated. The terrain must be reinforced by means of barriers and obstacles. Attack helicopters and US Air Force aircraft can concentrate heavy firepower even before reinforcing ground elements can be committed in reinforcement."

DEPARTMENT OF THE ARMY
HEADQUARTERS, 1ST BRIGADE, 3D ARMORED DIVISION
APO NEW YORK 09045

AETFOA-CO

12 June 1981

SUBJECT: Fighting

TO: All Members of the Ready First Battle Team

1. The purpose of this letter is to describe for each of you my thoughts on how the 1st Brigade Battle Team will operate during combat. My first duty as the commander is to define clearly the framework under which you will fight should that become necessary. To be successful in combat each of us must know the entire game plan before we move to the border to fight. In my opinion the key to successful tactical operations is a frequent and detailed flow of information between us, within the framework of this concept and the OPLAN.

2. Our battle is the execution of a coordinated, integrated and clearly thought out brigade plan; it is not a series of independent battalion actions. This is so for many reasons. The large area and varied terrain in the brigade sector make independent battalion battle areas vulnerable to defeat in detail. Battalion emphasis on holding specific terrain within rigid battle areas or sectors diffuses unity of effort and reduces the flexibility to occupy areas in response to unexpected enemy action. The brigade headquarters has access to communications and support resources to use more efficiently all of the fires and forces available in a concerted manner. It is the brigade plan that will stop and destroy the enemy-not the sum total of five separate battalion plans. Notwithstanding this point, I want to emphasize decentralized execution of battalion plans within the context of the overall brigade concept. You will use individual initiative pursuant to mission type orders.

3. We cannot long sustain a battle of attrition against Soviet forces. To engage in such an attrition battle is only to delay inevitable defeat. To win, we must take the initiative away from the enemy and attack him at the precise point which most quickly leads to his defeat. To do this, each segment of your planning must be responsive to the notion of "what can I do in this situation to attack, disrupt or confuse the enemy where he least expects it." Success on the battlefield lies in the ability to maneuver

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against the enemy in such a way as to disrupt his established plan, continually confront him with varying situations to which he must react, find places to attack him from the flanks and rear and ultimately collapse his capability to continue fighting in an organized manner. Detailed planning for the defense of a specified piece of ground must be replaced with an equally vigorous effort in planning to maneuver against the flanks and rear of enemy formations. We must change our thinking for the probability of kill (Pk) to the probability of collapse (Pc). I expect this concept to be applied locally at battalion level and within the brigade concept.

4. To do this, the battlefield must be structured so that the enemy reacts to our initiatives rather than the reverse. All of the resources available to the brigade must be planned to support the overall concept of operation. The capability to maneuver is created by structuring the battlefield with fires and obstacles to force the enemy to go where we desire in the formation we desire so that he can be attacked and destroyed with the smallest cost in lives and equipment. The focus of the 1st Brigade will be forward into the enemy's rear rather than on successive positions backward into our rear. One additional benefit to this concept of fighting is obvious. If each component operates within an overall structure-the brigade battle plan-and each component knows what the other is supposed to do, the ability of battalion and company commanders to take the initiative is enhanced. The battle can then continue successfully even in the absence of clear orders or less than perfect communications.

5. The ability of each of us to execute a concept of this nature depends on four critical issues:

- Knowledge of the Terrain.
- Quick/Correct Decisions Based on Limited Information.
- Rapid, Controlled and Coordinated Maneuver.
- Coordination and Application of Combat Multipliers.

Knowledge of the Battlefield is our most important asset! Without it, a concerted brigade plan is impossible. I will therefore accept nothing less than complete familiarity with the battlefield on which we must fight. I expect each leader to know the location, size, direction and extent of each avenue of approach into his area of responsibility. General familiarity with all of the major avenues of approach into the brigade sector is mandatory. Each leader must be able to describe in detail the number, type, formation and rate of presentation of enemy vehicles along each avenue of approach for which he is responsible. I expect each leader to be able to describe in detail his plan for destroying enemy formations to include control and distribution of all available fires, and the amount of time and resources necessary to do it. In those instances where insufficient combat

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resources have been allocated to destroy all potential enemy targets, I expect leaders to know what additional resources are necessary in order to do so. Supporting arms and services must be able to describe the impact of the terrain on the weapons and equipment for which they are responsible. Soldiers must know the terrain over which they will be fighting. This is essential for two reasons. First, familiarity with the terrain ties the soldier to some tangible evidence of his mission and importance to the overall plan. Secondly, if your soldiers know the terrain, you are more apt to put confidence in the reports they submit. After all, it is their reports upon which you base your tactical decisions. Finally, knowledge of the terrain allows ;you to think ahead to war game and develop alternative courses of action. The secret of collapsing the enemy's ability or will to fight is in presenting differing situations to the enemy that his decisionmaking process can handle. By knowing the terrain and planning ahead, we can take the initiative based on a well conceived plan rather than as a reaction to the situation.

Quick/Correct Decisions Based on Limited Knowledge is an unavoidable consequence of combat. While one never has complete knowledge, an understanding of the terrain and enemy doctrine can more clearly define what is possible. Knowing what is possible reduces the scope of the problem to solvable limits and allows quick, correct decisions. I encourage independent decisionmaking within the framework of the overall brigade scheme. However, units cannot independently move about the battlefield, rather this maneuver must be within the context of the brigade battle plan. My job is to orchestrate the maneuver battle. Battalions must concentrate on the direct fire battle. Initial and subsequent missions given to the battalions will reflect my appraisal of the entire brigade battle. My guidance will be specific based on each phase of the battle and commensurate with the overall battle scheme. Some battalions may have to go without needed resources because they have been applied elsewhere to ensure the success of the entire defense. The brigade plan will be developed as I have previously described to such an extent that we should be able to predict several alternative courses of action for each battalion during progressive phases of the battle. The brilliant surprise stroke by a company or battalion which we seek in combat will be possible only with such planning, because we will have structured our battlefield to enhance our operations. Finally, quick/correct decisions can be made only if the commander is in a position to do so. That position is well forward at the critical place of battle. Each leader must be able to look his soldiers in the eyes and know whether or not they, and we, can accomplish the assigned mission. In my view, the ultimate art of leadership is knowing how much strength our soldiers have left and then finding a way to apply that strength to destroy the enemy.

Rapid, Controlled and Coordinated Maneuver is the essence of an armored or mechanized brigade. The overall plan must cue leaders on when and where maneuver is necessary. Regardless of the circumstance, though, the response must be instantaneous and called for. Thorough planning, good communication and traffic control are absolutes for instantaneous maneuver.

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Soldiers must know what they are supposed to do and why. Our soldiers will respond quicker if they know what the mission is. All leaders must be able to describe in detail the plan for maneuver both locally in the battalion area and within the context of the overall brigade plan. This includes preparation and movement times, routes, objectives and expected results at the termination of the maneuver.

Coordination and Application of Combat Multipliers is essential in overcoming current force ratios. Even if our equipment gives us a 5:1 ratio over the enemy, his overwhelming superiority in numbers will eventually produce the sixth vehicle. Combat multipliers are those measures both tangible and intangible which increase our capability to destroy the enemy. On the tangible side, emphasize the advantages gained from the terrain. Know movement and presentation rates in your area. Know the impact of intervisibility segments on engagement times and missile flights. Know which enemy vehicles, if destroyed, most effectively disrupt his attack. Know how much benefit can be derived from the placement of obstacles in one area over another. Know how to use smoke and how to counter enemy use of it. Know the best covered and concealed routes to positions on the enemy flanks. Know how to use them at night. In short, know the impact of each increment of combat power added or subtracted from the battle. On the intangible side, seek ways to confuse, disrupt or slow the enemy. Know the value of troop morale. Look for ways to attack the enemy from unexpected places. Know how your plan fits into the brigade scheme. Plan ahead by war gaming possible enemy actions. Develop a plan for each possibility. Leave nothing to chance. As I have previously stated, hope is not a method.

6. A perplexing problem of modern battle is the conflict between concentrating to defeat conventional attacks and the vulnerability of concentrated units to enemy nuclear (and chemical) weapons. Each position that is occupied must be analyzed in terms of the impact of nuclear and chemical weapons. To do this, both you and I must become expert at templating positions or groups of positions to determine the relative vulnerability of our defense. Positions must then be readjusted to prevent wholesale destruction of units by single weapon systems. The integrity of the defense is maintained through maneuver--the movement of forces rapidly from dispersed, protected positions to the critical point of the battle--destroy the enemy and return to protected positions. Units must develop detailed plans for hasty decon, actions subsequent to NBC attacks, monitoring and reporting contamination, individual dosage levels and unit readiness to fight under the adverse conditions imposed by nuclear and chemical warfare. Above all, however, units must be prepared to take advantage rapidly of friendly nuclear and chemical weapons and to react to enemy use of such weapons.

7. Finally, each of us must be proficient with the tools available to defeat the enemy. Just as the TOW gunner must know how to set up and engage targets with his weapon, the commander and his staff must be competent in

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planning ahead, introducing combat power where and when it is needed, knowing the effects of various weapons and integrating fires and support together to obtain effects greater than the sum of the parts. This is most clearly illustrated in the ability of commanders to plan, distribute and control the multitude of ground and air delivered fires and obstacles in a manner that not only destroys the enemy but at the least cost in weapons expended.

8. In summary, I believe that to succeed against our enemy we must:

--Develop sound plans within the context of the brigade concept of operation.

--Know the terrain.

--Seize the initiative and attack.

--Avoid attrition battles-use maneuver to collapse the enemy's capability to fight.

--Become more aware of the effects of nuclear and chemical weapons.

--Learn to be expert with the tools of our trade.

We must plan our fight and fight our plan.

9. Ready First!

GORDON R. SULLIVAN
COL, Armor
Commanding

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