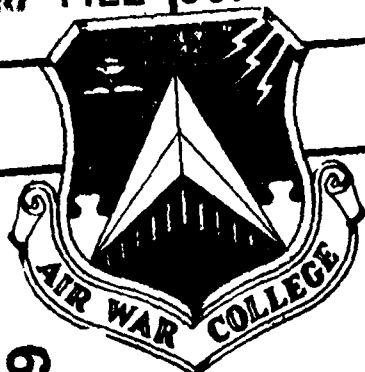


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# AIR WAR COLLEGE

## RESEARCH REPORT

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THE VALIDITY OF CONVENTIONAL ASSUMPTIONS  
CONCERNING FLEXIBLE RESPONSE

LT COL MARIE J. GUTIERREZ

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## EXECUTIVE SUMMARY

TITLE: The Validity of Conventional Assumptions Concerning Flexible Response

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The North Atlantic Treaty Organization (NATO) is an alliance for collective defense. Made up of 16 countries, NATO has been a successful alliance because there has been no war in Europe since 1945. In 1967, NATO adopted the strategy of flexible response, a strategy dependent upon conventional, tactical nuclear, and strategic nuclear weapons to provide deterrence from a Warsaw Pact attack. (1:27)

Although successful, NATO is suffering from an erosion in conventional strength. (2:405) (3:10) NATO continues to make assumptions about its conventional capabilities to successfully meet the requirements of the flexible response strategy. In the present day world of NATO, there is limited funding, a fact that is not likely to change any time in the foreseeable future. Limited funding makes it impossible to buy all the conventional force structure needed to ideally support the current strategy, also a fact that is unlikely to change. This paper will show limitations in some of the ways NATO assumes it can conventionally perform its mission. It is the author's position that NATO should modernize its conventional thinking to make it more in line with the realities of the situation NATO finds itself in today.

#### BIOGRAPHICAL SKETCH

Lieutenant Colonel Marie J. Gutierrez is an aircraft maintenance officer with five years experience in Europe. She served two years as a fighter wing maintenance squadron commander in a unit assigned to the United States Air Force Europe (USAFE). During this time, she was selected as USAFE's outstanding maintenance officer of the year for 1986. She then served as a NATO assistance chief of staff for logistics at the allied tactical air force level. Lieutenant Colonel Gutierrez is a 1989 graduate of the Air War College.

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## CHAPTER I

### INTRODUCTION

In December 1967, NATO officially adopted the solely defensive strategy of flexible response, a strategy that does not provide for any unprovoked, offensive use of NATO military capabilities. (4:3) (5:27) Flexible response is based on an integrated linkage between three elements of a triad: United States and United Kingdom strategic nuclear forces, NATO's theater nuclear forces, and NATO's conventional forces, and was developed specifically to move NATO away from the trip wire response strategy of the early 1950s, where any break in the front line would have triggered a massive nuclear retaliation from America. (6:12) (4:7) Important components of NATO's flexible response strategy are the linkage between the elements of this triad and NATO's capability to deliberately and in a controlled manner, escalate to the level necessary to win any conflict. (7:99) (8:51,52) The strategy is based on adequate forces and on the uncertainty in the mind of a potential aggressor as to NATO's response to his aggression. (6:133) In March, 1968, NATO reaffirmed flexible response as a viable strategy. (3:5)

This paper will address some of the overall assumptions concerning the conventional aspect of flexible response. One of the most important of these assumptions is that NATO troops positioned forward along the border between the two Germanys can hold until reinforcements from the United Kingdom, the United States and Canada

arrive. Another is that NATO will in fact have the will and the physical capability to reinforce before the Warsaw Pact can break through. Third, is that adequate logistical and combat support will be available to provide for an adequate defense. Next, is that NATO tactical air will be able to seriously degrade the Warsaw Pact follow-on echelons; thereby, cutting the force ratio between NATO and the Warsaw Pact down to a more manageable size. The last is that NATO tactical air can provide enough air defense to allow both intheater and reinforcement troops to perform their critical duties. The point of this paper is to show that these particular underlying assumptions about the conventional part of flexible response are at the best questionable, and more likely invalid. There are other assumptions about NATO's conventional capabilities, but they will not be presented as part of the author's argument. At the end of the paper, the author will offer some recommendations that could help modernize conventional thinking to make it more compatible to the realities of the present day situation in NATO. The more realistic conventional thinking is, the more likely it is to be able to adequately support the strategy of flexible response.

## CHAPTER II

### THE CONCEPT OF FORWARD DEFENSE

The first assumption is that the forward defense could hold until reinforcements arrive. A Soviet attack on NATO would be met by a NATO covering force, consisting largely of armoured cavalry formations deployed well forward along the German border. (6:12) (Appendix A) NATO has a forward defense along the East German border because in NATO, the land of one ally cannot be sacrificed to protect the others. (9:11) Since over one-half of West Germany's heavy industry and one-third of its population reside within 50 miles of the intra-German border, any strategy that did not involve forward defense would probably not be supported by the population. (10:32) (11:9)

NATO has a strategic disadvantage in that it is long and narrow and has little depth for maneuver. The lack of depth in the region discourages plans for wide-ranging defensive maneuvers, and carries with it the risk of penetration and encirclement. (10:32) Soviet doctrine calls for maintaining continuous pressure on one or more points with front line and then follow-on forces which would increase the force ratio over time. (12:170) Once a breakthrough is achieved, operational maneuver groups (OMG) and assault units would pour through and encircle and destroy NATO's ground forces, overrun air bases and destroy nuclear forces before they could be used. (12:171)

NATO's aim is to lose as little ground as possible and confine damage to a minimum. (2:409) This includes the recapture of

lost territory. Any substantial loss might prompt Germany to consider whether it is worth fighting on. (6:13) A prepared defensive position would help but NATO has none, (a political decision), and thus it has lost some of the advantage of fighting from the defense. (12:170) Therefore, the majority of NATO's forces are committed defending the front line.

NATO is outmanned and outgunned at the point of the expected attack. (13:29) (Appendix B) In fact, NATO does not in any way have numerical superiority. (43:115) The U.S. is short 100,000 troops in Europe for meeting M day requirements, and must depend on timely reinforcements. (14:41) The Soviets would in particular seek a quick victory using this favorable balance of force that would exist at the beginning of a war, because they realize that the West's greater manpower and industrial might would ultimately favor the Alliance. (10:40) (15:20)

Some major NATO units are kept at high readiness--U.S. armored cavalry regiments, about one-fifth of West Germany's divisional forces, and other selected units from other allied armies. (10:48) Other U.S. forces are fully manned but would take at least one day to reach the front. Other allied units tend to be less fully manned, with support shortfalls, and would need about three days to achieve wartime strengths and replace conscript trainees. Some estimates are that up to 50 per cent of the forces critical for the front line are maldeployed, and the forward defense line could not be fully in place until the fourth day of the mobilization. (16:37) (10:48) (17:26)

NATO does not have any robust operational reserves in the European Central Region. (18:16) For example, the main reserve force for the critical North is the American Third Corp, most of which is stationed in the U.S., and many of the units relatively promptly available in theater still need some time to mobilize. (19:183) This shortage of operational reserves is potentially one of NATO's worst problems. (10:37,38)

The Allied Command Europe Mobile Force, comprised of 5,000 men, was developed in 1976 to give NATO the capability to promptly inject forces into an endangered locality, but it suffers from the inefficiency of being made up of personnel from seven nations, using a multitude of equipment and munitions types and being supported by seven different logistics trains. (20:57) (21:26) France has 280,000 men as trained army reservists alone, but if France is to fully support NATO in war, such issues as whether or not its airfields can receive American transports (both physically and politically) must be resolved. (10:89)

#### Equipment Shortfalls

If war comes to the Central Region, the tank would be the centerpiece of any attacking force. (22:96) (23:53) The Warsaw Pact forces have a numerical edge over NATO in main battle tanks, armored fighting vehicles, and artillery and rockets (Appendix B).

Because of the new reactive armor of Soviet tanks, the anti-tank guided missiles NATO has long counted on to even the odds may

prove ineffective, because reactive armor can blunt the effectiveness of a missile by as much as 80 per cent. (23:52) The latest version of the missile, designed specifically to counter reactive armor showed in tests it was already outdistanced by the latest Soviet armor developments. (22:96) (23:53)

Over 1,800 of the Soviet tanks have been upgraded with the 125mm gun. (24:55) Currently, only 35 per cent of NATO tanks are the premier U.S. tank, the Abrams MIAI, and only 35 per cent of these tanks have the more powerful 120mm gun versus the 105mm gun. Approximately 40 per cent of the German inventory is the newer Leopard II, with the 120mm; and only 30 per cent of the British Army on the Rhine is equipped with the latest Challenger. (23:53) The Belgic are critically behind in their tank modernization. (23:53) The MI carries only forty rounds of 120mm as its basic load, which Army planners estimate will be used up the first day of the defense, and only enough fuel for six hours, whether moving or idle. (22:99)

The Army estimates that more than 70 per cent of the vehicles of the covering force would be lost or disabled on the first day. The defending brigades and battalion tank forces would expect to lose more than 50 per cent of their vehicles on the first day and 14 more the second. (22:96) The current tank recovery vehicle, the M88 whose job it is to remove disabled tanks from the battlefield can not tow the MIAI, nor the modified version of the M60. (25:16) Since the Army lacks a maintenance vehicle to support maneuver forces, such as armor and mechanized infantry; it must rely on a modified version of

the M113 armored personnel carrier, which has only 30 cubic feet of space to carry tools, fuel, test equipment, and spare parts, and no crane for doing larger repairs to engines and other heavy equipment. (25:21)

The Soviet replacement of armored personnel carriers with the BMP 060 mechanized infantry combat vehicle has enabled Soviet infantry to fight without dismounting. This capacity is denied NATO mechanized infantry divisions because except for those divisions attached to the Bundeswehr, NATO is for the most part, still tied to technologically obsolescent armored personnel carriers. (6:8) While the Army has decided to retrofit the Bradley fighting vehicle with reactive armor, troops will not see the new Bradley until 1990, and then only in limited numbers. (23:53)

## CHAPTER III

### REINFORCEMENTS

The plan is for major NATO combat formations in Europe to hold the line until reinforcements can be brought in from the United Kingdom, the United States and Canada.

#### The Will to Rapidly Respond

The goals, doctrine and tactics of the Warsaw Pact are all designed for one thing--victory. The Warsaw Pact is not hampered as NATO is, by being an essentially defensive (both militarily and politically), democratically controlled alliance, and they will take the war to the enemy. (12:170) For NATO to even successfully stabilize the situation if it were attacked, a multitude of events have to work like clock work and a long list of potential show stoppers would have to be eliminated. Rapid warning and quick reaction are especially critical since Soviet forces are forward deployed. (17:26)

Rapid warning and quick reaction are dependent upon members of NATO being willing to respond to ambiguous signals, while knowing that their response in itself, could be provocative. The Warsaw Pact will do all it can to capitalize on and increase NATO's reluctance and confusion in interpreting political and military warning signs of an impending Pact attack. Their aim in particular is to delay NATO's mobilization plans by confusing NATO as to when and where the attack will be. (12:170)

Rapid reaction predisposes a cohesive, coordinated group that could quickly act as one body. NATO is a protocol headquarters,

with all troops marching to their own national drumbeat. (26:65) All 16 nations have an equal voice, and unanimity is the rule for decisions.

(26:65) NATO would need time to digest national intelligence reports and convene the North Atlantic Council, then the Council would need to reach a unanimous agreement before NATO could declare the higher alert levels necessary for reserve mobilization and large scale troop movements. (26:65) The headquarters of Allied Forces for Central Europe has virtually no control during peacetime over the activities of the several member forces, nor does it have a charter to bring the several component nations together into a truly combined planning system.

(21:126) (18:20) There are insufficient allied war headquarters manned in peace time; and insufficient exercises in which national forces are an ever changing group have participated in NATO exercises where they would become personally aware of the problems they would face. (27:29) (21:257, 258)

Each democratic nation must move within its own national legal procedures to authorize essential warning measures while knowing reinforcement in itself could seem threatening and might bring on the attack it hopes to prevent. (27:29) (10:55) In 1968, while Soviet tanks were moving into Prague, NATO suspended reconnaissance flights and small ground reconnaissance units on the border were ordered not to dig in because NATO leaders did not want to appear provocative. (12:169) Thus, during one of the most critical crisis NATO has ever known, it did not increase readiness, but actually decreased it. (12:169) (18:113) And it must be remembered that even

the vigilant, aggressive Israelis were taken by surprise in 1973.

(12:169)

As for cohesiveness, many experts believe there is no way all 16 nations would agree to attacking Russia, even if one nation wanted to do so (a fact that would particularly be crucial in an early on follow-on forces attack (FOFA). (38:6) NATO discord today over whether or not the Alliance needs reshaping is believed by many experts to be different and may be more serious than at any time since its founding in 1949. (29:34) (30:4) (6:5) Western Europe maintains 3,500,000 personnel on active duty, compared to 2,100,000 for the U.S. and in a war, the allies would provide sixty per cent of NATO ground combat power and 50 per cent of NATO's air combat power. (29:40) The result is the U.S.'s dominant position in the Alliance has been somewhat neutralized. The allies are bent on asserting themselves and having a greater say in all policy making. (29:34,39) It is very unlikely they would unquestionably listen to U.S. direction to start procedures to reinforce.

As important, many Europeans believe that the U.S. is trigger happy and think the U.S.S.R. and the U.S. should be placed on the same moral plane. (6:138) The generation who were alive during World War II is growing old. The younger generation sees the military preparedness as unnecessary extravagance and the presence of troops in Europe as abnormal, and something the U.S. would not tolerate if the situation were reversed. (31:99) Recent German polls show that the U.S.S.R. is viewed more favorably, by a comfortable ten per cent margin, than the United States. (31:99)

Citizens of NATO particularly in Europe, are the targets of a well-financed, centrally directed Soviet campaign which fosters policies, activities and movements which are designed to undermine NATO resolve. (29:36) The Soviet peace offensive aimed at giving the Russians a benign image was so successful that without reversing or even slowing force deployments against NATO, the Soviets have convinced large segments of the public that the dangers of Soviet Power are remote. (29:36) (15:3,49) The seeming unlikelihood of something happening that would make it worthwhile for the Soviets to risk nuclear destruction by pouring through Germany and on across the continent makes the situation even more dangerous. Since there is no blatant reason for NATO and the U.S.S.R. to go to war, a reason, if it comes, will probably be over something subtle or something at first thought to be minor. (18:112) This fact increases the likelihood of surprise.

The Soviets have decided that if they are to progress technically and economically, they must have foreign investors. If the Soviets want to have a vital role in the international economy, they must have domestic economic reform and restructuring, but at the same time, the Socialist countries are also virtually the only real untapped markets left. (32:1089) Moscow has accepted billions of dollars of new credits from eager banks in Germany and Italy and is negotiating more with Britain. (33:1) (34:42) The Soviets are also approving more liberal terms for foreign business partners, including a decision to let capitalist partners own controlling interest in joint ventures. (33:1) A June 1988 agreement between the European

Community and Comecon, the Soviet led trade block, opened the dollar for further trade relations not only with the Soviets, but with the Warsaw Pact countries individually. (34:42) Western loans are said to free the Soviets to spend as much as 15 to 20 per cent of gross national product on defense, but that fact has not slowed down the new Western willingness to cooperate and develop ties. (34:42) Each step taken to solidify East/West contacts, especially between powerful, influential people or institutions who would stand to lose large sums of money if relations even worsened, let alone resulted in war, make a consolidated will to rapidly respond even less likely to happen, and NATO cannot afford the time.

#### Reinforcement Capability

Major problems would still exist even if NATO was able to muster the will to move rapidly and intheater forces were able to temporarily hold the line. Within ten days of a decision to mobilize, the U.S. is committed to raise its strength in Europe to ten Army divisions, 60 tactical fighter squadrons and one Marine amphibious brigade. (35:38) The U.S. has limited strategic airlift and sealift capability and an acute shortage of arms and equipment prepositioned on the continent. The U.S. would use 70 C-5, 234 C-141 and 227 commercial jet aircraft to reinforce Europe in the first 30 days of the conflict. (6:15) Following the decision to reinforce, it would take 10 days to transport the first division, even with most of the unit's heavy equipment stockpiled in Germany. Transporting three

more divisions could take three weeks. (6:15) The C-5 is the only aircraft that can airlift the MIAI tank, and it can airlift only one tank at a time, and a mechanized infantry division has 250. It would take nine round trips using 70 C-5s to transport the tanks of an armored division, assuming the airfields in Germany would still be available for use. (6:15) (35:38) In 1988, the Air Force told Congress that counting every airplane it could lay hands on, including the Civil Reserve fleet, it could only provide 45,400,000 ton miles of strategic airlift per day of the 66,000,000 ton miles required. (36:20)

For the Marines, a trade-off between greater amphibious assault capability by buying the MIAI tank, M-198, 155mm howitzer, air-conditioned landing craft and the CH-53E Sea Stallion helicopter, has created severe problems in getting to battle, moving equipment ashore, and supporting it on the battlefield. (37:42,48)

The Army support structure could not handle the arriving augmentation forces, so many of the mobilized units would stay at home, awaiting support. (14:41) European reception areas for Military Airlift Command aircraft are limited to a few full support bases. Prime targets for enemy aircraft, these points of embarkation will be seriously hampered by such things as the evacuation of civilians and the fact that the thousands of civilian host nation support personnel, without whom the reinforcement would be impossible, do not train in chemical protective gear. Also, these ports have very few fixed air defenses. (38:40) (39:39) Since a war in Europe would probably

not happen in isolation, personnel specialized in handling material in-theater may have already been sent to the Middle East or elsewhere.

(21:138) In fact, if the U.S. wants to take pressure off the Central Region, it may have to start something elsewhere and be prepared to support this additional effort.

Airlift aircraft are sturdy and capable of hard work, but are also susceptible to the many limitations of trying to fly during war-time. Even the C-130 is only marginally better at surviving gunfire and missile damage than the C-141. (40:48) Heavy take-off weights increase the danger if battle damage causes the loss of wing or tail surfaces or an outboard engine; and none of these airplanes can handle an airborne fire, especially with troops and ammunition on board.

(40:48) None can outmaneuver a fighter or helicopter gunship, none have on board self-defense missiles, and none can rapidly accelerate.

(40:48) The likelihood of all airborne reinforcements reaching Europe is slim.

In an emergency or war, 95 per cent of the materiel and supplies for reinforcing nations will move by sea. (5:110) In fact, the entire structure of the U.S. strategy depends upon seapower, and the ability to reinforce and resupply. (41:13) At present, the number of preferred ship types to support rapid reinforcement plans is dwindling as modern container ships supplant conventional freighters and as many NATO nation flag fleets decline. (42:32) Over 25 per cent of those available, fly flags of convenience and are not worked into NATO planning. (42:31) No matter when the war comes, a certain

percentage of the ships available would be at the wrong place, and would need to return to port to be changed from peacetime to wartime configuration and loads.

Ships are also very vulnerable and must be protected by the NATO navies and air defense. The interdiction of Western sea lines of communication has been a long-standing mission of the Soviet Navy. Although in the early nonnuclear phase of a war, the Soviets are expected to assign only a relatively few attack submarines to disrupt reinforcement, the ability to attack and sink any type of surface shipping is a critical facet of Soviet maritime strategy. (43:83,86) The antiship category of ships and submarines has grown both quantitatively and qualitatively during the 1980s, particularly in the antiship missile capability. (43:86) The Soviet stockpile of hundreds of thousands of mines and the large number of mine delivery platforms are evidence that mine warfare will play a key role in denying easy access to ports of debarkation in Western Europe, and will complicate operations in Greenland, Iceland, and Norway waters. (44:8)

The number of ships involved in the reinforcement means a sizeable problem with protection. To convoy for protection would add approximately five days to the Atlantic trip. A route designed to avoid most of the threat would add another five days. The shortages of appropriate escort vessels and the fact that ships go at different speeds further complicate the problem. (45:60) Each day added makes it less likely for reinforcements to arrive in time.

Air Force air defense assets will be tied up with their

mission on the continent. The Atlantic Command's ability to keep the sealanes open is a key issue. A criticism of the U.S. navy, who would be largely responsible for protecting this shipping, is that it has been so intent on shifting to a new era of electronics, including more weapons and platforms topside, it compensated for the extra weight by building aluminum superstructures, resulting in exposed soft targets. (46:25,26)

The Navy expects at least 10 per cent of the fleet to be damaged, sunk or lost during the first six months, with those ships that survive, losing 75 per cent of mission effectiveness. (47:34) At present, 11 Navy tenders are tasked to do fixes. A repair ship that could handle from hull work to sophisticated electronic gear, including anti-submarine helicopters, will not be available until 1995. (47:34)

A shortage of skilled ship workers and spare parts, especially electronics would cause problems in a surge situation. (47:36) The miles of electrical wiring and the hundreds of computer chips in today's ships, both things easily damaged by not only weapons but corrosive sea water that would be used to put out fires could cause some repairs to take months, as repairmen try to locate a problem wire or semiconductor. (47:36) There is no backlog inventory of electronics, fire-control systems, communications gear, and ship weaponry-systems that take a year or more to produce. (47:36) The Stark, for example, in peacetime will spend at least a year in repair and in wartime, it would take a minimum of 45 to 60 days. (47:36)

## CHAPTER IV

### LOGISTICS AND SUPPORT

To win in combat, NATO forces must have the power to fight during and beyond the initial period of combat. Combat support creates and sustains warfighting capability by organizing and equipping for optimum employment. It is an activity that exists on the battlefield, throughout the theater and even in the national industrial bases of the nations involved. (48:3-1) To successfully support a war in the Central Region, the right people, the right operational weapon systems, and the right support equipment must be at the right place at the right time, doing the right things. They must be rapidly mobile, and for a war in the Central Region, they must undoubtedly be available in huge numbers. A completely supported, maximum combat capability would be particularly crucial in the dangerous first hours of any conflict in Europe, and it must be backed up with the capability to sustain.

The various nations involved must be driven by a single minded pursuit of victory that would eliminate all national economic and political parochialisms that inhibits maximum combat efficiency. But that is not the case in NATO. All nations provide for their own logistics support. (5:24) Potentially show stopper type munition and equipment shortages, lack of standardization, and the lack of interoperability exist throughout the NATO support system. These factors keep NATO from enjoying the synergetic effect a truly combined team logistic effort would give the Alliance.

In 1978, during exercise Nifty Nugget, the first federal government conducted, full scale, simulated mobilization exercise in 30 years, 400,000 troops were "killed" in the first weeks, because they ran out of artillery shells, tank rounds, and other ammunition. (35:38) Although progress has been made, it is still not sufficient. (35:38)

For years, the U.S. has transferred an increasing portion of its logistic support to allied host nations. If past exercises are any indication, some U.S. reinforcement units might arrive only to find such things as their critical support in another country, fork-lift operators who can not reach cargo bay doors, and fuel support promised to a U.S. tank battalion provided in a tractor-trailer, with no cross-country capability. (49:30) Because host nation support (HNS) relies heavily on local reservists, and civilian trucks and transports, HNS agreements are almost impossible to test. (49:31) Each HNS agreement is activated by a different political and legal system, and little has been done to coordinate interaction and overlap. When representatives of the U.S. Federal Emergency Management Agency asked countries to identify civilian assets available, they found much of the information protected, and there is no way of knowing what might be earmarked for two or more conflicting roles. (49:32)

Since officials on both sides of the Atlantic admit that the U.S. cannot live up to its commitment to provide 10 divisions in 10 days, HNS planning is further complicated because nobody knows realistically how many can come and in what time frame. (49:34) Although

the 93,000 reservists earmarked for wartime HNS duty, have all completed their 15 to 18 months of active service, they are called up for only one two-week training session every two or three years. It will be well into the 1990s before all the reservists have had even two weeks of training at their HNS tasks. (49:36) Although officials have already seen potential shortages in several HNS specialties, critical support is still being entrusted to these units, such as putting 50 per cent of U.S. ammunition stocks in their care. (49:34,36)

Once reinforcements arrive in theater, the operation of the Federal Republic of Germany's railroad is carefully planned, but also operated by civilians who cannot be guaranteed in war. (50:76) Both road and rail will be highly susceptible to sabotage, the controlled or uncontrolled movement of refugees, and attacks by armed helicopters and chemicals. (50:76) NATO does not have the air defense assets to protect all lines of communication (LOC) and most run essentially north to south, parallel to the forward edge of the battle area. (51:197) (52:116) Supporting the northern and southern flanks is even tougher, where poor LOCs, rugged terrain and sparse areas of population will also cause an already overtaxed airlift system to do more work. (53:23)

#### Spare Parts and Ammunition

Because of both economic and political reasons, the allies have been reluctant to strengthen NATO's force of fighters, missiles, tanks and other nonnuclear arms, all made especially critical by the

intermediate nuclear forces agreement. As a result, there are shortages in support unit readiness and availability; prepositioning of material configured to unit sets (POMCUS); preferred munitions; equipment spare parts; and medical supplies. (17:29) (24:60) (14:42) NATO also lacks sufficient war reserves to replace battlefield losses and expenditures. (13:30)

There is no plan that integrates U.S. national political and military strategies to all of U.S. national resources that could in one way or another affect a war effort in the Central Region. (54:34) In Europe in particular, there is also widespread concern that embracing strong conventional military forces may suggest unwillingness to use nuclear weapons, thus calling into doubt the heart of the Alliance deterrent strategy and increasing the risk of Soviet aggression. (29:36) Aggravating the problem is the fact that the Pentagon emphasizes war-fighting versus deterrent weapons. (29:36) (54:34)

The U.S. is expecting weapons to be delivered to the target when critical jet engine and other spare parts are not available except for cannibalization of assets in the field. (13:30) (54:34) For example, in one year for all 210 jet engine spares that were reviewed, the average procurement lead time was 16 months. (54:34) The number of aircraft spare parts produced by foreign sources rose from 13 per cent in 1980, to 25 per cent in 1984. Fifty to sixty-five per cent of all new weapon systems are comprised of subcontractor parts. The F-15 has 75,000 component parts, produced by 300 major contractors and thousands of vendors. To add one additional F-15 aircraft to the

current production schedule would take 39 months, because of the non-availability of component parts. (52:14)

NATO has consistently lost ground relative to the Warsaw Pact in virtually all areas of conventional weapon numbers. (11:6) (2:405) Procurement of modern munitions has been slowed by budget constraints. (48:3-4) Immediate, immense firepower may be the only means of halting an invasion well forward, but there is a general shortage of artillery and missiles. (6:15,16) Ammunition requires as much as 20 times excess capacity to bridge the gap between peacetime consumption and wartime requirements. (55:52) Ammunition is not needed in peacetime and most NATO ammunition plants are privately operated, profit-oriented companies that will be unlikely to ever invest their own money on their own for wartime production requirements. (56:65) Industry is not even meeting regular ongoing requirements, let alone showing the capacity to surge. (21:222) Anything approaching an adequate wartime production base, could probably never run at an efficient rate during peacetime. The fact that U.S. stockpile levels were almost depleted, helping Israel in the 1973 war emphasizes the importance of these production bases being available. (57:48)

After nearly eight years of talks, in January 1978, NATO members tentatively agreed to a modest stockpile of surplus munitions to offset critical shortages in southern-flank countries like Greece, Turkey, and Italy, (the northern and southern flanks are recognized as having the most critical munitions shortcomings). (57:48) This effort was purposely kept off future meeting agendas because the

Germans were afraid that it might be a first step towards common funding of munitions, and nobody wants to commit to his share of the funding unless everybody does. (57:43)

The U.S. is the only country in the Alliance to have even reached the 30-day level of munitions stockpiles commonly agreed upon in 1978, and even 30 days is considered an interim level. (57:44) Overall, levels of NATO munitions stockpiles have improved only marginally since the predecessor to General John R. Galvin, Supreme Allied Commander Europe, General Bernard Rogers stated that ammunition shortages would force him to retaliate with nuclear weapons within only a week to 10 days. (57:44) General Galvin has stated that NATO could last perhaps two weeks, versus the Warsaw Pact who is thought to have 60 days of ammunition in its stockpiles. (57:44) Ammunition is also poorly located (most sites are concentrated, making them a temptation for air attack or sabotage) and poorly protected. (21:23) Also, the shortage of space makes it hard to preposition. (48:3-5)

National priorities and procedures have left NATO with a disparate arsenal of weapons, that are not only often specific to individual countries in terms of training and familiarity, but also in the basic logistics support required to keep them operating. (58:15) The Alliance's four main battle tanks for instance are produced in five different countries, (there are eight battle tanks, in the Central Region, requiring four different types of ammunition). NATO fields 23 different types of combat aircraft, two dozen anti-tank weapons, 100 different tactical missiles and more than 50 types of

ammunition. (58:15) Fifteen years ago, the 155mm, the backbone of NATO ammunition, was basically a U.S. round with U.S. standards, but now it is developed by different countries who have their own cannon and ammunition, and often have different bores and firing mechanisms. In fact, the 155mm is represented by 180 different components throughout NATO. (58:15,19) (24:60) During one NATO exercise, Norway was forced to withdraw from the exercise for 16 hours to take their ships back to port because Norwegian fuel nozzles were incompatible with those on the U.S. Navy refueling ship. (58:16) The result is troops will be expected to fight side by side with ammunition and equipment that cannot be used, repaired or serviced by each other. (59:5)

Many items are covered with protectionist laws such as the U.S. Arsenal Act which is seeking to ensure a substantial U.S. manufacturing base for all items essential to a war-fighting capability, which blocked the Department of Defense from participating in a common buy of ammunition. This type of problem is common to all the countries in the Alliance. (57:47)

Traditional service bias toward buying tanks and aircraft rather than bullets and spare parts has been aggravated by the extra cost of high-technology munitions. (17:26) Some people argue that smart munitions used creatively, could offset stockpile imbalances, and there is new interest in thinking about the proper mix of smart and dumb munitions. (60:28) Critics insist that smart munitions cost too much and rarely live up to their advertised probability of kill, and there is a danger they are too susceptible to smart counter-

measures. (57:49) Known shortages such as a scatterable mine to counter Soviet armor thrusts had, as of early 1988, yet to find a production contract. (57:49) The result is there is no true commitment to enough of either kind of weapon, and a lack of conventional sustainment. (17:26) The results are even if the U.S. is able to fly 100 per cent of projected wartime sorties, with full weapon loads, many would be flown with less effective general purpose munitions. This would mean higher aircraft attrition rates and decreased accuracy. (48:3-4)

## CHAPTER V

### TACTICAL AIR SUPPORT

Tactical air is probably the most important asset NATO has. Tactical air support provides counter air (including air defense), close air support and interdiction. (61:1) Counter air destroys enemy aircraft, enemy air defense systems and all the resources that support the enemy air threat. (61:14) Close air support helps blunt an enemy attack on friendly positions, helps ground forces in obtaining and maintaining the offensive and provides cover for friendly movements. (61:37) Interdiction destroys and delays enemy ground forces. (61:30) Tactical air missions for the most part, must be accompanied and supported by appropriate and sufficient reconnaissance, and electronic warfare capability, and adequate tanker support. Two of the most important tactical air roles are air defense and interdiction of the follow-on forces.

#### Air Defense

Under present NATO operational concepts, most aircraft capable of fighting air-to-air will be flying defensive counterair at first, air defense being particularly crucial in the first days of the war. (22:97) Not only the troops on the ground but NATO air bases must be protected. The Warsaw Pact has more aircraft, making NATO aircraft outnumbered, both airframe to airframe, and airframe to target. This makes sortie generation capability especially critical.

In 1960, air defense became an integrated Alliance task. (62:23)

The allies are making slow progress in meeting proposed solutions to critical gaps in air defense. Threats to the system include no adequate means for identification of friend or foe, no electronic counter-measure resistant communication system, Soviet helicopter gunships, and 1,600 tactical ballistic missiles. (62:24) (63:18) Most critical, NATO lacks sufficient numbers of air defense missiles, both air-to-air and surface-to-air. (21:24) Even some approved plans such as the Belgium plan to buy and deploy advanced Patriot surface-to-air missiles are being cut back, and Belgium will even dismantle existing Nike and Hercules units by 1990--two years early to save money. The result is critical gaps in defense of English Channel ports. (29:36)

#### Follow-on Forces Attack (FOFA)

The second echelon of the Warsaw Pact army groups and front armies will be almost exclusively fought by NATO's air forces. (64:8) FOFA is particularly aimed at overcoming Warsaw Pact numerical superiority by hitting enemy reinforcements hundreds of miles beyond the east-west border. (65:1) The goal is to help win the close battle by delaying and disrupting the Soviet attack. (13:29) The F-111, Tornado, F-16, F-18 and F-4 are NATO's attack aircraft which would penetrate Warsaw Pact territory. F-111s and Tornados in particular, would do the deep interdiction of FOFA, and hit Pact air bases that will be used for launching air strikes against NATO, and for moving up additional forces from the rear.

FOFA is criticized because of dependence on yet available firepower and electronic warfare capability; because it is an offensive strategy in a defensive alliance (the central idea of FOFA is that a purely static defense has no hope of repelling an invasion); the failure to resolve such issues as fratricide and the fact that turning too many planning efforts to destroying the follow-on forces could lead to neglecting the problem of fighting the first waves. (66:14) (67:65) (13:30) Also, U.S. aircraft have a critical deficiency in their ability to operate at night and beneath the weather. (48:5-1)

FOFA will not work without real-time, accurate, intelligence. That is the only way commanders can make timely decisions about how and what to strike to delay and disrupt the follow-on forces. In fact, to successfully fight a war in the Central Region, NATO needs a survivable targeting and battle management system (made even more crucial because weapon resources are scarce). (2:409) (18:20) The Joint Surveillance and Target Attack System, a surveillance and command and control system specifically designed for FOFA, has a 14 month delay in full-scale development flight testing. (48:5-15) Present day intelligence systems also do not provide the needed capability. (64:11) The only intheater reconnaissance units are two wings of RF-4C aircraft and the TR-1 aircraft in the United Kingdom. Only 14 of the RF-4C in the entire Air Force inventory have the tactical electronic reconnaissance sensor capability, for locating electronic emitters. (68:180)

Controlling the electronic environment is critical to winning.

(18:60) Wild Weasel electronic countermeasure aircraft such as the F-4G/F-16C would be required to destroy the capability of the radars that direct Warsaw Pact fighter/interceptor forces, surface-to-surface missiles, and anti-aircraft guns so attack aircraft could go in to interdict enemy second echelon and third echelon forces. (69:23)

The Warsaw Pact has highly effective active and passive electronic warfare capability. (64:11) NATO has no air combat fighter and no stand-off air-to-air missiles to give optimum capability for escorting the attack aircraft to defend them against enemy interceptors. Only 40 per cent of NATO combat aircraft have sufficient electronic countermeasure capability. (70:83)

Although F-15C/Ds are being upgraded, the F-16 upgrade design will not be finalized until fiscal year 90. (48:5-1) The advance medium range air-to-air program that will provide a better acquisition range, is more than two years behind schedule and hundreds of millions of dollars over budget. (69:23)

## CHAPTER VI

### NATO AIR BASES

NATO air bases are particularly vital to the successful application of airpower in a war in Central Europe because of the critical need to generate sorties. Air base attack is receiving increased emphasis from Soviet doctrine because the Soviets realize that they must disrupt this generation. (18:214) The bases are subject to being hit by conventional, chemical, biological and nuclear munitions, delivered by enemy aircraft, artillery, ground personnel, and even in some cases, by sea.

Soviet forces could be west of the Rhine within 48 hours after the start of an offensive with these air bases being primary targets. Soviet doctrine calls for a relentless effort to disrupt or destroy services in the rear area. From 15,000 to 20,000 Soviet agents are active in West Germany alone, and many radical political groups would willingly support a Soviet campaign of sabotage, bombing, disinformation and assassination of key officials and commanders. (52:13) SPETNAZ will try to eliminate airframes, command and control systems, and the bases' logistic support structure, such as supply buildings, petroleum, vehicle yards, and munitions build-up areas. (52:16) NATO air bases are particularly susceptible to the degradation caused by repeated chemical attacks. At the present time, NATO does not have a retaliatory capability. (2:408) The United States is the Central Region's main source of chemical weapons and most are stored in the U.S.

Air base support provides targets that tend to be very vulnerable and extremely critical. For example, POL wartime requirements will reach two and one-half times current U.S. production and roughly twice the amounts produced by all NATO countries. (51:282) U.S. strategic POL reserves, of which there is a shortage, are crude rather than refined, and currently, one fifth of U.S. wartime reserves in Europe are stored above ground in prime target, ordinary tanks. (51:283) (48:3-5)

Also, most munitions today will arrive in the battle area in a piece meal fashion and must be assembled prior to loading them on aircraft (conversely the Soviets transport theirs in a built-up condition). (52:16) Even in peacetime, a tremendous effort is required to configuring these munitions, but configuring to a surge capability would be critical in wartime, and there has to be some place to do it. (52:16) (2:409)

Most bases have only limited protection. The regular U.S. and host nation armed forces will both be in great demand elsewhere for the basic war effort. Paramilitary police and borders units will be busy with refugee control and other duties concerning the civilian population. Air Base Security Police, are not designed to engage main Soviet military forces, and do not have the appropriate firepower. (71:3) Most base personnel have no way to protect themselves, and the majority lack anything but the most basic skills with a rifle or revolver, and there is no plan to buy the extra millions of rounds of ammunition to train them. (71:5)

Soviet chemical attacks could come early because of any initial NATO success. (72:54) NATO's hot, bulky chemical gear could lead to a significant loss of capability. The author knows from experience, that even in peacetime, from five to ten flightline personnel minimum per day can be at least temporarily incapacitated by wearing chemical gear. Some degree of this incapacitation can last several days. This is a loss that the Soviets would not suffer, since NATO has no way to retaliate to keep the Warsaw Pact forces in their chemical gear.

Most of the NATO's aircraft are kept in hardened shelters, but reinforcements from the U.K. and U.S.A. will still be basically unprotected because they will be split between main operating bases and forward locations. Minimum essential facilities, including hardened protection are only available for twenty per cent of the deploying aircraft that plan to work out of collocated operating bases. (14:41) For example, since the F-15 is NATO's prime air-to-air fighter, among the first air bases to be hit in NATO undoubtedly will be Bitburg, home of one of the two F-15C units in theater. The situation would be critical since Bitburg is dependent upon a single runway, with just a taxiway as an alternate. A surprise attack against the F-15s, F-4s, and the newer F-16Cs under foul weather conditions or at dusk would give the Warsaw Pact temporary air superiority since the rest of NATO's fighters are only capable of fighting under visual, close-in combat conditions. (73:31)

In an exercise ran two years ago to simulate a bombing attack on one of NATO's most critical bases, Spangdahlem, home of the Wild Weasel electronic warfare capability, 31 per cent of the base's personnel were "casualties", half of them killed, and nearly a third of the "wounded" unable to return to duty. (74:50) There was considerable destruction and heavy damage to aircraft, vehicles, buildings, communications, and power. Fires burned all over and unexploded ordnance lay everywhere. Repair teams were shorthanded and often did not have the equipment and supplies they needed. (74:50)

A dispersal capability would be helpful but few designated dispersal areas have adequate support or hardened protection. Approximately 80 per cent of U.S. aircraft that land in Europe will be located on bases where they will not be able to refuel and rearm. (75) These factors do not bode well for the aircraft in Central Europe which are highly dependent upon sophisticated maintenance and support facilities.

## CHAPTER VII

### CONCLUSIONS AND RECOMMENDATIONS

The issues addressed in this paper concerning assumptions about NATO's power base, show this power base may not in fact, be as reliable and sound as it needs to be to support flexible response. If forces supporting concepts for their use are not as powerful as they are thought to be, they may become tactical forces, not strategic forces. Perhaps to move conventional thinking back more into the strategic arena, the United States should approach NATO with alternatives more in line with the realities of the situation.

Since airlift is and will undoubtedly in the future be limited, perhaps the U.S. should put increased emphasis to prepositioning, with the allies paying the bill for the things prepositioned. This type of prepositioning would take into account the logistic support pipeline that is too small to support flexible response. It should be politically acceptable to a defensive alliance. It would help appease those in the United States who do not think the allies pay for their fair share of the defensive commitment to their own defense, and would ease the U.S.'s ever increasing financial constraints. It would also allow the United States to withdraw more troops, (which should make many Americans and Europeans happy) because equipment is harder and takes more airlift and sealift to haul than personnel. This withdrawal of troops could also be in line with any legitimate Soviet arms reduction proposals. This type of prepositioning would also give the United States more leeway in providing for non-European commitments.

If the Europeans pay for the things that are designed to support only them, the United States could then possibly afford to duplicate more of the effort, and keep this duplication available to deploy to support other contingencies as needed.

The United States should also give its primary emphasis to air defense. Successful air defense is the keystone to the successful accomplishment of almost any other mission the U.S. would have in a war in Europe. Everything should be done to ensure NATO has an optimum capability. The author is not advocating NATO give up the offensive capability inherent in a fully robust FOFA effort. However, the best offensive capability possible (something NATO does not have at this time) will not matter if the aircraft needed for the effort can not get off the ground. Air defense would also add protection to prepositioned resources. The facts that air defense is already under NATO operational control and the concept of air defense fits the defensive nature of the Alliance, should help in efforts to expand this capability.

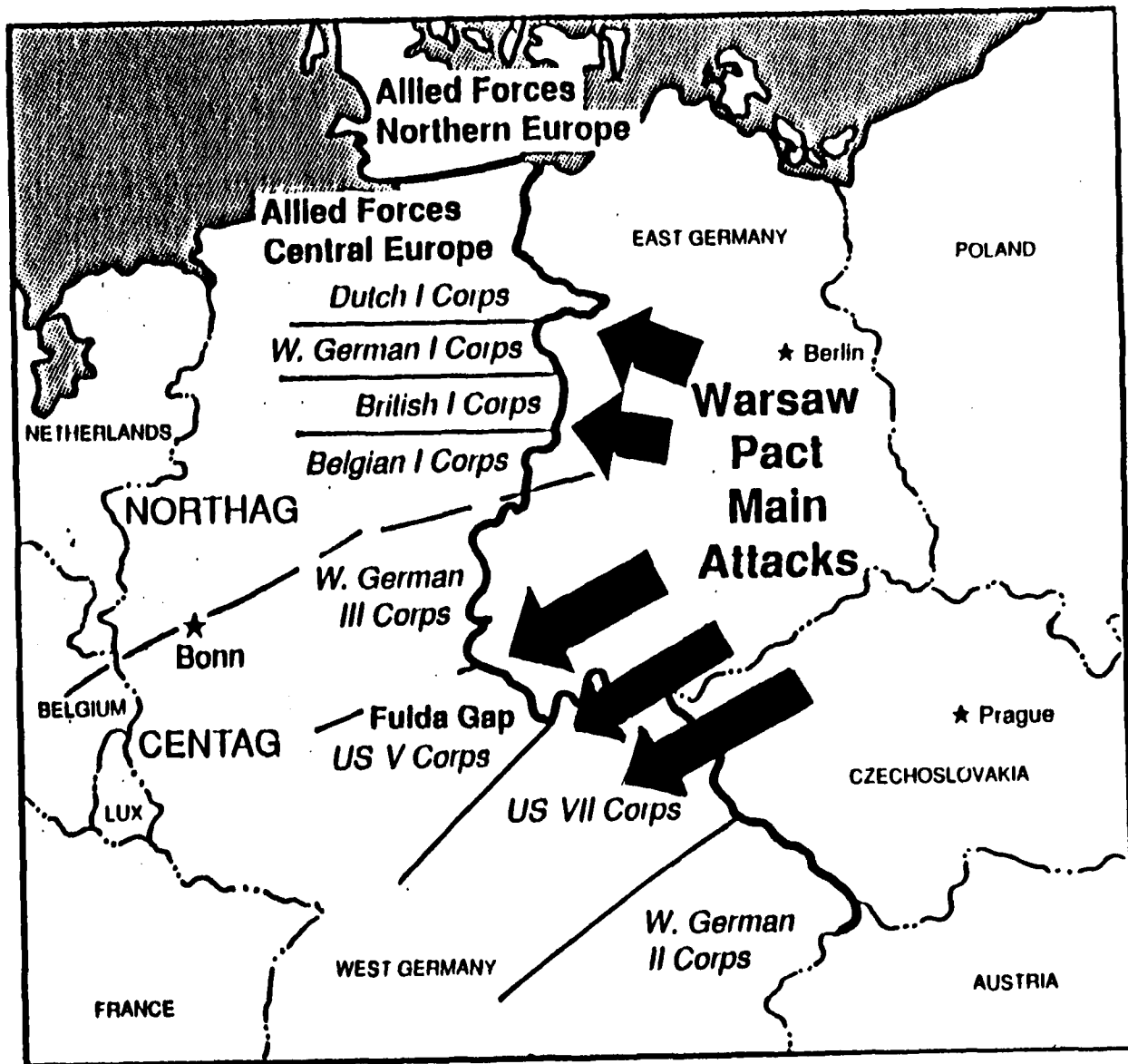
The United States should also put more emphasis on the concepts of dispersal and hardening. Dispersal and hardening would help negate the overwhelming numerical superiority of the Warsaw Pact, by causing them to have to deal with a bigger, more survivable target base. It would also give the allies a bigger base from which they could respond, more time for the reinforcements to arrive, better protection for prepositioned assets and decrease the vulnerability that centralization has to sabotage and SPETNAZ forces. Pouring

concrete is also one of the cheaper ways to increase capability, if the Alliance can not afford some of the more sophisticated means it would really like to have.

Conventional assumptions that are now part of the flexible response strategy have blatant shortcomings. In some cases, such as with HNS, the situation may be even worse than it seems on the surface because of double counting of some support. The author realizes that changing concepts about support is not an easy task. In the author's opinion, the recommendations listed would be in the best interest of the allies, and the United States should do everthing possible to politically and economically bring them about.

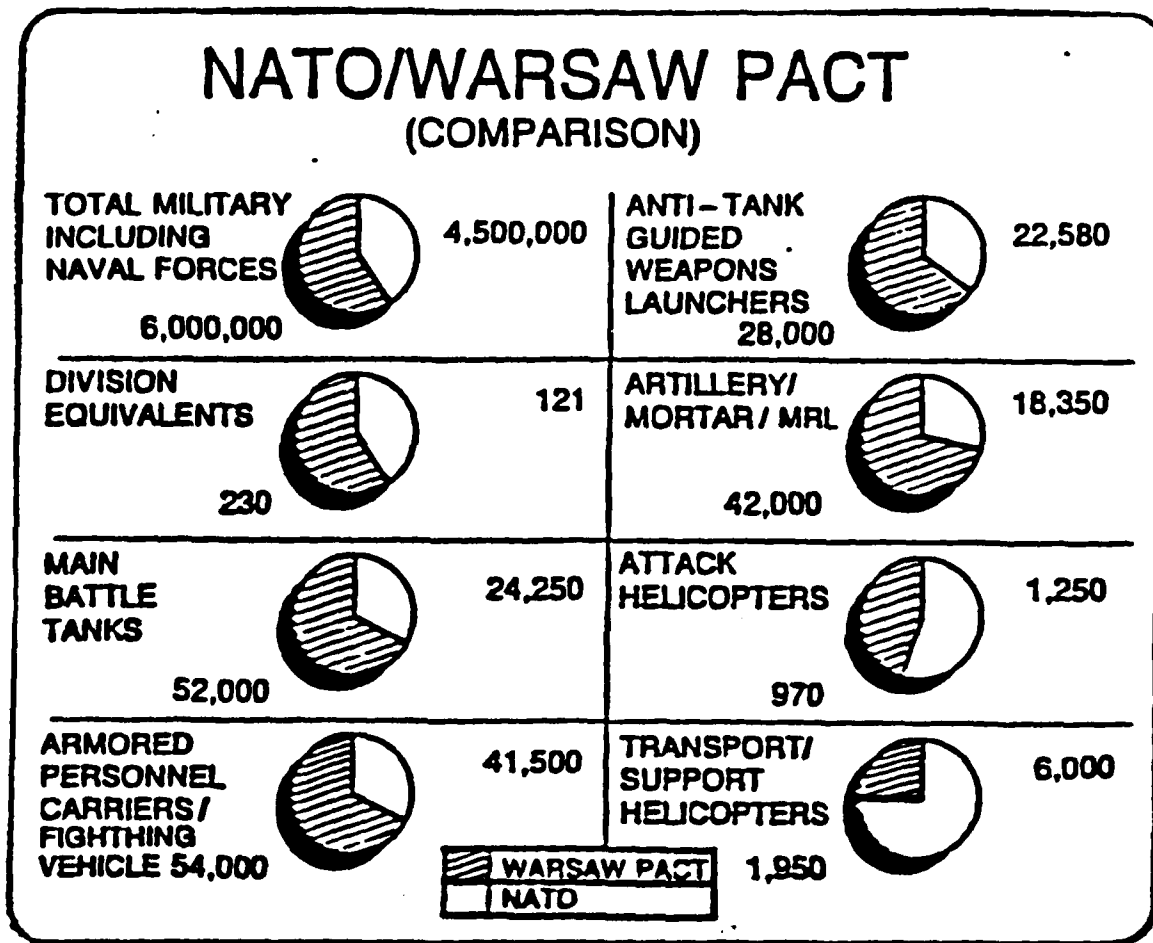
## APPENDIX A

Specific Corps Designations and Assumed Warsaw Pact  
Avenues of Approach into West Germany



Congressional Budget Office, "U.S. Ground Forces and the Conventional Balance," June 1988, in Air Force Magazine, Vol. 71, No. 10, October 1988, p. 95 and John J. Mearsheimer, "Why the Soviets Can't Win Quickly in Central Europe," International Security, Vol. 7, No. 1, Summer 1982, p. 21.

# APPENDIX B



Office of the Chief of Staff, United States Army,  
 The Army Overview, Washington D.C., 1988.

#### LIST OF REFERENCES

1. NATO Information Service, NATO Handbook, Brussels, April 1986.
2. Cordesman, Anthony H., "The Nuclear Balance, Part 2.," Armed Forces, Vol. 6, No. 9, September 1987, pp. 405-414.
3. Galvin, Gen. John R., USA, "Flexible Response and Forward Defense," Defense 88, July/Aug 1988, pp. 5-11.
4. Dougherty, Russell E. "Concepts and Capabilities," from the Atlantic Council's Strengthening Deterrence: NATO and the Credibility of Western Defense in the 1980s, 1982, in NATO Doctrine, Strategy, and Readiness, Air War College Associate Programs Supplementary Text, Air University, ATC, Maxwell AFB, AL, December 1983, pp. 1-8.
5. Senior NATO Logisticians' Conference Secretariat, NATO Logistics Handbook, Brussels, June 1986.
6. Coker, Christopher, The Future of the Atlantic Alliance, London, Royal United Services Institute, 1984.
7. Thomson, James A., "Nuclear Weapons in Europe: Planning for NATO's Nuclear Deterrent in the 1980's and 1990's," Survival, Vol. XXV, No. 3, May-June 1983, pp. 98-109.
8. Schulze, Gen. Franz-Joseph, "Rethinking Continental Defense," The Washington Quarterly, Vol. 7, No. 2, Spring 1984, pp. 51-58.
9. Hunter, Robert E., Ed., NATO: The Next Generation, Boulder Co., Westview Press, 1984.
10. Mako, William P., U.S. Ground Forces and the Defense of Central Europe, Washington, D.C., The Brookings Institute, 1983.
11. Connell, Jon, The New Maginot Line, New York, Arbor House, 1986.
12. Holmes, Kim R., "Measuring the Conventional Balance in Europe," International Security, Vol. 12, No. 4, Spring 88, pp. 166-173.
13. "Deep Strike in U.S. and NATO Doctrine," Defense and Foreign Affairs, Vol. XV, No. 2, February 1987, pp. 28-31.
14. Correll, John T., "Why NATO Needs a Conventional Defense," Air Force Magazine, Vol. 70, No. 8, August 1987, pp. 38-46.
15. Carlucci, Frank C., Annual Report to Congress, Washington, D.C., GPO, 1990.

16. Karber, Phillip A., "In Defense of Forward Defense," Armed Forces Journal International, May 1984, pp. 27-50.
17. "Senate Hearings Assess INF Treaty Impact on NATO," Army, Vol. 38, No. 3, March 1988, pp. 16-29.
18. European Security Study, Strengthening Conventional Deterrence in Europe, New York, St. Martin's Press, 1983.
19. Mearsheimer, John J., "Numbers, Strategy and the European Balance," International Security, Vol. 12, No. 4, Spring 1988, pp. 175-185.
20. Golden, James R., The Dynamics of Change in NATO, New York, Praeger Publishers, 1983.
21. Rush, Kenneth, Brent Scowcroft, and Joseph J. Wolf, Strengthening Deterrence: NATO and the Credibility of Western Defense in the 1980's. Cambridge, MA, Ballenger Publishing Company, 1982.
22. Berry, Clifton F., "Defeating Red Armor," Air Force Magazine, Vol. 71, No. 10, pp. 94-99.
23. Kitfield, James, "Tanks; Tipping the Conventional Balance," Military Forum, Vol. 4, No. 9, June 1988, 50-54.
24. Galvin, Gen. John R., "NATO After Zero INF," Armed Forces Journal International, March 1988, pp. 54-60.
25. Donnell, Tom, "Logistics Vehicles Face Tough Battles," Military Forum, Vol. 4, No. 9, pp. 16-21.
26. Milton, Gen. T.R., "The Imbalance in Control," Air Force Magazine, Vol. 71, No. 2, February 1988, p. 65.
27. Rush, Kenneth, Brent Scowcroft and Joseph J. Wolf, The Atlantic Council's Working Group on the Credibility of the NATO Deterrent, The Credibility of the NATO Deterrent; Bringing the NATO Deterrent Up to Date, Washington, D.C., The Atlantic Council, 1981.
28. Akehurst, Gen. Sir John, "Soviet Military Continues To Build Despite Superiority," Reserve Officer Association, National Security Report, Vol. 6, No. 10, October 1988, pp. 6-9.
29. Dudley, Robert S., "New Fissures in NATO," Air Force Magazine, Vol. 71, No. 10, October 1988, pp. 34-40.
30. Brady, Linda P. and Joyce P. Kaufman, Ed., NATO in the 1980's, Praeger Publishers, 1985.

31. Milton, Gen. T.R., USAF, "Rethinking The Summit," Air Force Magazine, Vol. 71, No. 8, August 1988, p. 99.
32. "What Perestroika Means for American Business," Science, Vol. 239, March 1988, pp. 1088-1089.
33. Keller, Bill, "Soviet Call to West: Money For Rebuilding," New York Times International, Vol. CXXXVIII, No. 4767, October 18, 1988, p. 1.
34. "Europe's East-West Politics of Trade," U.S. News and World Report, Vol. 105, No. 19, November 14, 1988, p. 42.
35. Correll, John T. "The Power-Projection Shortfall," Air Force Magazine, Vol. 71, No. 8, August 1988, pp. 38-42.
36. Program Analysis and Evaluation Directorate, Office of the Chief of Staff, USA, The Army Overview, OCSA, 1988.
37. Russell, James A., "Marines: How Heavy is Too Heavy," Military Logistics Forum, Vol. 3, No. 6, March 1987, pp. 40-48.
38. Sullivan, Leonard Jr., "Psychosis to Armed Sunroofs," Armed Forces Journal International, March 1988, pp. 34-48.
39. Morrison, David C., "The Chemical Threat," Military Logistics Forum, Vol. 3, No. 3, October 1986, pp. 38-41.
40. Nance, John J. "How Vulnerable Are Airlifters?" Military Logistics Forum, Vol. 3, No. 9, pp. 47-50.
41. Crowe, Adm W. J. Jr., USN, "Strategic Applications of Seapower," Military Strategy, National Security Management Program, National Defense University, pp. 168-178, in Air War College Associate Programs, Vol. II, Ch. 8, 19th Ed., pp. 9-13.
42. Stryker, Russell F., "Civil Shipping Support for NATO," NATO Review, Vol. 34, No. 1, February 1986, pp. 29-33.
43. Soviet Military Power: An Assessment of the Threat, Washington, D.C., GPO, 1988.
44. McDonald, Adm Wesley L., "U.S. Atlantic Command," an article prepared for the Air War College Associates Programs, Air University, ATC, Maxwell, AFB, AL, April 1985, in Air War College Associate Programs Vol. II, Ch. 16, 19th Ed., pp. 6-10.

45. Curtis, Air Marshall Sir John, "The Air Situation in the North Atlantic," Naval Forces, Vol. V., No. III, 1984, pp. 60-63, 65-66.
46. Kitfield, James, "How Survivable Are Today's Ships," Military Logistics Forum, Vol. 3, No. 6, March 1987, pp. 24-31.
47. Bedard, Paul, "Repairs: Could Shipyards Handle the Load?" Military Logistics Forum, Vol. 4, No. 6, March 1988, pp. 32-37.
48. Air Force Issues Team, The Air Force Issues Book, Washington, GPO, 1988.
49. Kitfield, James, "The Host Nation Support Gamble," Military Logistics Forum, Vol. 4, No. 3, October 1987, pp. 30-36.
50. Nash, Richard, "Tracks on Wheels," NATO's Sixteen Nations, Vol. 30, No. 8, December 1985/January 1986, pp. 75-77.
51. Myers, Kenneth A., Ed., NATO-The Next Thirty Years: The Changing Political, Economic, and Military Setting, Boulder CO., Westview Press, 1980.
52. McDaniel, LTC William T., Jr., "Combat Support Doctrine: Coming Down to Earth," Air Force Journal of Logistics, Vol. 1, No. 2, Spring 1987, pp. 13-15.
53. NATO Information Service, NATO and the Warsaw Pact, Brussels, 1984.
54. Collins, Col. Orville M., "Combat Sustainability and Reconstitution Warfare: The Missing Link in Air Force Basic Doctrine," Air Force Journal of Logistics, Vol. XI, No. 3, Summer 1987, pp. 33-37.
55. Fabrie, Robert C., "Ammunition: Why NATO is Lagging," Military Logistics Forum, Vol. 3, No. 1, April 1987, pp. 50-54.
56. Canan, James, "The Profitability of Defense," Air Force Magazine, Vol. 68, No. 1, January 1985, pp. 62-67.
57. Kitfield, James, "NATO's Sustainability Shortfall," Military Logistics Forum, Vol. 4, No. 5, January/February 1988, pp. 43-49.
58. Kitfield, James, "NATO Weapons: Little in Common," Military Logistics Forum, June 1987, Vol. 3, No. 9, pp. 14-19.
59. Heronemus, Mike, "NATO Needs Joint Weapon Systems to be More Competitive, Official Says," Stars and Stripes, April 18, 1986, in NATO Headquarters Central Army Group and Fourth Allied Tactical Air Force European Press Review, April 18, 1986, p. 5.

60. Mearsheimer, John J., "Nuclear Weapons and Deterrence in Europe," International Security, Vol. 9, No. 3, Winter 1984/85, pp. 19-46.
61. TACM 2-1, Tactical Air Operations, Department of the Air Force, Headquarters Tactical Air Command, Virginia, 15 April 1978.
62. Altenburg, Wolfgang, "Defence in the Air, NATO's Integrated Air Defence Today and In the Future," NATO's Sixteen Nations, Vol. 31, No. 5, August 1986, pp. 22-25.
63. Guidi, Marcello, "Air Defence in the Nineties - NATO's Major Problem," NATO's Sixteen Nations, Vol. 31, No. 5, August 1986, pp. 16-18.
64. Alder, Konrad, "Air Interdiction in Support of FOFA Operations," Armada International, Vol. 12, No. 1, January/February 1988, pp. 8-16.
65. "New Advantage Seen in 10 Years for NATO in Conventional War," AFCENT Press Summary, July 31, 1986, in NATO Headquarters Central Army Group and Fourth Allied Tactical Air Force European Press Review, January 15, 1987, p. 1.
66. Roberts, LTC Bill, USAF, "Fratricide - We Can't Win With the Status Quo," Headquarters Tactical Air Command/Headquarters Training Doctrine Command, Air Land Forces Application Agency, Air Land Bulletin, Bulletin No. 87-1, March 31, 1987, p. 14.
67. Dudley, Robert S. "Eight Principles for NATO," Air Force Magazine, Vol. 71, No. 4, April 1988, pp. 62-66.
68. Young, Susan H. "Gallery of USAF Weapons," Air Force Magazine, Vol. 71, No. 5, May 1988, pp. 175-192.
69. Kitfield, James, "Unguided Missiles?" Military Logistics Forum, Vol. 4, No. 7, April 1988, pp. 16-24.
70. "NATO Emphasizes Joint Efforts to Meet Soviet EW Threat," Aviation Week and Space Technology, Vol. 126, No. 6, February 9, 1987, pp. 83, 89.
71. Keller, Capt Robert, "Logistics Under Fire: A Call to Combat Arms," Air Force Journal of Logistics, Vol. 1, No. 2, September 1987, pp. 2-7.
72. Ulsamer, Edgar, "The Potential Checkmate in Europe," Air Force Magazine, Vol. 68, No. 11, November 1986, pp. 54-57.
73. Eshel, Tamir, "Airfield Attack," Defence Update 83, pp. 16-29.

74. Correll, John T. "Fighting Under Attack," Air Force Magazine, Vol. 71, No. 10, October 1988, pp. 50-55.

75. Wilson, George C., "Nunn, Long a NATO Critic, Will Use Senate Chairmanship to Try to Remold Alliance," in NATO Headquarters Central Army Group and Fourth Allied Tactical Air Force European Press Review, November 12, 1986.