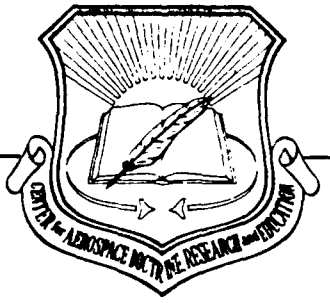
(1)

After you have read the research report, please give us your frank opinion on the contents. All comments—large or small, complimentary or caustic—will be gratefully appreciated. Mail them to: CADRE/RI, Building 1400, Maxwell AFB AL 36112-5532.

FORWARD OFFENSE
Preparing the B-52 for Conventional Warfare

Thank you for your assistance

Cut along dotted line



Research Report No. AU-ARI-88-6

FORWARD OFFENSE
Preparing the B-52 For Conventional Warfare

by

GREGORY J. BERLAN, Maj, USAF
Research Fellow
Airpower Research Institute

Air University Press
Maxwell Air Force Base, Alabama 36112-5532

February 1989

DISCLAIMER

This publication was produced in the Department of Defense school environment in the interest of academic freedom and the advancement of national defense-related concepts. The views expressed in this publication are those of the author and do not reflect the official policy or position of the Department of Defense or the United States government.

This publication has not been reviewed by security and policy review authorities and is not cleared for public release. It is the property of the United States government and is not to be reproduced in whole or in part without permission of the commander, AUCADRE, Maxwell Air Force Base, Alabama.

In Memory of

JOHN G. MURRAY

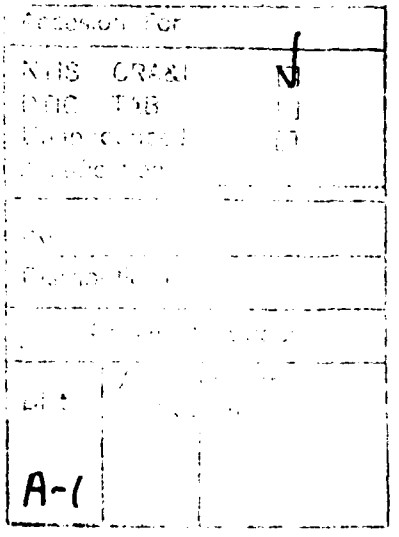
12 March 1917 - 4 November 1987

Husband, Father, and World War II Veteran

Who Shared with Me

Not only His Love of God and Country,

But also His Daughter



CONTENTS

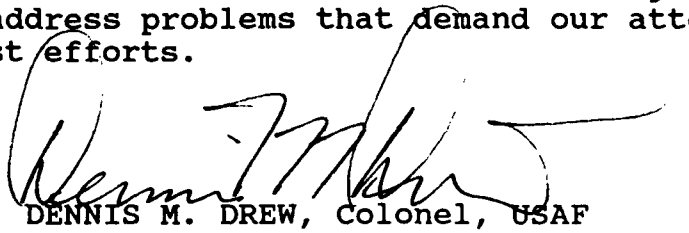
Chapter		Page
	DISCLAIMER	ii
	FOREWORD	vii
	ABOUT THE AUTHOR	ix
	ACKNOWLEDGMENTS	xi
	INTRODUCTION	xiii
	Overview	xiv
	Notes	xv
1	POTENTIAL B-52 MISSIONS	1
	Strategic Aerospace Offense	1
	Strategic Conventional Standoff Mission	3
	Strategic Conventional Penetration Mission	4
	Strategic Aerospace Defense	6
	Counterair	8
	Offensive Counterair	8
	Suppression of Enemy Air Defenses	9
	Defensive Counterair	12
	Air Interdiction	12
	Close Air Support	13
	Special Operations	17
	Airlift	17
	Aerospace Surveillance and Reconnaissance	18
	Aerospace Maritime Operations	19
	Aerial Minelaying	19
	Reconnaissance and Surveillance	20
	Interdiction of Surface Vessels	22
	Subsurface Interdiction	23
	Summary	24
	Notes	26
2	LIMITATIONS TO THE B-52 CONVENTIONAL FORCE	29
	Political Considerations	29
	Geographic Factors	33

Chapter		Page
	Aircraft Constraints	36
	Equipment and Weapon Concerns	41
	Terrain Avoidance	42
	Bombing/Navigation System	44
	Electro-optical Viewing System	45
	Electronic Countermeasures	46
	Communication Limitations	47
	Weapon Limitations	48
	Aircrew Matters	50
	Employment Constraints	54
	Summary	56
	Notes	56
3	PROPOSALS FOR ORGANIZING, EQUIPPING, AND TRAINING B-52s FOR CONVENTIONAL OPERATIONS	61
	Questions and Assumptions	61
	How to Organize	64
	Mission-Specialized B-52 Conventional Force	65
	A New Numbered Air Force	68
	How to Equip	71
	Aerospace Maritime Operations	72
	Counterair	75
	Strategic Aerospace Offense and Air Interdiction	77
	Training Concepts	80
	Nuclear versus Conventional Training	82
	Fundamental Training Concepts	83
	Evaluation and Qualification	89
	Joint Exercises	90
	Maritime Operations Training Concepts	91
	Counterair Training Concepts	91
	Strategic Aerospace Offense and Air Interdiction	94
	Summary	97
	Notes	98
4	CONCLUSION	101

FOREWORD

Strategic Air Command (SAC) is continually seeking ways to increase capabilities, sometimes with new weapon systems but more frequently with older weapon systems such as the B-52. Faced with an increasing imbalance between the conventional forces of the East and the West, and current fiscal constraints, SAC has begun to focus on how to increase the B-52's capabilities in conventional warfare. This is the subject of Major Berlan's study.

This study serves two purposes. First, for those unfamiliar with the B-52 it introduces them to the Buff's capabilities and its potential. Second, for those intimately involved in this topic, it presents several interesting ideas and concepts about how to organize, equip, and train the B-52 force for conventional operations. Although many of the solutions offered are subject to debate, they all address problems that demand our attention and deserve our best efforts.



DENNIS M. DREW, Colonel, USAF
Director, Airpower Research Institute
Center for Aerospace Doctrine, Research,
and Education

ABOUT THE AUTHOR

Maj Gregory J. Berlan graduated from the United States Air Force Academy in June 1975 with a bachelor of science degree in history. After completing navigator training he was assigned to B-52s at K. I. Sawyer AFB, Michigan, where he was first introduced to the B-52's conventional mission. In 1980 he was assigned to Robins AFB, Georgia, as a radar navigator. While at Robins AFB he received a master's degree in management from Georgia College and served as a KC-135 maintenance officer for six months after the B-52s were transferred from Robins AFB. From March 1984 until March 1985, he served as a military observer with the United Nations Truce Supervision Organization in Syria, Lebanon, and Israel. He returned to B-52 operations at Barksdale AFB, Louisiana, until 1987 when he was assigned to the Air University Center for Aerospace Doctrine, Research, and Education as a SAC-sponsored research fellow. During his time in B-52 operations, he has been a senior standardization evaluation navigator and radar navigator as well as assistant chief of flight training. Major Berlan--accompanied by his wife Peggy, and their sons David, Robert, and Kevin--is now stationed at Headquarters SAC, Offutt AFB, Nebraska.

ACKNOWLEDGMENTS

Military officers seldom have the opportunity to deliberate about events beyond the next mission, the next inspection, or the next suspense. As a Strategic Air Command-sponsored research fellow at the Air University Center for Aerospace Doctrine, Research, and Education (AUCADRE), I've been fortunate to have the time to think about the future and to write about the B-52's role in conventional operations. Consequently, I wish to express my gratitude to the many individuals involved in the selection process that gave me this opportunity: Lt Col Larry W. Northington, Col David W. McIlvoy, Col Phillip Ford, Brig Gen Eugene E. Habiger, Maj Gen Robert D. Beckel, and Lt Gen James P. McCarthy. I hope my research effort has justified their faith in me.

I also would like to thank the many individuals who contributed to this paper. First, the various "crewdogs" whose ideas have formed the basis of my work but are too numerous to mention by name. Second, to the professionals at AUCADRE: Dr Lawrence E. Grinter, whose advice kept my research on track; Dr Richard Bailey, who converted my language into English; Lt Col Manfred Koczur, who provided encouragement when I needed it; and Maj Richard L. Davis, who provided ideas and served as a sounding board for many other concepts.

Last, I want to thank my wife Peggy who, despite her own suffering this year, gave me the support I needed.

INTRODUCTION

In February 1987, Gen John T. Chain, Jr., commander in chief, Strategic Air Command, prepared a presentation for the United States Senate. In this presentation General Chain said,

> It is imperative that we help bolster the nation's conventional capabilities to make nuclear war less likely. Theater commanders require a large, long-range, fully capable conventional bomber force to do their mission. Our strategic bombers are an essential element of their warfighting capability. When timeliness, range and payload are considered, there are conventional missions which cannot be accomplished and areas of the world which cannot be reached without SAC bombers. . . .
>
> To ensure our future capability to provide theater CINCs the conventional striking power they need for deep strikes beyond the reach of tactical air forces, we need to dedicate non-ALCM B-52Gs to a conventional role. . . . By combining our planned force enhancements with maintenance of the B-52 force structure, we will be able to provide theater commanders an enormous warfighting capability at an affordable price and increase their flexibility. . . .
>
> The bottom line is: This is a very important issue and cannot be pushed aside. We as a nation cannot afford, particularly at a time of constrained resources, to take any bomber out of service.[1]

Many individuals believe the B-52 has outlived its usefulness; but many other individuals, including this author, agree with General Chain and support the retention of the B-52 for conventional operations. This study does not attempt to explain why B-52s should be dedicated to a conventional role. Instead, it addresses the question, How should SAC organize, equip, and train the B-52 force for conventional warfare?

Overview

This study focuses on how SAC organizes, equips, and trains B-52 forces for conventional operations. I have started by examining the types of missions which the B-52 may be required to perform. Then, I have identified problems which limit the B-52's ability to accomplish these missions. Last, I have explored ways to organize, equip, and train our B-52 forces to overcome these constraints and to prepare for their conventional role.

Chapter 1 examines the B-52's potential role in the nine fundamental Air Force missions specified in Air Force Manual (AFM) 1-1, Basic Aerospace Doctrine of the United States Air Force.[2] Each mission is briefly described and then analyzed to identify what aircrew skills are required and what equipment is needed to accomplish these missions. This chapter also identifies problems peculiar to each mission and offers solutions to overcome some of these problems.

Chapter 2 identifies factors that inhibit the effectiveness of the conventional B-52 force. Political considerations, geographic factors, aircraft constraints, weapon and equipment concerns, aircrew matters, and employment constraints are examined. These factors combine to create problems which reduce the effectiveness of our B-52 forces.

Chapter 3 offers ways to organize, equip, and train our B-52 force to overcome the problems identified in chapter 2 and to accomplish the missions identified in chapter 1. Missions whose requirements most nearly match the B-52's potential are identified. Basing concepts, equipment requirements, mission distribution, unit evaluation procedures, and wing staff organization are addressed as well as training concepts which may be used in the formation of these conventional units. Although certainly not all inclusive, these proposals should stimulate thought and ideas to the formation of B-52 conventional units whose potential far exceeds their present day capabilities. As Thomas A. Keaney, a senior fellow at the National Defense University, wrote,

> The emerging reality is that the conventional strength of bombers is again becoming the oldest and most expendable part of the bomber force. . . .

Actions to prepare bombers for conventional roles are needed before a conflict occurs; otherwise those bombers will be prepared only for a conventional war of the past.[3]

Notes

1. Gen John T. Chain, Jr., remarks to the Senate, Committee on Appropriations Defense Subcommittee, Washington, D.C., February 1987, 7-8.

2. AFM 1-1, Basic Aerospace Doctrine of the United States Air Force, 16 March 1984.

3. Thomas A. Keaney, Strategic Bombers and Conventional Weapons: Airpower Options (Washington, D.C.: National Defense University Press, 1984), 66.

CHAPTER 1

POTENTIAL B-52 MISSIONS

According to Air Force Manual (AFM) 1-1, Basic Aerospace Doctrine of the United States Air Force:

> The fundamental role of the Air Force is to prepare aerospace forces to accomplish these missions. Strategic Aerospace Offense, Strategic Aerospace Defense, Counter Air, Air Interdiction, Close Air Support, Special Operations, Airlift, Aerospace Surveillance and Reconnaissance, Aerospace Maritime Operations.[1]

For over three decades Strategic Air Command B-52s have prepared to accomplish several of the missions previously listed primarily in a nuclear environment and secondarily in a conventional environment. Now that the B-1, air-launched cruise missile (ALCM), and MX have begun to assume their perspective roles in nuclear warfare, portions of the B-52 force can be released from their nuclear role and can be assigned to conventional missions (any military mission which does not use nuclear weapons).

To prepare the B-52 force to accomplish conventional missions, we must first understand what these missions are, what aircrew skills are required to accomplish each mission, and what equipment modifications are required to enable the B-52 to accomplish each mission. When we are armed with this knowledge, we can identify which missions the B-52 is capable of performing, which will enhance the strength of the United States' conventional force. Following the mission outline described in AFM 1-1, we will examine strategic aerospace offense.

Strategic Aerospace Offense

The objectives of strategic aerospace offense missions are defined in AFM 1-1:

> Strategic aerospace offense objectives are to neutralize or destroy an enemy's war-sustaining capabilities or will to fight. Aerospace forces may conduct strategic aerospace offense actions, at all levels of conflict, through the systematic application of force to a selected series of vital targets. Attacks are directed against an enemy's key military, political, and economic power base.[2]

The B-52 was designed for the strategic aerospace offense mission. For over 30 years B-52 aircraft and crews have prepared to accomplish this mission. However, during this time, the vast majority of effort has been focused on delivering nuclear weapons against strategic targets. Using conventional munitions to accomplish strategic offense objectives alters the way in which the B-52 must be employed.

The B-52 is quite capable of destroying vital strategic targets with conventional 500-pound bombs. Its inherent payload capacity, range, and bombing accuracy virtually assure the destruction of any strategic target the B-52 can overfly. However, the very nature of a strategic target ensures that it will be strongly defended, frequently to the utmost ability of an enemy. Consequently, the ability of a B-52 to penetrate and overfly a strategic target, without the benefit of the confusion caused by preceding missile attacks (as is anticipated in a nuclear war), is limited by the numbers and types of defenses the enemy can muster.

In many relatively undefended countries of the third world, the B-52 could strike strategic targets with a high degree of success and with low attrition. Countries defended with second-rate equipment and second-rate forces would also be vulnerable to B-52s as currently configured. The current tactics, training, and equipment in use by B-52s enable them to operate successfully in low-threat environments.

In contrast, the ability of the B-52 using the same tactics and equipment to attack Soviet allies armed with the best Soviet defenses would be a different story. In high-threat environments, modern enemy defensive systems would extract a terrible toll on B-52s. Consequently, new tactics and equipment must be designed to enable the B-52 to attack strategic targets in the high-threat environments found in the Warsaw Pact countries. The ongoing improvements in ECM, testing of standoff weapons, and development of new tactics are steps in the right direction.

B-52s can attack strategic targets in high-threat areas by using two different approaches. The first way uses standoff munitions that can destroy strategic targets and can be launched from a position outside the enemy's lethal defense line. The second way uses weapons and tactics that can avoid or neutralize enemy defenses, thus enabling the B-52 to reach and destroy strategic targets with ballistic or short-range munitions.

Strategic Conventional Standoff Mission

The air-launched cruise missile is a long-range conventional standoff munition with the ability to destroy strategic targets. The ALCM has the range to be launched from a B-52 outside the enemy's lethal defense line. It also has the accuracy necessary to ensure the total destruction of a target. However, it is effective only because its warhead is nuclear. To achieve the desired range and accuracy and to keep the missile's overall dimensions to a reasonable size, the ALCM's payload is very small. A single ALCM with a conventional warhead does not have the "punch" to knock out most strategic targets as identified in AFM 1-1.

An extremely accurate conventional ALCM could destroy some small strategic targets and portions of other targets, but in most cases numerous weapons would be required to ensure destruction. Due to the high costs of each ALCM, multiple ALCMs targeted against individual strategic targets would be economically prohibitive. Gen Robert D. Russ, speaking at an Air Force Association symposium in Orlando, Florida, on 21 January 1988, addressed the problem of employing high-cost standoff weapons: "'Everybody's enamored with standoff weapons,' but that they 'sometimes come in the million dollars a copy' range. This means that 'you better have a million dollar target out there to hit'."[3]

Development of low-cost, standoff weapons could provide a solution to this problem, as could the development of a "super-powerful" conventional warhead that could enable a single missile to destroy a large or hardened target. Future technology may provide other solutions, but present technology limits the options to a choice between range, accuracy, and warhead size. The equipment required to accomplish standoff bombing depends on the types of weapons developed.

Conventional standoff aircrews require certain basic aircrew skills, which are common to all B-52 flight operations. Pilots must be proficient in a variety of skills: takeoff, high-altitude cell formation, air refueli g, instrument procedures, equipment operation, and landing. Navigators must receive proficiency in rendezvous, high-level navigation, and equipment operation procedures. Electronic warfare officers (EWOs) must have proficiency in airborne threat and electronic countermeasures (ECM), and gunners must have expertise in fire control system operation. All crew positions must require some degree of training in fighter-defensive operations, since fighter

attacks could occur outside of anticipated enemy defensive positions. (These minimal aircrew skills are referred to as basic aircrew skills--BAS.)

Besides proficiency in BAS, conventional standoff crews require weapon training, which depends on the requirements established by the weapon itself. Training for a launch-and-forget-type weapon (like the ALCM) would be relatively simple and similar to the ALCM training requirements found in the Strategic Air Command Regulation (SACR) 51-52, B-52 Aircrew Training. Overall, the training program for conventional standoff missions, launched outside of enemy defenses, would be much less demanding than the present B-52 training program or the training to accomplish the strategic penetration mission.

Strategic Conventional Penetration Mission

Strategic penetration of a high-threat area is probably the most difficult challenge for a B-52 or any other aircraft. Successful penetration of an area equipped with the newest enemy defenses requires imaginative tactics, surprise, coordination, cooperation, and deceptive and destructive ECM. A high-success rate could only be expected of the most experienced crews flying the best-equipped aircraft. Realistically, a lone penetrant (the role nuclear-tasked B-52s prepare for) would be too vulnerable to enemy defenses not suffering from a high degree of confusion (as can be anticipated in a nuclear war). Conventionally, one way to confuse enemy defenses is to attack the enemy with several B-52s (an aircraft cell) equipped with a multitude of weapons that aid in the penetration process.

The actual cell composition, weapon load, and tactics would depend on the route of flight, the enemy defenses, and the desired target. Variations in numbers and composition of the cell would optimize the probability of success. Aircrews assigned with the actual strike role (the strategic penetration aircraft) would use many of the same skills as the nuclear B-52 force as well as some other skills.

The penetrating aircrew must be proficient in air refueling, low-level navigation, terrain avoidance, a variety of ECM skills, bombing, and aerial gunnery. Additionally, low-level cell formation, visual terrain-following procedures (with or without night-vision goggles), multiple axes near simultaneous bomb delivery, destructive ECM (direct engagement and attack of enemy defenses), and other enhanced conventional skills would be required. The mastery of so many skills would require extensive training

and frequent practice. Essential elements of this type of training program would include the requirements listed in SACR 51-52 for nuclear and conventional training and extensive use of simulators. The MAC training program for night-vision goggles and EWO training for destructive ECM would have to be incorporated. Due to the flying skills required of them, aircrews selected for this role should be only the most experienced and the most skillful crews available. As a guess, the number of crews capable of achieving and maintaining this proficiency would be equal to somewhat less than one-third of the crews currently available. (This is based on the assumption that it would take at least two years' experience in each seat to achieve proficiency.)

The number of strike aircraft per cell depends on the type of target, its location, and the anticipated en route attrition. Range considerations affect whether each B-52 could carry 51 or 27 conventional bombs. One or more of the strike aircraft may have to carry precision-guided munitions to ensure that vital points of the strategic targets are destroyed. These factors would affect cell composition. Probability to penetrate (PTP) would be enhanced by the contributions of the remaining cell aircraft.

One support aircraft would be an ECM platform similar to the EF-111. On this aircraft up to three crew stations could be equipped with advanced ECM gear. The ECM aircraft's mission would be to electronically confuse the enemy's airborne warning and control system (AWACS) and early warning systems. Additionally, it could carry drone decoys which would further distract and confuse the defenses. A new version of the old Quail missile is an example.

Another aircraft could be equipped with surface-to-air missile (SAM) suppression weapons, most likely drones equipped with radar seekers which would attack the SAM site upon activation of the SAM radar. These drones would be launched ahead of the cell, along the intended route, and be orbiting in place, awaiting the SAM radar signal. They would knock out the SAM sites prior to the cell's penetration of the lethal SAM line. The Tacit Rainbow system under development is one such system.

The third supporting aircraft could carry standoff weapons which would be used against fixed defenses. Again, prior to the cell's detection, these weapons would be launched against the enemy's defenses to reduce their effectiveness and to add more confusion to the attack. A

conventional ALCM with a cluster bomb unit (CBU) warhead would at least temporarily knock out a SAM system.

The remaining aircraft would serve as the actual striking force of the cell. As they are equipped with standard ECM systems and employed with enhanced conventional cell tactics, B-52s would penetrate through degraded enemy defenses and strike the assigned target(s). Withdrawal would be accomplished using the remaining deceptive and destructive ECM systems along with the mutual support provided by the electronic countermeasures B-52, SAM suppression drones, and decoys. The training and equipment required for each of the three support aircraft are discussed later.

The strategic penetration B-52 might encounter stiff resistance from enemy point defenses and, thus, may require some standoff weapon capability. However, standoff conventional weapons launched from penetrating B-52s near a point-defended target would not require the same range capabilities as the previously discussed long-range conventional munitions. They also would not require such a sophisticated navigation system to achieve the desired accuracy. Thus, the shorter-range standoff munitions would carry a larger payload at less expense.

Using either of these two methods (conventional standoff or conventional penetration) or a combination of both methods, the B-52 would pose a threat to any enemy from any direction at any time. When faced with this possibility, an aggressor would have to devote a large portion of the military forces to defend against a B-52 force. Enemy forces withheld for defensive purposes cannot be used offensively. Offensive forces would have to worry about not only their front and flanks but also their rear. In this way the enemy's striking power is reduced. B-52s prepared to accomplish strategic aerospace offense missions provide an enormous deterrent to conventional aggression.

Strategic Aerospace Defense

The next mission to examine is strategic aerospace defense. In this regard AFM 1-1 states:

> Strategic aerospace defense objectives are to integrate aerospace warning, control, and intercept forces to detect, identify, intercept, and destroy enemy forces (in any medium) attacking our nation's war sustaining capabilities or will to fight.[4]

The Air Force has a multitude of forces, AWACS, satellites, and ground radar assigned to this mission. The B-52 currently contributes to this mission through sea surveillance. The feasibility of using a B-52 in any other related mission is very remote except for one new threat: the Bear-H aircraft.

The Soviets have deployed long-range cruise missiles on their Bear-H aircraft. These nuclear missiles can be launched against the United States from over 1,500 miles away and are extremely difficult to detect and destroy after launch. The ability of US forces to intercept and destroy these aircraft prior to launch is limited by the extreme ranges from which the Bear-H can launch its missiles. A B-52 equipped with an air-intercept system and under the control of an aircraft with AWACS would have the range to reach the Bear-H aircraft prior to launch. A study of this concept would reveal whether this was a feasible solution.

The equipment for an air-intercept B-52 would include an intercept-type radar and appropriate missiles. The Hughes AN/AWG-9 weapon control system, the Phoenix advanced medium-range air-to-air missile (AMRAAM), and the advanced short-range air-to-air missile (ASRAAM) are possible systems. Minor design modifications (such as removal of the electro-optical viewing system--EVS), if shown by engineering tests to increase performance, could also be undertaken.

Besides the training required for basic aircrew skills, the training for such a mission should involve AWACS coordination exercises, target-acquisition and weapon-launch procedures, and aircraft defensive-procedures proficiency. Training would be relatively simple since smart launch-and-forget missiles would be employed. However, the incorporation of an intercept weapon system in these B-52s may prohibit the use of this weapon system in the traditional bombing role.

Although the B-52, equipped for strategic aerospace defense, could match up favorably with the Bear-H, there is another Soviet threat with which the B-52 could not contend. This new threat is the Soviet Blackjack aircraft. With its high-speed and long-range capability, the Blackjack could easily outrun a B-52 attempting to intercept. Thus, the role of the B-52 in strategic aerospace defense is too limited to warrant the modifications required to enable the B-52 to accomplish strategic aerospace defense. Other solutions to this threat need to be developed.

Counterair

Counterair operations are divided into three missions by AFM 1-1: offensive counterair (OCA), suppression of enemy air defenses (SEAD), and defensive counterair (DCA). The combined effect of these three missions is to achieve air supremacy and, thus, control of the aerospace environment. Properly equipped B-52s could contribute significantly to all phases of the SEAD mission and could accomplish portions of the offensive and defensive counterair missions.

Offensive Counterair

Size, speed, and maneuverability place the B-52 at an obvious disadvantage when matched against aircraft designed for air superiority. The current Air Force fighters are superior to the B-52 in the counterair role once the enemy's aircraft have been launched. Thus, B-52s should not attempt offensive counterair operations by seeking out enemy fighters in the air. The B-52 can contribute to offensive counterair objectives by attacking the enemy's infrastructure, and his aircraft still on the ground, or by diverting the enemy's attention.

There are several ways to accomplish an offensive counterair objective. The first method is to use conventional standoff munitions (CSM) to attack enemy airfields. The previously discussed constraints of conventional weapons still apply in this situation. The payload and cost of CSM prevent the total destruction of an airfield with these weapons. Consequently, the warheads must be designed not to destroy the airfield itself but rather to stop operations from that airfield for as long as possible. Warheads which deploy cluster bomblets or land mines can effectively destroy unsheltered aircraft and temporarily shut down an airfield.[5] When they are employed at the proper moment, such as shortly before our forces begin an offensive drive or prior to a B-52 cell's penetration of the early warning line, conventional standoff munitions can dramatically improve our chances for success.

After an airfield has been shut down temporarily, other B-52s (or the aircraft which launched CSMs)--employing both conventional general-purpose bombs and air-scatterable mines--can attack and destroy aircraft trapped at the airfield, command and control facilities, fuel reserves, and exposed personnel; and can crater the runway and taxiways. Aircraft en route to or launched from the airfield would be forced to divert to alternate landing sites with minimum

fuel reserves and without guidance from ground control. The overall effect would be to deny the enemy access to that airfield for an extended period and to destroy the enemy's air assets (aircraft, fuel, equipment, and personnel).

This second OCA method provides a longer period of air supremacy but requires the aircraft to penetrate to the airfield itself and to avoid other enemy defensive systems and the airfield's own point defenses. The additional enemy defenses encountered by penetrating B-52s greatly complicate the B-52's mission and increase the possible attrition rate. Crews assigned to the strategic aerospace mission would be able to attack OCA targets. Thus, this method of OCA does not need to be considered as a separate alternative.

The third way of contributing to OCA operations is to use decoys launched from B-52s to divert enemy aircraft from the actual attacking force. Decoys could mask our actual intentions, concentrate enemy defenses in the wrong location, and cause aircraft to be launched against worthless targets. This increases enemy sortie requirements; reduces aircraft availability as aircraft recover, refuel, and regenerate; and contributes to aircrew fatigue and task saturation.

Enemy interceptors launched against a decoy that simulates a KC-10, a C-5, a C-141, or a B-52 could be lured into a deadly trap. Instead of finding a nice big, slow target, the enemy could encounter a flight of air-superiority F-15s or F-16s. Even if the enemy discovers the trap before it is sprung and is able to escape, he has been taken out of action from another part of the theater.

Besides basic aircrew skills, crewmembers assigned to OCA would need few other skills. If the weapons have sufficient range, crewmembers would not need extremely demanding skills such as low-level navigation or terrain-avoidance proficiency. The only additional skills required would be proficiency in weapon operation. Depending on the actual weapons employed, weapon system operation proficiency could be achieved almost exclusively in simulators. B-52s equipped with a mixture of both decoys and CSMs (specifically designed to attack airfields and divert interceptors) would be effective OCA aircraft.

Suppression of Enemy Air Defenses

SEAD seeks to "neutralize, destroy, or temporarily degrade enemy air defensive systems in a specific area by physical and/or electronic attack."[6] This objective has

been an important part of air warfare since World War II and has been an essential element of the B-52's effectiveness for almost 30 years. Numerous modifications to the B-52's electronic countermeasures have occurred throughout three decades.

The three support aircraft used as an example in the previously discussed strategic aerospace offensive cell are all different types of SEAD aircraft. The first possible method of suppressing enemy defenses is to use electronic countermeasures. Every B-52 is configured with ECM gear and includes one electronic warfare officer. Electronic warfare countermeasures are essential for the aircraft's survival in a high-threat environment. However, this configuration (electronic equipment and one EWO) only uses a small portion of the B-52's potential ECM capacity.

A B-52 which does not penetrate the enemy's line of defense nor is used to deliver ordnance could be modified with more ECM gear and could contribute significantly to the successful penetration and withdrawal of an attacking aircraft or cell. The B-52's ECM capabilities could be enhanced threefold by its redesignation as an ECM platform. Since these aircraft have no weapon-delivery role and do not require precise navigational skills, one or both of the navigators can be replaced with EWOs and the associated ECM gear. (Current, ground-aligned, inertial navigation systems provide the required navigational accuracy and can be operated by the copilot.) Even the gunner and his station can be replaced with ECM equipment and an operator. If necessary, additional generators can be added to other engines to increase ECM power. The result would be a B-52 with four electronic warfare officers and the corresponding equipment. These modifications would be expensive, but since only a few aircraft need to be modified this way, the cost probably would not be prohibitive.

A second method of accomplishing SEAD is to attack the enemy's defenses directly. Enemy air-intercept airfields can be attacked with long-range standoff munitions which deploy land mines and, thus, prevent the launching of enemy fighters until after the attacking force has passed by. Other types of enemy defenses could be attacked by B-52s equipped with drones or missiles which launch directly against known fixed enemy defensive positions, or with missiles which are launched into areas of suspected enemy defenses and search for enemy radar signals to attack. Two possible systems are the Seek Spinner[7] (modified to be launched from a B-52) and the Tacit Rainbow.[8] Of these systems the Air Force Times said,

> The missiles could be programmed to precede a bombing attack by either B-52s or strike fighters. The missiles fan out to cover antiaircraft concentrations along the target route. When on site, the missiles circle, waiting for enemy operators to turn on their radars. Loiter time depends on how far the missile had to fly to its target.
>
> Radar commanders would be faced with the dilemma of turning on and being attacked, or letting the attacking force fly through relatively unmolested.
>
> A third response, attempting to shoot the missiles down, also is acceptable to the Air Force, which would prefer that an enemy use up his surface-to-air missiles and antiaircraft artillery ammunition trying to destroy unmanned aircraft, a defense official said. All of the options result in less-effective enemy air defense and an increased chance for survival of the main air strike force.[9]

SEAD also seeks to equip a penetrating B-52 with a destructive ECM system which attacks SAM systems if they acquire the attacking aircraft. The EWO would control and deploy a missile, such as the high-speed, antiradiation missile (HARM),[10] which attacks any radar system that acquires the B-52. Destructive and deceptive ECM procedures combine to create sufficient confusion within the enemy's defensive structure to increase the B-52's survivability.

Engineering studies and tacticians should decide which systems would be most cost-effective. Training for these roles naturally depends on which systems are actually employed. Training for a standoff ECM role should be similar to the program used in the EF-111. Simulator training would allow the crew to practice procedures against threats which cannot be simulated in the air.

The training program for launching decoys, drones, and missiles would exclude the traditional bombing and navigation items and replace them with the skills required to operate and launch each particular system. Simulator training would be much less important except for systems which require operator guidance after launch. HARM-type missiles deployed on penetrating bombers would require both additional simulator training and the additional inflight practice required for identifying and launching weapons against enemy defenses.

Defensive Counterair

The B-52 has the most limited and least likely potential in defensive counterair due to its speed, size, and maneuverability. B-52s employed against enemy fighters are at an obvious disadvantage. Airborne warning and control systems adequately provide the necessary detection and identification of attacking enemy forces. Except possibly for attacking enemy cruise missile launchers, targeted against the United States or US Navy forces, the B-52 could be employed more effectively in other roles. The B-52's possible contributions to strategic aerospace defense and maritime operations are discussed elsewhere in this paper.

Overall, the B-52 can contribute significantly to air supremacy. Penetrating strategic aerospace offense B-52s targeted against airfields or the enemy's infrastructure perform an offensive counterair mission. CSM carriers targeted against the same enemy positions perform a similar role. Standoff ECM platforms and CSM carriers operating against radars and SAM sites are performing a SEAD function. Even penetrating bombers using ECM for self-defense are accomplishing a SEAD role. Because air supremacy allows so many other missions to be performed (including ground and sea operations) and the B-52 has the ability to contribute greatly to air supremacy through OCA and SEAD, B-52s should be assigned to counterair missions.

Air Interdiction

According to AFM 1-1, "Air interdiction objectives are to delay, disrupt, divert, or destroy an enemy's military potential before it can be brought to bear effectively against friendly forces."[11] AFM 1-1 lists interdiction targets as "enemy surface forces, movement networks, command, control, and communication networks, and combat supplies."[12] In the simplest terms, air-interdiction targets are the enemy forces moving toward the front lines, or the transportation, communications, or supply lines that support the movement of enemy forces.

The B-52 is not designed to search and destroy enemy land forces. Aircraft designed for search-and-destroy missions, such as the A-10, have difficulty solving the problems of target acquisition, identification, and destruction.[13] Exposing a large and relatively slow aircraft such as a B-52 to the high-threat environment

anticipated in the air-interdiction role would result in an aircraft attrition rate which would probably greatly outweigh the expected damage.

The B-52 can attack numerous air-interdiction targets. Temporarily immobile or fixed targets are vulnerable to a B-52 strike. If the position of these targets is known and if they remain fixed long enough to generate a strike, they can be destroyed by the B-52. The required ordnance is dependent on the type of target. Conventional 500-pound iron bombs will be effective on some targets. Smart bombs may be necessary for other targets, and air-scatterable mines[14] may be most effective for even other targets. The debate over which weapons to use on what types of targets is beyond the scope of this paper. However, regardless of the outcome of this debate, B-52s can deliver any one of these types of munitions.

The training and skills necessary to accomplish air interdiction are similar to the skills and training necessary for strategic offensive operations. Consequently, these skills and training requirements will not be repeated in this section except to add one generality. Due to the number of potential interdiction targets, the required mobility of enemy reserves and supplies, and the size of lines of communication and transportation, interdiction target defenses are less concentrated and prepared. Thus, compared to strategic offense operations, air interdiction requires less support for successful target penetration, and it can be accomplished by slightly less-skilled aircrews.

Some air-interdiction targets are located great distances from the battlefield and deep inside enemy territory. Because of the distances involved, the B-52 may be the only weapon system with the range and firepower to destroy these targets. If the second and third echelons of enemy ground forces are allowed to advance unimpeded, the United States' ground forces could be overrun rapidly. B-52s assigned to air-interdiction targets well behind the front lines are essential to the AirLand Battle concepts. Thus, B-52s should be assigned to the mission of air interdiction.

Close Air Support

Close air support (CAS) is an Air Force mission which is very dear to the hearts of many infantrymen, especially when they are under attack by an overwhelming force. AFM 1-1 states that "close air support objectives are to support surface operations by attacking hostile targets in close

proximity to friendly surface forces."[15] The wisdom of using B-52s in such a role has been and will continue to be a hotly debated issue in the Air Force. Despite the wisdom of B-52 usage, some situations may require the B-52 to be used in a close-air-support role. Consequently, possible ways to employ the B-52 in CAS require examination.

The B-52 could be used for close air support whenever no other means exist to obtain the necessary firepower. This could occur if US land forces were under enemy attack outside the range of other air, naval, or ground assets, or if our offensive movement were stopped by a determined enemy defensive position. In either case the B-52 is the only weapon system available that could provide timely and adequate firepower.

The accuracy of the offensive avionics system (OAS) allows the B-52 to drop weapons relatively close to friendly troops without harm to them. What essentially is required to provide CAS is an axis of attack and a set of target coordinates. The requesting Army unit knows the desired CAS target and axis of attack. All that is required is for the Army to pass this information to the B-52. There are several ways of transferring this information from the Army unit to the B-52. The most timely and consequently the most useful way is by secure radio communications between ground forces and airborne B-52s. B-52 conventional wings practice the procedures required to perform this type of bombing through the bomber target change procedures specified in SACR 51-52.[16] Currently, these target changes are passed from the home unit's command post to airborne B-52s, but through the use of new technology, including communication satellites, an airborne B-52 could receive target information directly from any Army unit equipped with the proper communication gear.

Currently, ground forces pass CAS requests and targeting information through the tactical air control system to the CAS aircraft. In some situations, the forward air control party (FACP), stationed with the requesting unit, provides final target identification directly to the aircraft. B-52 CAS could operate in the same manner. After receiving and validating targeting information from the FACP, B-52s determine bomb-run routing and provide a target time to the Army unit. When it establishes and maintains secure radio communications, FACP can direct target aborts or withholds up to seconds before release. Therefore, the decision to release is controlled by the ground forces and can be stopped if any problems arise. If the bomb run is aborted, the B-52 could withdraw to a safe area and await new targeting information.

Target coordinate identification could be determined through the use of the Army's position location reporting system (PLRS)[17] or with a portable unit that ties into the global positioning system (GPS). Equipping B-52s with GPS improves their accuracy by eliminating OAS errors and errors caused by differences between two separate mapping reference systems. Another method of target identification involves an entirely different approach.

If desired, Army units could be equipped with secure radar beacons. Target identification would be based on a true bearing and range between this beacon and the desired target. The axis of attack would be determined as usual. The B-52's OAS software would require modification which determines the target by adding the provided range and bearing to the radar beacon picked up by the B-52's radar. The B-52's radar navigator would only have to input the provided range and bearing into OAS, configure the bombing system for release, locate the beacon on radar, position the cross hairs on the beacon return, and allow OAS to determine the desired target based on the input range and bearing. Essentially, the radar beacon is an offset and the resolved range and bearing define the target. This arrangement eliminates coordinate reference errors because the target is defined off the radar beacon and reduces OAS drift error because the beacon may be used for aiming almost until the actual release. Additionally, if the target were to move shortly before bomber arrival (such as is possible if our troops were required to retreat from an attacking force) the B-52 could still deliver its payload as long as the range and bearing between our forces and the enemy remained relatively constant.

B-52s equipped with standoff weapons could also provide close air support for an Army unit. Orbiting safely behind the front line, B-52s equipped with laser-guided munitions such as the Laser Maverick or Paveway laser-guided bombs[18] would attack targets identified by the Army. Army units equipped with ground laser locator designators would identify and illuminate targets and then call for the bomber to deliver the weapon. With its large payload and loiter time, a single B-52 could attack several targets and remain on station for an extended period. A relay system of employment would provide the Army unit with continuous CAS for several hours or even days if necessary.

Aircrew training for close air support would be very demanding. Therefore the crew's bombing requirements would be extensive. Aircrews selected for these missions would have to be some of the most accurate bombers available. Actual training requirements depend on which method of

target identification is selected as well as the munitions to be employed. Laser-designated bombing is the simplest since the bomber remains behind the front lines and needs only to launch the weapon in the general direction of the target. GPS bombing is the next simplest because GPS accurately determines the required target release information. Aircrews would require basic aircrew skills and bombing checklist and equipment configuration, loading of target coordinates, pilot bombing skills, and threat-penetration tactics. Use of the Army PLRS and the OAS would be least accurate due to errors between two different inertial navigation systems and the potential OAS drift errors (if no accurate offset were available in the immediate target area). This type of bombing would require extensive OAS programming training to reduce OAS errors and possibly bomb-run radar aiming proficiency. Radar beacon bombing training would require the previously discussed skills plus certain bomb-run radarscope tuning and aiming proficiency. Fortunately, using a beacon as an offset is the easiest type of offset bombing.

In addition to these skills, aircrews and ground forces would need frequent exercises to practice procedures, eliminate coordination problems, and determine mutual capabilities (how much lead time is required, et cetera). Using dummy munitions in these exercises, thereby adding some degree of risk to the exercise, would be essential to the development of Army confidence in B-52 capabilities and, thus, would allow the bomber to be used in the most effective manner.

The B-52 close-air-support role should be reserved for unique situations or at least used as a last resort. Many other aircraft currently practice for this type of mission and can perform at least as well as if not better than the B-52. Dedicating B-52s to CAS is probably a misuse of the B-52. However, this reasoning should not be used as the justification for not preparing B-52s at all for close air support. Some unique circumstances may require the B-52's massive firepower. For example, a surprise attack by Warsaw Pact forces in Europe is just one situation in which the B-52 could be called upon to delay the attacking forces while reserves are brought into action. Procedures need to be developed and aircrews prepared to accomplish CAS if the situation is desperate.

Special Operations

Special operations encompasses the previously discussed missions as well as any other potential uses of aerospace forces. According to AFM 1-1, "Virtually all aerospace forces have the potential for employment in special operations."[19] Obviously, the B-52 has the potential to contribute significantly to this role.

Many special operations would benefit from the support available from selected B-52 crews trained in the previously discussed areas. A small squadron--six or seven aircraft--dedicated to special operations could be formed to train for those unique roles which have not been previously discussed. This squadron would work with other special operations units in planning and developing new contingency operations. The long-range and massive firepower of a single B-52 would greatly expand the potential of our special forces.

As an example, a small special forces unit could be dropped into a country which supports terrorist activity. The ground unit would locate the terrorist headquarters or training camp, and special operations B-52s orbiting outside of the target country would be dispatched to destroy it. The ground units could use laser designators to guide precision weapons to a particular building or could use any of the other previously discussed methods to identify target coordinates for the attacking B-52s. This type of capability would make terrorist groups susceptible to attack anytime or anywhere in the world without the warning signals provided in operations like the 1986 raid in Libya.

Training and equipping a special operations squadron would depend entirely on the contingencies developed. The squadron staff which develops these plans also would have to determine what equipment would be required and what type of training would be necessary. Imaginative thought combined with the experiences of other special operations units would ensure a squadron fully capable of completing its mission. The budget process will determine if enough B-52s are available for the Air Force to devote a few of them to special operations.

Airlift

The B-52 does have a very limited airlift capability. In extreme emergencies it could be used to carry personnel or some equipment in the bomb bay or the "47 section" of the aircraft. However, neither compartment is pressurized nor designed to carry anything except a weapon payload. With

the existence of so many more capable airlift aircraft, such as the C-130, C-141, C-5, and KC-10, using B-52s in an airlift role would be a waste of resources. There may be unique situations in which a B-52 may be required to airlift equipment to some remote region of the world (beyond the range of special operations C-130s), but this is highly unlikely and could be handled on an individual basis if such a situation were to arise.

Aerospace Surveillance and Reconnaissance

The objective of aerospace surveillance and reconnaissance missions is to collect information from a variety of different systems, including airborne, orbital, and surface-based sensors.[20] Our focus here is on airborne sensors. The Air Force currently has a multitude of aircraft assigned to surveillance and reconnaissance. The SR-71, U-2, RC-135, RF-4, and WC-130 are just some of the aircraft assigned to this role. However, the Air Force appears to lack emphasis in one area which could be crucial in the next war. This area is in the role of reconnaissance drones. The potential of such vehicles was demonstrated by the Israelis in the Bekaa Valley of Lebanon in 1982.

Since drones can be launched from outside of enemy defenses, B-52 drone carriers require few defenses and minimal navigational and pilot skills. With four crew stations besides the pilot and the copilot, the B-52 could be modified to launch drones that operate independently after launch or with drones that require continuous control after launch. Real-time analysis and evaluation of data provided from the drones also would be possible. In a tactical situation this information could be crucial to locating and targeting mobile forces.

The required aircrew training would depend on the type of drones employed. B-52s that merely launch autonomous drones would require minimal basic aircrew skills and launching skills. Flight training would consist of basic proficiency training only, and simulators could be used for most launch procedures training.

Training for drones that are controlled after launch would be more extensive. Besides their basic flight proficiency, these crews would require practice in controlling and directing the drone itself. Learning to "fly" the drone would require the development of a drone simulator as well as the occasional flight of practice drones.

Crews tasked with analyzing and evaluating real-time drone information would require the most training. Piloting and navigating skills would still be minimal but interpreting and evaluating information (as well as possibly passing targeting information to attack aircraft) would require extensive training and practice. This would require simulator training and frequent drone launches in a realistic training environment.

If reconnaissance drones were developed which require launch from an airborne platform, the B-52 would be an obvious candidate. However, the B-52 is not the only potential candidate. If the launch platform were kept out of hostile airspace and only required to launch a few drones per sortie, numerous other aircraft could perform this mission. C-141s are just one alternative. A modified C-141 could launch several drones and could have the space to handle several drone operator stations in the cargo bay. Although this would require significant modification, the C-141 could easily assume this role and allow the B-52 to perform other missions.

Aerospace Maritime Operations

Department of Defense Directive 5100.1 assigns the Air Force with the responsibility to perform a collateral function of maritime operations. AFM 1-1 states:

> Aerospace maritime operations objectives are to neutralize or destroy enemy naval forces and to protect friendly naval forces and shipping. Aerospace maritime operations may consist of counter air operations, aerial minelaying, reconnaissance and surveillance, and interdiction of enemy naval surface and subsurface forces, port facilities, and shipping.[21]

Interdiction of port facilities is similar to interdiction of other land targets and has been covered in the appropriate section. Counterair operations capabilities also have been previously discussed.

Aerial Minelaying

The B-52 can deliver aerial mines anywhere in the world in less than 24 hours. The B-52 carries the following mines: 51 DST-36, 51 Mk 117D, 10 Mk 40 DST, 22 Mk 52, 18 Mk

55, 18 Mk 56, and 18 Mk 60.[22] Compatibility between aerial mines and the bomber harness system would enable the B-52 to carry any future aerial mines.

Recent events in the Persian Gulf underscore the effectiveness of mine warfare. Renewed interest in minelaying[23] must continue and must result in increased numbers and types of aerial mines available for immediate delivery. Stockpiling sufficient types and numbers of aerial mines at appropriately tasked B-52 wings would greatly increase the military's overall minelaying capabilities.

The accuracy of the B-52's OAS and the proficiency of bomber's aircrews are more than sufficient to meet most mining accuracy standards. Actual B-52 bombing accuracy is classified but would easily satisfy most requirements. Aircrew skills used in dropping mines are very similar to basic low-level bombing procedures. Consequently, all bomber crews would be able to lay mines with only a minor amount of additional training. Presently, minelaying is practiced on a regular basis by conventionally qualified aircrews.[24]

B-52s laying mines in friendly waters would encounter essentially no threats. Likewise, mining of international waters would involve very little risk. (The potential presence of enemy naval vessels in international waters increases risk factors.) Aerial mining of enemy waters would encounter the highest threat level. However, the B-52's current tactics and ECM equipment reduce the risk to the aircraft to an acceptable level in the vast majority of situations. Counterair, ECM, and SAM suppression support from Navy or Air Force units in high-threat areas would enable the B-52 to deliver mines virtually anywhere in the world without undue risk.

Overall, the B-52 can significantly increase US minelaying capacity. Cooperation between the Air Force and Navy in this area would be very beneficial, and if this cooperation develops, a relatively small investment in weapon procurement and B-52 aircrew training would pay large dividends.

Reconnaissance and Surveillance

The potential capabilities of B-52s for maritime reconnaissance and surveillance have been demonstrated by numerous Busy Observer missions since 1975.[25] These missions have shown the B-52 to be very effective in

locating and identifying naval vessels anywhere in the world. However, these same missions have identified problems that apply in a wartime situation.

The basic Busy Observer mission is accomplished in the following manner. A B-52 is assigned a general area to search for a specific vessel or any vessel within the search area. The B-52 begins a search pattern in that area and identifies potential targets in the area primarily by radar. Some information from the electronic warfare officer may aid in locating targets. Once it identifies a target on radar, the B-52 descends and overflies the suspected target. Positive identification is achieved visually. In a wartime environment the need to identify positively a vessel by visual means would expose the B-52 to the ship's defensive systems. However, the positive identification of unarmed enemy merchant vessels, the tracking of enemy naval vessels prior to actual shooting, and the general location of vessels within an ocean area are well within the current B-52 capabilities. This ability is viewed as a very effective deterrent.

In a wartime environment several ways exist to eliminate the need to close within visual range for positive identification. The first way is to assign the B-52 to an area which has no known friendly vessels operating. In this way the B-52 would assume all vessels located by radar were enemy ships and would remain outside of the threat environment. This method would require no modifications to the B-52. A second method would be to equip friendly vessels with secure transponders that the B-52 could interrogate by radar. Equipping all friendly vessels with transponders would be somewhat expensive, but it is technologically feasible.

A third method would be to use a drone launched from the B-52 to accomplish the actual positive identification phase. Controlled by the B-52, the drone would be directed to the suspected target and send real-time pictures to the B-52. This method would be expensive, but it would be technologically feasible and would greatly increase the B-52's effectiveness.

Other methods are available to resolve this problem. For example, improved optical systems or a better radar set would enable the bomber to identify a target outside of the range of shipborne SAM systems. A more detailed discussion of this problem and possible solutions is found in chapter 3.

Aircrew training for the reconnaissance mission would depend on which suggested method is employed. Using a drone requires a simulator which enables the crew to remain proficient with actual "hands-on" experience. Using cameras or a new radar system requires the same type of training as with any new aircraft system. Busy Observer training as specified in SACR 51-52,[26] plus the additional training required to operate the new identification systems, would enable the B-52 to contribute to maritime reconnaissance and surveillance.

Interdiction of Surface Vessels

The destruction of surface vessels, naval or merchant, is an extension of the reconnaissance and surveillance mission. After positively identifying a surface vessel, the B-52 could launch weapons against enemy vessels. The most effective method of accomplishing this mission would be to use precision-guided munitions. The GBU-15 glide bomb, Shrike antiradiation missile, Maverick missile, and Harpoon antiship missile are examples of munitions that could be used in this role.[27] Some B-52 wings are currently equipped with the Harpoon system.

The B-52 can carry 12 Harpoon missiles. These missiles employ an active radar guidance system for terminal guidance, allowing the B-52 to "launch and forget" the Harpoon outside of the range of shipborne threats. The effectiveness of the Harpoon missile was demonstrated by sinking two Libyan warships in the Gulf of Sidra in March 1986.[28] However, this type of weapon has several inherent limitations.

The first limitation is its inability to distinguish types of targets. In essence, the launching platform must make positive identification of the target prior to launch. (Being only semismart a radar-guided weapon will attack any target--friend, foe, or neutral--within the target area.) Consequently, the problem of "positive identification" discussed in the reconnaissance and surveillance section of this chapter must be resolved prior to weapon launch.

A second limitation of a semismart weapon is its inability to select either the optimum target within the search area or the optimum impact point. Given a choice of targets, a semismart weapon may select a previously disabled vessel or a cruiser amongst battleships. Inability to select the impact point may result in relatively minor damage to the ship while a hit in the stern may have disabled the vessel. Due to the high cost of this type of

weapon, each launch must achieve the highest possible level of damage.

The procurement of a weapon system that eliminates these problems would greatly improve the effectiveness of the B-52 in this role. Due to the size of the sea lines of communication (SLOCs) and the tremendous amount of shipping activity required to support a NATO/Warsaw Pact confrontation,[29] the US Navy has an enormous task. B-52s configured to locate and attack enemy vessels from outside the range of shipborne defensive threats can help keep SLOCs open. B-52s can also provide extended-range protection for the Navy's vessels while posing a threat to the enemy's ships at any time or at any location.

B-52 surface interdiction training, using the Harpoon missile, is outlined in SACR 51-52, B-52 Aircrew Training. This training is relatively simple because the weapon is internally guided. In addition, procedures for configuration and launch are fairly simple. Except for the additional coordination and communication between the B-52 and the Navy directing agent (if applicable) and target search/identification procedures, the skills necessary to drop a Harpoon are similar to the basic aircrew skills used every day.

Training with future antiship weapons may be more complicated. A weapon requiring operator guidance from launch to impact would require training for that portion of the missile's flight. Due to missile costs, this would probably require the use of a weapon simulator. Overall, the more self-sufficient the weapon system, the less aircrew skills are required; conversely, the less self-sufficient the weapon system, the more aircrew skills are required.

Subsurface Interdiction

The role of the B-52 in antisubmarine warfare (ASW) is currently limited to indirect support only (i.e., minelaying and interdiction of ports). Direct ASW is a five-step process: detection, classification, localization, tracking, and kill.[30] As it is currently configured, the B-52 cannot accomplish the first four steps without extensive modification, the cost of which can be prohibitive. A B-52 configured with the latest ASW equipment should be investigated as an alternative to the 125 P-3Ds requested by the Navy.[31]

The B-52 can execute the "kill" step without significant modification. Working in concert with a P-3, a B-52 can kill a submarine by dropping one of several different types of Navy torpedoes within range of the enemy's submarine. This combined ASW team has enhanced capabilities due to the composite effects of both aircraft's capabilities. When the P-3 functions in this way, its range, loiter time, and payload would be enhanced.[32]

The P-3's normal fuel capacity is 62,500 pounds. Its payload is 20,000 pounds.[33] If the B-52 carried ASW weapons, the P-3 could carry approximately one-third more fuel (or equipment). This extends the P-3's range of loiter time by approximately one-third. Additionally, the B-52's increased payload capacity provides more weapons for employment.

The P-3/B-52 team would operate in the following manner. The P-3 would detect, classify, localize, and track the submarine. The location of the desired weapon impact point would be given to the B-52. This may be accomplished by passing coordinates to the B-52 or by dropping a radar beacon on the desired impact point. From its orbit, the B-52 would drop the desired weapon on the target.

Training for this type of mission for the B-52 would be similar to standard minelaying and bombing training and would also require some additional joint training. Joint missions would practice procedures for communicating the desired impact point to the bomber and simulated delivery of the desired weapon specified by the P-3. Coordinated teamwork between the Air Force and the Navy would result in an effective ASW team with enhanced capabilities.

B-52s assigned to aerospace maritime operations have a great deal of present-day capability. Independently, they can conduct aerial minelaying, reconnaissance and surveillance, and interdiction of enemy surface forces, port facilities, and shipping. Working in cooperation with Navy assets, they are even more capable of performing these missions as well as of interdicting enemy subsurface vessels. If available, B-52s should be assigned to aerospace maritime operations.

Summary

The B-52 is an extremely flexible aircraft. When it is properly configured, the B-52 can accomplish many of the nine Air Force missions listed below and also specified in AFM 1-1.[34]

Strategic Aerospace Offense. This is the original mission of the B-52. With modifications the B-52 can accomplish this mission by using conventional standoff munitions, by penetrating enemy territory and using free-fall ballistic munitions and short-range, precision-guided munitions, or by using a combination of both methods. The B-52 is the only aircraft in its class (similar range and firepower) that can be used for conventional operations.

Strategic Aerospace Defense. The B-52 can accomplish this mission but would require extensive modifications and would have a limited role. Many other aircraft have better qualifications.

Counterair. With new weapons the B-52 has great potential in both OCA and SEAD portions of counterair missions. It has a very limited capability in DCA. The B-52 used in a counterair mission has unique capabilities which could enhance the effectiveness of the Air Force's other counterair assets.

Air Interdiction. The B-52 is the only aircraft that could be dedicated to conventional warfare with the range to perform deep interdiction.

Close Air Support. The B-52 also could be used in an emergency, but too many other aircraft with better characteristics are available for this mission.

Special Operations. Like any other aircraft the B-52 could be used in special operations.

Airlift. The B-52 has some very limited airlift capability.

Aerospace Surveillance and Reconnaissance. The B-52 could be modified to accomplish this mission but so could many other aircraft with equal or better capabilities.

Aerospace Maritime Operations. The B-52 with no modifications is extremely capable of performing aerial minelaying, reconnaissance and surveillance, and interdiction of enemy naval surface forces, port facilities, and shipping. It has a limited capability in ASW. With relatively inexpensive modifications it could be even more potent in maritime operations.

Although it may be desirable to assign conventional B-52s to all of the missions with which it has a great amount of potential, this may not be possible. This is due primarily to the various limitations confronting the

conventional B-52 force. Familiarization with the various factors that limit the B-52's capabilities allows an individual to determine which missions the B-52 should be assigned to. The following chapter discusses the B-52's limitations.

Notes

1. AFM 1-1, Basic Aerospace Doctrine of the United States Air Force, 16 March 1984, 3-2.

2. Ibid.

3. "Use Advanced Conventional Weapons Early in War, [Frank C.] Carlucci Says," Aerospace Daily, 29 January 1988, 151.

4. AFM 1-1, 3-2.

5. My initial thoughts on the problem of closing runways came from conversations with Lt Col Price T. Bingham and from his CADRE Paper, Air Power and the Defeat of a Warsaw Pact Offensive: Taking a Different Approach to Air Interdiction in NATO, Research Report AU-ARI-CP-87-29 (Maxwell AFB, Ala.: Air University Press, March 1987).

6. AFM 1-1, 3-3.

7. "Congressional Pressure Prompts Order to Revive Anti-Radar Drone," Aviation Week, 3 August 1987, 84.

8. "Tests Progress on Tacit Rainbow 'Crew-Saver'," Air Force Times, 19 October 1987, 36.

9. Ibid.

10. Jane's Weapon Systems 1986-87 (London: Jane's Publishing Company Limited, 1987), 191-92.

11. AFM 1-1, 3-3.

12. Ibid.

13. Bingham, Air Power and the Defeat of a Warsaw Pact Offensive, 3-8.

14. Research, testing, and development of new weapons is an ongoing process. As this process continues better weapons (hopefully) will be developed and deployed. The relatively high cost of these advanced technology weapons

will require optimum targeting. The issue of which weapons to employ against which targets requires continual debate and discussion. Bingham's article, Air Power and the Defeat of a Warsaw Pact Offensive, offers some interesting ideas in the employment of air-scatterable mines.

15. AFM 1-1, 3-4.

16. SACR 51-52, B-52 Aircrew Training, 26 September 1987, A2-17.

17. Jane's Weapon Systems 1986-87, 309.

18. Ibid., 187-88.

19. AFM 1-1, 3-4.

20. Ibid., 3-5.

21. Ibid., 3-5, 3-6.

22. Lt Col John E. Frisby and Maj Grover E. Myers, Strategic Forces in Transition: A Doctrine for Indivisible Aerospace Application, Research Report AU-ARI-85-2 (Maxwell AFB, Ala.: Air University Press, June 1985), 140.

23. Capt Thomas Bradley, The Use of Air Power in Joint Maritime Operations, Research Report AU-ARI-84-9 (Maxwell AFB, Ala.: Air University Press, August 1985), 71-72.

24. SACR 51-52, A2-1.

25. Bradley, 77.

26. SACR 51-52, A2-4.

27. Bradley, 73.

28. Jane's Weapon Systems 1986-87, 191.

29. An interesting discussion of the importance of SLOCs can be found in North Atlantic Assembly Papers, NATO Anti-Submarine Warfare: Strategy, Requirements, and the Need for Co-operation (Brussels, Belgium: North Atlantic Assembly, 1982).

30. J. R. Hill, Anti-Submarine Warfare (Annapolis, Md.: Naval Institute Press, 1985), 44-52.

31. Jane's All the World's Aircraft 1986-87 (London: Jane's Publishing Company Limited, 1987), 438.

32. Frisby and Myers, 218.

33. Jane's All the World's Aircraft 1986-87, 439.

34. AFM 1-1.

CHAPTER 2

LIMITATIONS TO THE B-52 CONVENTIONAL FORCE

The most obvious limitation to preparing B-52 forces for a larger conventional role is the monetary one. Now and in the immediate future, all United States military forces are confronted with a decreasing budget. Consequently, all military forces, especially forces needing additional funding, must recognize monetary constraints as a limitation in the development of new capabilities.

Besides being the most obvious limitation, monetary constraints are also the most comprehensive and complex. Any action taken to improve B-52 capabilities, to support weapon development and procurement, to support daily operations, or to pay B-52 personnel is influenced by monetary constraints. However, an in-depth study of the impact of the funding problem associated with organizing, equipping, and training B-52 units for conventional operations is beyond the scope of this project. In addition, this study does not address actual dollar figures, or fiscal limitations, except to recognize that proposals suggested will be constrained by the budget, so their implementation must significantly improve capabilities while minimizing costs.

The six general areas outlined in this study include political considerations, geographic factors, aircraft constraints, equipment and weapons concerns, aircrew matters, and employment constraints. When they are combined these factors create problems which affect the way B-52 forces can accomplish their assigned missions. These factors must be considered as B-52 forces are prepared for conventional operations.

Political Considerations

In the area of political considerations, the first limitation to consider is the impact of arms control agreements upon the development of conventional B-52 forces. Although it is impossible to predict with complete accuracy the content of future arms control agreements, we can examine previous arms control negotiations as indications of the shape of any new agreements.

The 1979 Strategic Arms Limitation Talks (SALT II Treaty) and the arms control discussions at the 1986 Reykjavik summit are two samples that may indicate the

direction of future arms limitation agreements. Future agreements which follow the SALT II Treaty and Reykjavik-type arms control guidelines could dramatically affect the way the United States could develop the B-52 conventional bomber force.

The SALT II Treaty specified ceilings on the number of intercontinental ballistic missile (ICBM) and submarine-launched ballistic missile (SLBM) launchers, heavy bombers, and air-to-surface ballistic missiles (ASBMs) the United States and USSR could develop. The treaty defined heavy bombers as

> (a) currently, for the United States of America, bombers of the B-52 and B-1 types, and for the Union of Soviet Socialist Republics, bombers of the Tupolev-95 and Myasishchev types.
>
> (b) in the future, types of bombers which cancarry out the mission of a heavy bomber in a manner similar or superior to that of bombers listed in sub-paragraph (a) above.[1]

The SALT II Treaty also defined air-to-surface ballistic missiles (or cruise missiles) as "any such missiles capable of a range in excess of 600 kilometers and installed in an aircraft or its external mountings."[2]

The treaty then placed a ceiling on the number of strategic weapon delivery vehicles each side could maintain. Overall, strategic delivery systems could not exceed 2,250. ICBMs, SLBMs, and ASBMs with multiple independently targeted reentry vehicles (MIRVs), and aircraft with long-range cruise missiles were limited to 1,320 systems. By identifying B-52s and ASBMs as strategic delivery vehicles, the treaty permitted both systems to be included in the established ceiling limit regardless of what types of warheads they carried. Thus, B-52s assigned to a conventional role and each ASBM (with a range of over 600 km) with a conventional warhead would count the same as a nuclear ICBM or SLBM.

The Salt II Treaty excluded from the strategic weapon delivery vehicle ceiling any bomber modified to be incapable of performing the strategic (nuclear) bomber mission. The bomber modification must be verifiable through reconnaissance satellites. The treaty stipulated the following:

> Airplanes which otherwise would be bombers of a heavy type shall not be considered to be bombers of a heavy bomber type if they have functionally related observable differences which indicate that they cannot perform the mission of a heavy bomber. . . . Functionally related observable differences shall be verifiable by national technical means.[3]

The same type of rule applied in differentiating between ASBMs with ranges over 600 km and those with ranges under 600 km. Thus, on 28 November 1986 the United States exceeded the 1,320 strategic nuclear missile delivery system limit when the 131st B-52 was equipped with cruise missiles.[4]

Arms control discussions at Reykjavik, Iceland, were even more restrictive because "the United States agreed for the first time to include bombers within the 1,600 limit, and to a formula for counting loaded bombers in the warhead category."[5]

> The tentative Reykjavik formula would limit each superpower to 6,000 strategic missile warheads and air-launched cruise missiles and 1,600 delivery systems, including ballistic missiles and bombers. According to the Reykjavik formula, a strategic bomber carrying only nuclear bombs and short-range missiles would count as one against [a] 6,000-weapon ceiling; each bomber carrying cruise missiles with ranges in excess of 600 kilometers, however, would count [as] an agreed higher number, such as 12.[6]

The cumulative effect of these rules would tie conventional B-52s and conventional cruise missiles (with ranges of over 600 km) to the ceilings imposed by strategic arms limitation agreements. In this way the United States is confronted with an unacceptable choice. It can increase its conventional deterrence by deploying conventional B-52s with cruise missiles but only at the expense of reducing its nuclear deterrence force.

To avoid this limitation, future arms control agreements must exclude conventional B-52s and conventional ASBMs from strategic arms limitation quotas. If a means of achieving this distinction is not found, then deployment of conventional B-52s or ASBMs would reduce the number of nuclear strategic systems the United States could maintain. Possible means to achieve this exclusion in future arms control agreements can be found in "Bombers in the

Conventional Role," a report by Ronald E. Sawyer of the General Research Corporation.[7]

The second political consideration when deciding how to employ B-52s in a conventional role is the attitudes of the general population toward nuclear weapons. The general population fears nuclear weapons due to the potential horrors of such weapons and the public's inability to control the use of nuclear weapons (if the Soviet Union were to launch its missiles, the United States could not stop the missiles). Any movement of nuclear forces and the associated publicity of any such movement immediately revive the public's fear of nuclear war. Thus, the deployment of nuclear weapon systems in new environments triggers intense protests.

In the United States this reaction was seen when Trident submarines were launched from Groton, Connecticut, and again when they arrived in Bangor, Maine, in the early 1980s.[8] In October of 1983 a larger reaction occurred when protests developed in the United States as the Pershing II and ground-launched cruise missiles (GLCMs) were being deployed in Europe.[9] As vocal as the protest was in the United States, the reaction in Europe was even more severe.

In England 200,000 demonstrators protested against the deployment of GLCMs and Pershing IIs. On that same day one million Germans protested against the same deployment.[10] The resistance of such a large portion of the general population threatened the governments in Great Britain and West Germany and almost prevented Pershing IIs and GLCMs from being deployed. Similar European and American protests during President Carter's administration stopped the development of the neutron bomb.

The NATO alliance itself has been threatened by public opinion. Currently, American bases in Spain and Greece may be closed due to local opposition. Although the nuclear issue is not a major factor in this opposition, in most cases, this reaction is triggered when nuclear weapons are part of the issue. But how does the nuclear issue impact upon the development of conventional B-52s?

The B-52 has been an important part of the US nuclear force for over 30 years. During this time period, people throughout the world have begun to associate B-52s with nuclear weapons and nuclear warfare. The extent of this psychological association can be seen in America as the word strategic has become synonymous with the word nuclear.

> Misperceptions go far beyond statements of military doctrine. A president or secretary of defense making a statement to the press or Congress on "strategic policy" is more than likely discussing US nuclear weapons policy. The Strategic Arms Reduction Talks (START) are not intended to reduce strategic weapons but strategic nuclear weapons. When the secretary of defense in his annual report to Congress discusses our fighter aircraft requirements under the heading of "Tactical Air Forces," and bombers under "Nuclear Forces," he is making a clear distinction in the role of these aircraft.[11]

Observers can understand how the general population of the United States and its allies can make this mistake when the senior leadership of the United States military makes these same types of unintentional errors.

Consequently, because the perception of the B-52 is psychologically tied to nuclear weapons, any action which introduces B-52s into a new environment or a new role may encounter some resistance. This resistance results in political limitations to the deployment of B-52 forces to any places where the B-52 has not already established its presence.

To reduce this limitation, the Air Force must separate the conventional B-52 force from nuclear weapons in the minds of the general population. Until this is accomplished, both in the United States and overseas, the basing and deployment of B-52s will be restricted. The overall effect of such a political consideration is closely allied to the subsequent limitation--geographic factors.

Geographic Factors

Once it is airborne the B-52 has no absolute geographic limitations. With sufficient fuel, the B-52 can operate anywhere in the world and in any type of weather. This ability has been demonstrated by exercises conducted in Egypt, Australia, Korea, and the Indian Ocean. But the effectiveness and efficiency of such operations can be limited by geographic factors.

Threats to the vital interests of the United States or its allies exist throughout many regions of the world. The United States is committed to the defense of countries in Western Europe, Southeast Asia, Central America, the Middle East, and other regions of the world. If hostilities erupt

in any of these regions, the basing of US conventional air forces (to include conventional B-52 forces) would influence the effectiveness and efficiency of air operations.

Currently, US tactical air forces operate out of many bases in Great Britain, West Germany, Japan, the Philippines, and Korea. US Navy and airlift forces frequently operate out of the same countries and many other nations. But in their peacetime roles, B-52s operate routinely out of only two bases that are not in the continental United States (CONUS): one in Guam and one in Great Britain. In its wartime posture, the United States assumes that B-52 forces can be deployed to some other allied bases, but this will require extensive logistical support, political approval, and a fair amount of time--none of which may be readily available in a major crisis situation.

Furthermore, B-52 units which may be tasked to deploy overseas in times of conflict will do so without the benefit of having recently practiced for overseas deployment to a non-SAC base in any region of the world except for Great Britain. Consequently, the deployment of a conventional B-52 unit during a crisis may encounter problems which could be avoided if practice deployments to different regions of the world had been attempted. Likewise, B-52 crews who have not had much overseas experience will find operating outside of the United States quite different from operating within the United States.

Therefore, conventional B-52 effectiveness and efficiency is geographically limited. Without sufficient political support B-52s cannot be based at the most optimum locations and cannot overfly or train in many of our allied territories. The total impact of such a limitation is hard to predict, but some aspects are readily apparent.

The examination of a B-52 mission launched from a CONUS base as opposed to the same mission launched from a forward operating location will identify some of the geographic factors. The most obvious aspects of these geographic factors include fuel consumption, air refueling support, sortie duration, sortie availability, regeneration time, response time, and crew duty time.

The aforementioned General Research Corporation report on conventional bombers identified some of the factors that must be considered during planning for long-range missions.[12] This report used some of the following data to analyze their sample bomber missions:

B-52G usable fuel----------244,000 pounds
Average high-altitude
fuel consumption----------21,000 pounds/hour
Low-altitude fuel consumption--------36,000 pounds/hour
Average cruise speed (high/low)---------400 knots
Average KC-135 maximum offload------100,000 pounds*

By using these figures, one can understand how a B-52G loaded with weapons can fly 11.6 hours or 4,640 nautical miles (NM) unrefueled. This flight equates to a 2,320-NM combat radius. A quick look at a map reveals that a B-52G would require at least one air refueling just to launch from a base in CONUS, fly to Great Britain, and return.

If the same B-52G were required to operate at low altitude from Great Britain to strike a target in a Warsaw Pact nation, it would require additional refuelings. The previous data make it clear that the B-52G would require a 100,000-pound onload of fuel for every 2.8 hours or 1,100 nautical miles (550-NM radius) flown at low altitude.

The cumulative effect of fuel consumption and distance would be that each B-52G launched from CONUS to the Warsaw Pact area would require air refueling support from two or three KC-135s and would reduce the air refueling support available for other aircraft. If the B-52G were launched from and were recovered to a base in Great Britain, the same mission could be accomplished without air refueling support.

B-52s operating from forward locations (as opposed to operating from CONUS) have several other advantages--fuel consumption declines, sortie duration and crew fatigue is reduced, aircraft regeneration begins sooner, and the number of sorties available for subsequent strikes is dramatically increased. The greater the distance between the target area and the United States the more advantages are gained from forward basing.

Other less predictable geographic-related factors include mission effectiveness, attrition, equipment failure rates, and mission timeliness. As the sortie's length

*Although the figures listed are conservative and vary depending on the source, the conclusions drawn from this information are still valid. These figures ignore conditions such as the KC-135 launch base, air refueling location, the difference between high- and low-altitude cruise speeds, and the effect of gross weight on fuel consumption.

increases we can expect crew effectiveness and mission timeliness to decrease; and equipment failures, attrition, and regeneration times to increase. Overall mission effectiveness would be degraded. Thus, geographical factors such as the ones identified above can limit the effectiveness of conventional B-52 operations.

One final geographic factor for consideration is the availability of bases capable of supporting B-52 operations. Foremost, bases that support extensive B-52 operations must have runways of very large dimensions, approximately 10,000 feet by 150 feet. Second, their surfaces must be stressed for very heavy aircraft--that is, over 450,000 pounds. And finally, they must have a large parking ramp with equally stressed surfaces and possess a large petroleum, oil, and lubricant (POL) capability. B-52 operations from a base lacking any of these features would be severely limited or impossible. CONUS has approximately 52 airfields which are suitable for B-52 operations.[13] Outside of CONUS approximately 200 airfields are suitable for B-52s.[14]

Aircraft Constraints

Aircraft constraints are the result of the aircraft's design. Every aircraft built for the military is designed with two principal considerations: the mission of the aircraft and the defensive threats it may encounter. For example, the C-5 Galaxy was designed for hauling large loads over great distances. It was not expected to encounter significant threats, because it was intended to operate between CONUS bases and friendly overseas bases. Consequently, it was designed as a heavy, long-range aircraft with few defensive considerations.

Because the C-5 is such a large aircraft, it can effectively operate only between aerodromes with large, heavily stressed runways, ramps, and parking spaces. Thus, some design features that enable aircraft to perform their missions better, may restrict and limit the way the aircraft can perform other missions. The B-52 has some of the same limitations as the C-5.

The B-52 was designed in the 1940s to carry a large payload long distances. The only threat to the B-52 at that time consisted of gunfire from pursuit aircraft and antiaircraft artillery (AAA). Consequently, it was designed as a large aircraft (to carry great amounts of fuel and weapons) that flew fast at high altitudes (to avoid AAA and pursuing aircraft).

The basic characteristics of the B-52G are listed below:

- Length, 160 feet;
- Height, 40 feet;
- Wingspan, 185 feet;
- Payload, 75,000 pounds;
- Gross takeoff weight, over 488,000 pounds;
- Ceiling, 50,000+ feet;
- Range, over 6,500 miles (unrefueled);
- Speed, 440 knots high, 360 knots low;
- Distance between tip gear, 148 feet;
- Engines, 8 J57-P-43WP.[15]

These design characteristics enable the B-52 to perform its original mission--that is, high-altitude strategic nuclear bombing--but they also limit future use.

The first limitation is its enormous size. The B-52's weight and size require it to operate from large aerodromes with great POL capability. This limits the number of bases from which the B-52 can efficiently operate.

The second limitation emanates from new and improved aircraft defense threats. As pursuit aircraft and SAMs were developed, the B-52's basic design characteristics (size, shape, and material composition, which cannot be changed) became very vulnerable to aircraft defenses in three spectrums: visual, infrared (IR), and radar. Fortunately, the B-52's design was flexible enough to reduce its own vulnerability without changing its basic characteristics.

To reduce its vulnerability in the visual spectrum, the B-52 was modified and equipped to operate at very low altitudes. Thus, fighters and AAA/SAM operators had more difficulty visually detecting a penetrating B-52. Although it was impossible to change the B-52's speed or physical size, by operating at extremely low altitudes (and by being camouflaged) the B-52 could penetrate enemy defenses without suffering too many losses.

To reduce the B-52's vulnerability to IR detection, flares were added to its armament. When they were combined with low-altitude operations, flares reduced the B-52's vulnerability to IR missiles but did not reduce its IR signature.

To reduce the B-52's vulnerability to radar detection, other modifications were made. Besides low-altitude penetration, chaff dispensers were added, decoys (Quails) were used, and electronic countermeasures were added and

improved as the enemy radar systems changed. These equipment changes and new operational procedures confused the enemy's radar systems but did not reduce the aircraft's basic radar signature.

The cumulative effect of these changes reduced the B-52's vulnerability to visual, IR, or radar detection and enabled the aircraft to penetrate enemy territory with an acceptable probability to penetrate (PTP). These factors, combined with the expected degradation of enemy defensive systems in a nuclear war, mean that the B-52 can be expected to strike successfully any target in the world, even against the highest defensive threats.

In recent years the survivability of the B-52 against the latest threats has been questioned seriously. Many experts doubt that a B-52 can survive in high-threat areas. Due to its design the visual, IR, and radar signature of the B-52 cannot be sufficiently reduced to enable it to escape detection by new enemy defenses. Even though this subject can be debated in a nuclear environment, the B-52's success in a conventional war against the newest threats can be seriously doubted.

The Soviet Union has developed new fighter systems which seriously threaten the B-52. The following paragraph highlights the seriousness of that threat:

> Over the past decade, the Soviets have significantly enhanced the performance characteristics of their tactical combat aircraft. Older weapons systems had limited range and payload capabilities, short-range air intercept radars or range-only radars, little or no capability to employ precision-guided munitions, and were restricted primarily to clear-weather operations. Newer fighters and interceptors, however, can conduct air intercepts at beyond visual ranges. Moreover, they can operate at greater distances from their airfields, carry up to eight air-to-air missiles, and perform in all weather conditions. The newest generation of fighter-interceptors--FOXHOUNDs, FULCRUMs, and FLANKERs--has a true look-down/shoot-down capability that enables them to engage low-flying aircraft or cruise missiles.[16]

The Soviets also have made vast improvements in their AAA and SAM systems. They can defend a target out to a

range of 300 kilometers and an altitude block between the surface and 30 kilometers when they use AAA and SAM systems to provide overlapping coverage.[17] Quantitatively, Soviet defenses are astonishing:

> Currently, the Soviets have more than 9,000 strategic SAM launchers, over 4,600 tactical SAM launchers, and some 10,000 air defense radars. More than 1,200 Air Defense Forces interceptor aircraft are dedicated to strategic defense. An additional 2,800 interceptors assigned to Soviet Air Forces (SAF) will be drawn upon for strategic defense missions. 12,000 AAA pieces are deployed with Air Defense Forces units at regimental through front level. In addition, as many as 25,000 shoulder-fired SAM launchers are at battalion and company level.[18]

With these types and numbers of defensive systems, B-52s (as currently configured and employed) will have an extremely difficult time penetrating Soviet airspace.

Many people believe that an all-out conventional war between the United States and the Soviet Union is highly unlikely and therefore US forces do not need to be prepared to counter Soviet defenses. However, the possibility does exist and must be considered as the United States develops its conventional forces. In addition, the possibility of encountering these types of forces exists for two other reasons.

First, the Soviet Union has developed an extensive mobility capability. With their extensive airlift and sealift capabilities, the Soviet Union can project a large portion of its military forces to any region in the world. Their will to use this military capability can still be seen in Afghanistan. Thus, US forces could confront Soviet forces in limited conflicts in many other regions of the world.

Second, the USSR is one of the world's largest arms exporters. In fact, since 1981 the USSR has delivered over 5,465 tanks/self-propelled guns, 1,825 aircraft, 1,025 helicopters, and 15,275 SAM missiles to third world countries in Asia, Africa, and Latin America.[19] These shipments included some of the most sophisticated Soviet arms to countries such as Syria, Cuba, Vietnam, and India. Thus, in a conflict with these or other Soviet allies, US military forces could face formidable defenses.

Consequently, as conventional B-52 forces are developed, the US Air Force must consider the basic B-52 design limitations.

Because the B-52's design characteristics cannot be significantly changed, the aircraft's weapons and the way they are employed must be altered to be effective in high-threat areas. The previous section on potential roles for B-52 conventional operations offered ways to improve B-52 capabilities for various roles. However, as the Air Force considers which modifications are desired, it must also recognize that the number of aircraft available (and with sufficient funds to be modified) will affect which missions the B-52 should prepare for and how they can prepare. Due primarily to budget constraints, the US Air Force does not have the ability to match numerically the potential opposition's forces. Instead, the United States must prepare mobile, flexible forces which can defeat any potential enemy force.

In the past, the senior leadership of the United States believed aggression could be deterred by an extremely powerful, highly sophisticated, flexible strategic force equipped with nuclear weapons, which could operate anywhere in the world. Senior leaders believed a relatively small number of strategic nuclear delivery vehicles could effectively deter aggression because of the enormous yield of each weapon. They knew that a single B-52, armed with nuclear weapons, could destroy completely any 24 enemy targets (cities, airfields, army divisions, ships, or other targets). US leaders believed such a nuclear force would deter any type of military aggression. Consequently, instead of having thousands of strategic bombers like the United States produced in World War II, senior leaders decided a few hundred strategic bombers would provide sufficient flexibility and power to prevent war.

US leaders were only partially correct: a strong nuclear force has deterred nuclear war but not conventional war. The United States was forced to counter aggression with conventional forces in Vietnam. The leadership of the United States discovered that many B-52s, armed with conventional weapons, would be required to inflict the same amount of damage on a target as a single B-52 with a nuclear weapon. As an example, look at the B-52's role in Vietnam.

The first B-52 flew in Vietnam in June 1965. Over the next eight years, B-52 pilots flew thousands of missions and dropped millions of pounds of bombs. In June 1972 over 200 B-52s were assigned to operations in the Vietnam War.

During Linebacker II, in a period of less than two weeks' duration, B-52 pilots flew 729 sorties and dropped over one and one-half million pounds of bombs.[20]

Many people believe that the B-52 was ineffective in Vietnam and was improperly employed. Whether this was true or not is unimportant to this discussion. What is important here is that the senior leadership of the United States felt at that time that over 200 B-52s were needed to end the war in Vietnam.

Although the Vietnam War was viewed as a large conflict, in comparison to a possible conventional war in Western Europe between NATO and the Warsaw Pact it becomes a relatively small conflict. If the senior US leadership felt that over 200 B-52s were needed in this type of small conflict, it seems likely that many future conflicts could be fought which would require the same number of bombers or more. If a future conventional war were similar to the Vietnam War or even larger, then the number of B-52s that may be required is less than the number of bombers available.

Thus, it becomes obvious that the number of B-52s available for conventional operations is a serious limiting factor--how serious is very difficult to anticipate. It will depend on what type of conflict the United States becomes engaged in, where the conflict is, what weapons B-52s carry, how many other aircraft are available, what the attrition rate is, and many other considerations. What is also obvious is that the number of B-52Gs retained for conventional operations becomes more significant as the total number is decreased. Since our B-52 conventional force will be limited in number, the Air Force must employ each B-52 more intelligently and organize, equip, and train the B-52 force to be efficient and more survivable despite improved enemy defenses.

Equipment and Weapon Concerns

The equipment installed on aircraft and the weapons the aircraft employ are factors that are as crucial to the aircraft's success as is the basic aircraft design. Without the proper equipment and munitions, aircraft are unable to accomplish their assigned roles. The KC-10 is a marvelous aircraft, but without its refueling system and rendezvous equipment, it could not provide fuel for other aircraft. The B-52 is equally dependent upon its equipment modifications and munitions. Therefore, without the proper

equipment and weapons, the B-52 could not accomplish its assigned role.

Even though all subsystems of the B-52 contribute to mission capabilities, the systems we will examine are the terrain-avoidance (TA) system, the electro-optical viewing system (EVS), the bombing/navigation system or the offensive avionics system (OAS), electronic countermeasures (ECM), and the weapons themselves.

As we begin, it is essential to point out that there are two basic differences between nuclear weapons and conventional weapons. First of all, a single nuclear weapon is much more powerful than many conventional weapons and can destroy a target without pinpoint bombing accuracy. Second, nuclear weapons have some unique weapon effects which the aircrew must be protected from: thermal radiation and flash blindness.

In consideration of these two very important factors, the B-52 was equipped to protect the aircrew from the nuclear weapons' harmful effects while dropping a single nuclear weapon close to each of several targets. To afford this protection the crew compartment had to be sealed from thermal radiation and flash blindness. This took away the normal external visual references and resulted in a closed-curtain environment. (All the windows were equipped with shades which would be closed immediately after takeoff and would remain closed whenever a nuclear explosion was possible. Other equipment was installed to replace the visual references and to allow the mission to be accomplished, but at the expense of bombing accuracy.)

Being equipped in this way, the B-52 is capable of delivering conventional weapons, but in its present configuration, its role in a conventional war is not optimized. The Air Force must understand what limitations the current systems have before desired equipment improvements for conventional warfare can be made. In that regard the first system to examine is the terrain-avoidance system.

Terrain Avoidance

The current B-52 TA system is composed of an electronic terrain computer, a radar scan computer, a video distribution unit, and the electro-optical viewing system. Working together these components provide an electronic trace of the terrain in front of the aircraft on the EVS monitors (small video displays). Then with close coordination between the pilots and navigators, crews can

fly very close to the ground, even with their thermal curtains closed. Thus a good crew can avoid most enemy defenses by terrain masking.

When the terrain-avoidance system was installed, it was the best system available. However, since that time many better systems have been developed. Instead of terrain-avoidance equipment, there now exists terrain-following (TF) systems in aircraft such as the FB-111 and the B-1. These systems operate more automatically, and they can reduce the penetration altitude. By operating through the autopilot, TF systems eliminate human error and reduce the crew work load.

However, due to the B-52's performance characteristics, the effectiveness of a terrain-following system on a B-52 is not as great as on an FB-111 or on a B-1. Being less maneuverable than an FB-111 or a B-1, the B-52 needs to start and stop maneuvers much sooner than the other aircraft. Climbs and descents must be more gradual which results in a higher aircraft altitude as the B-52 approaches or crosses over high terrain. The overall result is a flight profile higher than either of the other two aircraft.

If a TF-equipped B-52 is compared to a skilled aircrew operating with the present terrain-avoidance system (and using visual terrain-following techniques), the flight profiles would be almost identical except during periods of reduced visibility. Under such conditions, the TF system would lower the overall penetration altitude. However, the amount of time a TF system would be used by a B-52 crew can be reduced by equipping the crews with night-vision goggles for periods of darkness. Thus, the only time a TF system would provide a lower flight profile is during periods of reduced visibility caused by inclement weather. The cost of a TF system must be carefully weighed against the benefits.

With proper training (stressing visual terrain-following procedures) skilled aircrews equipped with the present TA system and night-vision goggles can very closely match the flight profile of a TF-equipped B-52. The key to this capability is to provide crews with sufficient training to achieve TA skills. Terrain-avoidance skills are not obtained rapidly or easily. A great deal of practice is required. As the overall flight profile altitude is reduced, the number of crews capable of matching the TF profile performance is reduced. Thus, the number of crews qualified would be smaller than if we employed TF systems. This limitation must be considered as the Air Force prepares B-52s for conventional operations.

Bombing/Navigation System

The B-52's new offensive avionics system is a very accurate bombing/navigation system. In the nuclear role, the B-52's circular error average (CEA) is more than sufficient to destroy almost any target. In the conventional role (dropping a string of 51 general-purpose bombs), the B-52's CEA is accurate enough to destroy most targets with an equally sufficient probability of destruction. According to Jeffrey P. Rhodes, the B-52's bombing accuracy is improving:

> That reality is demonstrated in the continuously falling "Circular Error Average," or CEA, which measures the average distance from the actual target that the weapon strikes during a single bombing run.
>
> Once that figure was calculated in terms of thousands of feet. Today, based on the results of the latest competition, the CEA extends less than 300 feet--even for bombs dropped from an altitude of more than four miles.
>
> This kind of accuracy, while extraordinary, is not out of the ordinary--not for today's SAC crews. Indeed, each and every crew that took part in Proud Shield came within this same general range of accuracy.[21]

However, B-52 bombing accuracy is limited by two factors--target identification and radar characteristics.

First, the B-52 needs geographic coordinates to initially identify a target. If grossly inaccurate target coordinates are provided, the B-52 cannot find the target. If the coordinates are somewhat accurate and the target is radar reflective, the target can be found and bombed. However, if the target does not reflect radar, then radar offsets are used for bombing. When radar offsets are used for bombing, any error in the coordinates of the target or the offset will cause the B-52 to miss the target. EVS can be used for final aiming but due to the picture quality and limited range at low level, this type of bombing is frequently impossible. Unlike some other weapon systems, EVS makes it extremely difficult to change the desired impact point when the target is finally acquired visually. Thus, if the target moves--even a small distance--or if the coordinates are slightly inaccurate, a conventionally armed B-52 would miss the target. Consequently, B-52 targets should be limited to fixed targets or to targets whose

coordinates can be accurately defined several minutes before bomb release.

Although it is feasible to develop a system which would provide the B-52 with the ability to change its target at the last second, such a system probably would be very expensive and its utility probably would be fairly low. With this limitation, the currently configured B-52 is equipped primarily for stationary targets. An exception to this constraint is the Harpoon-equipped B-52. But even this B-52 faces the second limitation, the radar system itself.

As presently configured the B-52 radar system is very good, and the strategic radar system should be even better. However, every radar system has limitations. For example, radar can only see reflective targets. Some reflective targets are too small to show up on most radar sets. Radar can also be deceived. Not even the strategic radar has the resolution required to pick out a target from a field of radar decoys or similarly reflective objects. Only an inverted synthetic aperture radar (ISAR) or other highly sophisticated radars could do that or could pick out a moving target from a stationary target.[22]

Another limitation of radar systems stems from errors caused by spot size and beam width. These errors increase bombing CEA and, therefore, reduce probability of destruction. Radar can also be affected by moisture in the air or other meteorological conditions that distort the radar beam. Last, and perhaps most important, radar systems are also electronic emitters. As such they help the enemy to locate the attacking aircraft.

The global positioning system (GPS), the strategic radar, an inverted synthetic aperture radar, or a visual bombing system could reduce some of the B-52's current bombing/navigation limitations. However, these systems have their own limitations and may be costly. SAC must consider these types of bombing/navigation limitations as the conventional B-52 force is organized.

Electro-optical Viewing System

The electro-optical viewing system is made up of two systems: the forward-looking infrared (FLIR) sensor and the steerable low-light-level television (STV) camera. Through monitors installed at the pilots' and navigators' stations, all four crewmembers have low-light or infrared pictures of the external environment. When initially installed in

the B-52, these systems were state of the art. Today, much better systems are available.

Although the capabilities of the currently installed systems are somewhat limited for final target aiming or position updates, their picture resolution prevents optimum utilization. Their capabilities also are limited by atmospheric conditions, target characteristics, and aircraft altitude. New systems could improve these limitations but could not totally eliminate them. If the B-52 is employed in a search-and-destroy role, new systems with improved resolution and extended viewing range could improve its capability. But without such improvements the B-52's use of the EVS for bombing and terrain following is limited.

Electronic Countermeasures

The B-52 is equipped with many different electronic countermeasures. Besides simple systems such as chaff and flares, B-52s are equipped with sophisticated jammers and threat detectors such as the ALQ-122, ALQ-155, ALQ-117, ALQ-153, and ALR-46.[23] As new enemy defenses are developed, new ECM are also developed. As each new ECM package is developed, the B-52's ECM potential grows.

Besides economic constraints, ECM limitations relate to such factors as generator power (which could be increased by adding new generators), equipment weight, operator ability, aircraft radar signature, and tactics. Since there is little that can be done about the B-52's large radar signature and the improving capabilities of new defensive systems, crews must optimize their ECM potential and use all of the options available to reduce their vulnerability.

One important option available to the B-52 in the arena of electronic warfare (EW) is offensive ECM. The B-52 currently has only one offensive ECM system: the AGS-15 fire control system. Other ECM systems on the B-52 are defensive. The B-52's defensive ECM systems (chaff, flares, jammers, and warning receivers) enable the B-52 to avoid or confuse the enemy's antiaircraft systems, but only the gunnery system allows the aircrew to fire back and possibly eliminate the threat.

The gunnery system is effective against enemy aircraft that enter into its cone of fire. However, against SAMs or air-to-air missiles (or aircraft which avoid the cone of fire), the B-52 has no destructive countermeasures. This deficiency, combined with the other current ECM deficiencies, severely limits the way the B-52 can be

employed in a conventional war. Offensive ECM systems and improved defensive ECM systems would greatly increase the bomber's probability to penetrate.

Communication Limitations

The growing complexity of warfare requires the development of better communications for more efficient command and control of airborne aircraft. Command and control of the B-52 is maintained through the aircraft's numerous communication systems: two UHF radios, one HF radio, a secure voice communication system (Have Quick), and Air Force Satellite Communications System (AFSATCOM). Although Have Quick and AFSATCOM have improved the B-52's communication capabilities, other improvements are necessary.

Due to the flexible and rapidly changing nature of conventional warfare, the B-52 will require rapid and secure communication with supporting aircraft, headquarters, and other controlling agencies. If a target is destroyed, the threat environment changes, or a higher-priority target develops as the B-52 proceeds to the target area; this information must be passed on to the aircraft. Sometimes, a single recall word may be sufficient. At other times, the B-52 may require a booklet of information. At these times, a data burst system will be necessary to provide the B-52 with sufficiently detailed information in a timely manner.

The B-52 will also require more jam resistant and secure communications than are currently available. As the enemy finds ways to intercept or disrupt our communications, we must equip the B-52 with new communication systems that can overcome the enemy's actions. The B-52 may also require the ability to communicate with operator-controlled smart bombs, drones, or other similar weapons. Therefore, in the future more, not less, communications will be necessary.

Until improved communication equipment is procured which satisfies the requirements listed earlier, the limitations of the current communication systems must be compensated for. This can be done partially through more thorough planning and execution but at the expense of time and flexibility. The B-52 can operate with the current communication systems but with less efficiency.

Weapon Limitations

The B-52G currently carries an impressive list of conventional munitions. This list includes the following:

B-52G Conventional Weapons[24]

Quantity/Type	Quantity/Type	Quantity/Type
51 CBU-52	24 CBU-89	18 Mk 84
51 CBU-58	24 Mk 20	18 Mk 55
51 CBU-71	24 Mk 94	18 Mk 56
51 Mk 82	24 Mc-1	18 Mk 60
51 M117	22 Mk 52	12 AGM-84A
51 DST-36		10 Mk 40 DST
51 Mk 117D		

Despite this impressive payload, gravity bombs and mines (except for the AGM-84A) suffer from the same limitation--they are ballistic munitions which require the B-52 to overfly the target.

As the B-52 overflies the target it is exposed to enemy defenses. This exposes the aircrew to more dangers, reduces their accuracy, and limits the B-52's effectiveness. The AGM-84A (Harpoon) is the only exception to this rule. As a standoff munition, the Harpoon can be delivered from outside of the lethal range of enemy point defenses, thereby reducing aircraft vulnerability. In addition, as a smart weapon, the Harpoon provides its own terminal guidance and is much more accurate than ballistic munitions.

Since future enemy defenses will probably be more effective, future B-52 weapons with standoff range and precise terminal guidance can offset the growing threats. A great deal of work is being spent to develop these types of weapons. The B-52 must be modified to employ these weapons.

Another weapon-related limitation is the number of weapons available. Because future standoff smart munitions will be expensive, the number of weapons procured will be limited. If an aircrew is not given sufficient practice in employing these weapons (particularly if they require some operator guidance after launch), weapon accuracy and efficiency in combat will be reduced. Since the number of weapons available will be limited, wasted expenditure of munitions during combat may result in disaster. This limitation must be addressed as the Air Force procures sufficient weapons (or weapon simulators) for peacetime and for war.

The last weapon limitation to be addressed concerns mixed payload. (A mixed payload occurs when an aircraft carries several different types of weapons on the same mission.) In the nuclear role B-52 crews are familiar with mixed payloads. B-52 crews frequently train for nuclear missions which require a mixed payload of short-range attack missiles (SRAMs), air-launched cruise missiles (ALCMs), and gravity weapons. In a conventional role the same requirement may exist.

Unlike its role in the war in Vietnam, the United States may not have the luxury of employing supporting aircraft, such as the Wild Weasel, MiG-cap, and ECM support aircraft, with the B-52 force. Instead, either individually or as a group, the B-52 force must be capable of providing its own support. Without such support, the B-52 would be very vulnerable.

This author does not imply that the B-52 should be entirely self-sufficient. In the author's opinion, this is impossible in modern warfare. Aircraft can fly from one location to another without airborne support, but the world of combat is not so simple. To succeed in many missions, all aircraft require additional support. Sometimes this support appears in the form of air refueling from a single tanker; at other times, it may require the assistance of several different types of aircraft. However, the more self-sufficient each aircraft is, the less support it needs from other forces. In wartime the available support will be in critical demand.

Thus, either singly or as a flight, the B-52 must carry a mixed payload. The B-52 will need both offensive and defensive weapons as well as smart missiles and dumb bombs. The B-52 may even need decoys or a command and control aircraft. To achieve an optimum mix of weapons, the B-52 needs to have compatibility with as many different weapons as possible.

As presently configured, the B-52 cannot carry some munitions. For example, the US Navy uses several mines the B-52 cannot carry.[25] Even the Air Force uses several weapons which have not been tested on the B-52 (an obvious example is the air-to-ground missiles on many different fighters). If the heavy stores adapter beam modification were not added to the B-52, the aircraft would be even more limited. As American engineers develop new weapons, they must consider weapon lug spacing and external dimensions as factors that will limit the number of weapons to be carried or will even determine if the weapon can be carried by the B-52.

The B-52 has three stations that can carry heavy loads. These stations are the left and right pylons and the bomb bay. If one station (or even a portion of a station) is used to carry defensive munitions, the offensive payload is reduced proportionately. The overall effect of carrying a mixed payload is to reduce the B-52's offensive power.

As an alternative engineering studies could determine the feasibility of using other weapon stations to carry defensive munitions. Some possible alternative stations would be stations which replace the current tip tanks, additional hardpoints on the wing between pods 1 and 2, or 3 and 4, and along the aircraft fuselage itself. It appears that several relatively small defensive missiles such as the Shrike or high-speed antiradiation missile (HARM) could be placed at these locations without significantly degrading aircraft performance.

By avoiding these weapon limitations as new munitions are designed or by modifying the B-52 weapon harness to carry these new munitions, planners can improve the B-52's conventional performance. Failure to adapt to these limitations may waste the B-52's inherent flexibility.

Aircrew Matters

The one limitation common to all aircraft is the aircrew itself. The capabilities of every aircraft, from the single-seat F-16 to the six-seat B-52, are limited by the performance of the aircrew. Even though it is impossible to completely control the factors which affect aircrew performance, it is possible to influence two factors that affect aircrew performance: stress and aircrew experience.

Stress universally affects human performance. Individuals react differently to stress. Some individuals can perform well in spite of high levels of stress while others fall apart at low-stress levels. At times, individuals will react differently to the same stress levels. Occasionally, humans under great stress can perform superhuman feats. However, over the long run, too much stress will reduce performance and cause human errors. Conversely, moderate amounts of stress can improve performance as the senses and the mind are used to their fullest.

Stress can come from a multitude of sources. In peacetime it can come from such benign things as an exam, an

argument with a coworker, a sleepless night, or task saturation. In wartime stress is compounded by fear.

Although fear itself cannot be eliminated from combat, it is possible to reduce other stress factors which reduce aircrew performance. The Air Force tries to reduce as many stress factors as possible. Crewmembers are encouraged to see the flight surgeon and to be grounded if they are physically ill. By regulation aircrews are provided with adequate crew rest prior to missions. They also are provided with sufficient mission planning time to prepare for each sortie. Even though circumstances do occasionally arise which interfere with these objectives, crews normally receive sufficient rest and preparation in peacetime to perform at their peak. However, in wartime our ability to control these stress factors is limited. Thus, reduced performance due to combat-related stress must be recognized as a limitation.

The Israeli experience in two wars provides an example of the role of stress. According to a 1985 article, "In both [the] 1973 and [the] 1982 wars, battle intensity and battle stress decreased combat effectiveness and promoted psychiatric breakdown."[26] Psychiatric casualties resulting from stress will have a dramatic effect on our forces. Evidence from three wars shows how serious a limitation combat stress imposes on military forces.

> In the 1973 Arab-Israeli War, the incidence of psychiatric casualties (expressed as the ratio of psychiatric casualties to wounded) was an estimated 30 to 100. In the 1982 Lebanese War, the incidence . . . was 23 to 100. For comparison, the overall ratio of psychiatric casualties to wounded in the US Army in the European, Mediterranean and Pacific theaters of operations during the four years (1942-45) of World War II was 36 to 100.[27]

Regardless of which figures are used, combat stress reduces the effectiveness of military forces. Actions taken in peacetime to prepare aircrews to handle high levels of stress, as well as efforts taken to reduce stress during combat, will pay handsome dividends.

The other universal performance variable is individual and aircrew experience levels. Like stress, the effect of different levels of experience varies between people and aircrews. Some crewmembers will need much less experience than others to perform the same tasks. But as a general rule, the more experience an individual (or crew) receives,

the better the performance. The way experience is gained is through the various aircrew training programs.

With proper training and sufficient repetition, an individual will respond correctly to most situations even during periods of stress or during complex operations. Because the low-level penetrating B-52 mission is so demanding, aircrew training requires an enormous amount of time, effort, and expense. However, in spite of the efforts expended to improve aircrew training, certain restrictions are unavoidable. Several of these restrictions are:

- Flight time. Flight time is very expensive. With the current federal budget constraints, the amount of flight time available for training will continue to decline.

- Simulators. Simulator training supplements flight training but suffers from its own constraints. The scarcity of available simulators, due to cost, construction, and contracting problems, reduces the time crews can spend in them. Also, simulators cannot duplicate accurately all real-world conditions. Inaccurate simulation reduces the value of some of the training received in the simulators.

- Low-level training. The location and altitude restrictions of the various low-level training routes reduce both the quality of the training and the flight time available for low-level operations.

- Safety. Due to its safety constraints, training can only approach actual combat conditions.

- Security. To preclude the disclosure of certain wartime capabilities, crews are restricted from using some systems during peacetime flight operations.

Although this listing comprises only a partial survey of aircrew training restrictions, these factors inhibit training programs and reduce the value of the training received. When these deficiencies combine with other problems, such as pilot retention, typical career progression, and the real location of experienced crewmembers from one aircraft to another (such as when the initial B-1 crewmembers were assigned), the experience level of the B-52 crew force declines.

Aircrew experience can be identified by several factors such as sorties, combat flights, or flight time. This author has elected to use flight time. An examination of data extracted from the aircrew characteristics section of

SAC Facts Book from 31 March 1982 until 31 March 1985 reveals the following information:

B-52 Total Hours Flying Time[28]

Crew Position	31 Mar 82	30 Apr 83	30 Apr 84	31 Mar 85
Pilot	2,769.2	2,740.2	2,680.2	2,547.8
Copilot	1,000.6	972.8	1,027.7	1,021.0
Radar Nav	2,304.7	2,296.8	2,255.9	1,934.0
Navigator	752.6	681.1	732.6	725.3
EW Officer	1,437.7	1,289.1	1,053.8	879.7
Gunner	1,514.0	1,593.4	2,359.5	1,768.5

Overall, B-52 pilot experience as indicated by flying hours declined by over 200 hours. Radar navigator experience decreased by over 350 hours, navigator experience by 25 hours, and electronic warfare officer experience by over 550 hours. Copilot and gunner experience increased by 20 hours and 250 hours respectively. (The data for gunner experience are questionable due to the dramatic jump from April 1983 to April 1984.) A closer examination of the data above reveals more evidence of a declining level of experience in the B-52 crew force.

The flying hours for pilots, radar navigators, electronic warfare officers, and gunners include the flying hours of wing staff personnel and not just the individuals assigned to crews in the various wings. Consequently, the average experience level of individuals assigned to the B-52 crew force in these four positions is actually much lower. Likewise, the experience level for navigators and copilots does not indicate the average experience level of individuals in these two positions but probably the experience achieved by navigators and copilots at the time they were retrained as radar navigators and pilots. (This author recalls that in 1980 at K. I. Sawyer AFB, Michigan, a navigator upgraded to radar navigator at approximately the 1,200-hour point. In 1986 and 1987 navigators at Barksdale AFB, Louisiana, and other bases were upgraded with less than 700 flying hours.) Thus, the B-52 crewmember experience level has decreased. In consideration of the recent pilot retention figures, this trend will probably persist. If it does, the Air Force must carefully consider the impact aircrew experience will have on the B-52's ability to perform its conventional mission.

Closely related to the aircrew experience level is SAC's collective knowledge of conventional bomber tactics and doctrine. One of the limitations identified in the

General Research Corporation report, "Bombers in the Conventional Role," is that "no new body of doctrine for conventional bomber operations has been developed since WWII."[29] Even though this statement may be debated, particularly in light of the increased emphasis on bomber conventional operations in the past few years, it is safe to say that SAC has been primarily concerned with nuclear operations since its formation. In their preoccupation with nuclear operations, SAC has neglected conventional bomber tactics and doctrine.

Since early 1973 no B-52 has flown a combat mission or dropped bombs on an enemy target. In the subsequent 15 years, the wisdom gained from combat missions in Vietnam has faded. To improve the B-52's conventional capabilities the lessons of combat must be incorporated into new conventional bomber tactics and doctrine. Until this occurs, the B-52 conventional force will not be as proficient as the B-52 nuclear force.

Employment Constraints

Up to this point five areas of limitations--politics, geography, aircraft, equipment and weapons, and aircrew--have been examined. Even though each of these factors is important, their cumulative effect is even more important. When these limitations are combined, they create serious problems which reduce the B-52's conventional capability. A hypothetical B-52 mission will demonstrate this.

In retaliation for terrorist attacks against US targets, the US national command authorities decide that a surgical strike of a target in Iran, similar to the raid against Libya, is appropriate. To avoid interference with the Iran-Iraq war, the mission selected is a strike of an air base near Tehran.

To avoid political restrictions, the United States decides that the attacking force must avoid operating from or over the airspace of uninvolved countries. Thus, the route of flight would have to be in international airspace, in US airspace, or in Iran itself. Due to this political restriction, the strike force must fly from the Indian Ocean and must penetrate Iranian airspace from the south.

Geographically, the closest place to launch from is an aircraft carrier in the Indian Ocean or from Diego Garcia. Due to the distances involved and the continual monitoring of our carriers in the Indian Ocean, FB-111s or B-52s are selected as the strike force. Because the distance is so

great (over 5,000 miles round-trip), several tankers are required to support either force.

The Iranian airfield has three major target areas: the runway, a large parking ramp, and numerous associated support facilities. To destroy the target areas, a large number of 500-pound conventional bombs will be required. Since only the B-52 has a large enough payload capacity, it is chosen as the weapon system.

Further target study determines that to hit all target areas, a minimum of three bomb runs on different axes of attack is needed. Since B-52s with ballistic conventional weapons can strike only one target at a time and enemy defenses are heavy, at least three B-52s making one bomb run apiece are required.

Weapons and equipment limitations require B-52s to overfly the target and to penetrate through numerous defenses. Due to aircraft vulnerabilities, some attrition is anticipated. As a precaution to ensure destruction, the strike force is doubled to six aircraft. In addition, some spares are required in case of aircraft failure prior to penetration of Iranian airspace. Thus, the requirement for aircraft and support systems is more than doubled.

Aircrew fatigue, combat stress-related human errors, congestion of the airspace over the target, meteorological conditions, and weapon inaccuracies combine to create the potential for damage to a village located just outside the airfield. Although none of these factors alone would prevent B-52s from attacking the airfield, when combined they may cause the decision to launch the fleet to be withheld.

The cumulative effect of these factors and others is what can be called employment constraints. Simply stated, they are the problems created by the sum total of the current B-52 force limitations. Besides the limitations previously discussed, employment constraints include such variables as integration of the B-52 with other units, the level of staff competence, the intelligence support available at the unit level, and most important, the funding available for preparing the B-52 force for conventional operations.

Summary

The B-52 and the aircrews assigned to this aircraft have a tremendous amount of potential. However, for this potential to be realized, a number of limitations must be overcome. A partial list of these limitations includes political considerations, geographic factors, aircraft constraints, weapon and equipment concerns, and aircrew matters. The combination of these limitations creates problems that are called employment constraints.

These problems are not easily solved. Some problems may not have solutions; on the other hand, some solutions are possible but are also very expensive. In light of budget constraints, the solution to a problem may not be affordable. However, recognition of a problem is the first step in deriving a solution. The limitations that have been previously examined are sufficient to identify some of the problems confronting the conventional B-52 force. Having identified many of the problems, we now turn to the question of what can we do to overcome them. The answer can be found in the way we organize, equip, and train the B-52 force for conventional operations. The next chapter offers solutions to some of the problems and suggests possible roles and missions for the conventional B-52 force.

Notes

1. Jozef Goldblat, Arms Control Agreements (New York: Praeger Publishers, 1983), 213.

2. Ibid., 214.

3. Ibid.

4. John D. Morrocco, "Deployment of Cruise Missiles on B-52 Exceeds SALT 2 Limits," Aviation Week & Space Technology, 8 December 1986, 22.

5. "Reykjavik: What Might Have Been," Washington Post, 14 October 1986.

6. Stephen T. Hosmer and Glenn A. Kent, The Military and Political Potential of Conventionally Armed Heavy Bombers, Rand Report R-3508-AF (Santa Monica, Calif.: Rand Corporation, August 1987), 20.

7. Ronald E. Sawyer, "Bombers in the Conventional Role" (U), Report GRC 88-3454 (McLean, Va.: General

Research Corporation, October 1987) (SECRET). (Information extracted is unclassified.)

8. Associated Press Photo, Washington Post, 13 August 1983, A-3; "Sub Launched Amid Protests," Washington Post, 20 May 1984, A10.

9. Paul Taylor, "Texans Lending Support to Europe's Missile Foes," Washington Post, 23 October 1983, A26.

10. Peter Osnos, "Rally in London Draws Crowds of 200,000," and William Drozdiak, "More Than a Million Protest Missiles in Western Europe," Washington Post, 23 October 1983, A21.

11. Lt Col John E. Frisby and Maj Grover E. Myers, Strategic Forces in Transition: A Doctrine for Indivisible Aerospace Application, Research Report AU-ARI-85-2 (Maxwell AFB, Ala.: Air University Press, June 1985), 10.

12. Sawyer, 81-92. Data used apply only to the B-52G and not the B-52H model. The author uses the designation B-52G to differentiate between the B-52G and B-52H models. Figures derived from the following formulas:

B-52G maximum gross takeoff weight	488,000 lbs
minus aircraft empty weight	189,000 lbs
minus nominal payload	40,000 lbs
minus 5 percent fuel reserve	15,000 lbs
equals B-52G usable fuel	244,000 lbs

B-52G usable fuel	244,000 lbs
divided by high-altitude fuel consumption	21,000 lbs/hrs
equals high-altitude cruise duration	11.6 hrs
times cruise speed	400 knots
equals unrefueled high-altitude cruise range divided by 1/2	4,640 NM
equals high-altitude combat radius	2,320 NM

Average KC-135 maximum offload	100,000 lbs
divided by low-altitude fuel consumption	36,000 lbs/hr
equals low-altitude cruise duration	2.8 hrs
times cruise speed	400 knots
equals low-altitude cruise range per offload divided by 1/2	1,100 NM
equals low-altitude combat radius	550 NM

13. Ibid., 131.

14. Frisby and Myers, 185.

15. Jane's All the World's Aircraft 1986-87 (London: Jane's Publishing Company Limited, 1987), 378-79; TO 1B-52G-1, B-52G Flight Manual, 1 January 1975, 1-3. Data varies with source.

16. Superintendent of Documents, Soviet Military Power (Washington, D.C.: Government Printing Office, March 1986), 77.

17. Ibid., 57.

18. Ibid., 54, 80.

19. Ibid., 134.

20. Bill Yenne, SAC, A Primer of Modern Strategic Airpower (Novato, Calif.: Presidio Press, 1985), 90-119.

21. Jeffrey P. Rhodes, "Up to the Test," Air Force Magazine 71, no. 2 (February 1988): 54.

22. Sawyer, 40-45. Included is a good discussion of SAR and ISAR.

23. Jane's All the World's Aircraft 1986-87, 378.

24. Frisby and Myers, 140.

25. Capt Thomas Bradley, The Use of Air Power in Joint Maritime Operations, Research Report AU-ARI-84-9 (Maxwell AFB, Ala.: Air University Press, August 1985), 70.

26. Lt Col Gregory L. Belenky, Lt Col Shabtai Noy, and Lt Col Zahava Solomon, "Battle Stress: The Israeli Experience," Military Review, July 1985, 29.

27. Ibid.

28. SAC Facts Book (Offutt AFB, Nebr.: Strategic Air Command, n.d.). Data extracted from the aircrew characteristics charts cover period between 31 March 1982 and 31 March 1985. Data in SAC Facts Book after March 1985 until October 1986 seemed to indicate that crew experience level was improving. This information was disregarded by the author because of what appeared to be obvious errors in the information and changes in the data base (crewmembers receiving CCTS training at Castle AFB, California, were

excluded from the data base starting in March 1985). SAC discontinued tracking aircrew characteristics after October 1986.

29. Sawyer, xiv.

CHAPTER 3

PROPOSALS FOR ORGANIZING, EQUIPPING, AND TRAINING B-52s FOR CONVENTIONAL OPERATIONS

According to the Department of Defense Directive 5100.1, one of the primary functions of the Air Force is to "organize, train, and equip Air Force forces for the conduct of prompt and sustained operations in the air."[1] DOD Directive 5100.1 also provides similar general guidance for the other services. Although the assigned tasks vary between services, the means of preparing armed forces for combat remain constant: organize, equip, and train. This study now turns to these three subjects.

One of the many challenges before us is how to organize, equip, and train the B-52 force for conventional operations. Unfortunately, the definitive program that would answer this challenge is not found in any single source; instead the answer can be found in the evolutionary development and integration of numerous ideas from a variety of sources. This study provides some thoughts in these areas. These and other thoughts hopefully will be debated and argued, tested and tried, modified and changed, and in the future will evolve the B-52G fleet into a potent conventional military force that significantly increases national security.

Questions and Assumptions

To attempt to address the challenge of organizing, equipping, and training, a few questions must be answered and several related assumptions must be made. The first question is, What are the resources to be considered?

For the purpose of this study only, approximately 150 B-52Gs currently in the United States inventory will be considered. Due to the current budget constraints and the competing demands for a portion of the federal budget, it is unlikely that sufficient funds will be available to retain all of the B-52Gs and equip them in a manner that would maximize their potential. Consequently, this study will assume that the Air Force will receive sufficient funds to retain and modify only a portion of the B-52G fleet.

Still, the question remains, How many B-52s are required for conventional operations? The General Research Corporation found unanimous opinion within the military community that B-52Gs are needed for conventional operations

but divided opinion on how many bombers are required to satisfy the perceived needs.

> There are a host of parties and organizations having vested interests in the question of B-52G retention; however, their specific positions relative to it were not so obvious or fully understood. Therefore, visits were made to and discussions held at various OSD [Office of the Secretary of Defense] entities and virtually all the theater and major joint commands as well as selected theater force component commands. . . . A strong consensus arose from these discussions. It was that all 69 of the B-52Gs being considered for retirement should be retained and that they should be upgraded to enhance their survivability and weapons laying capability. The unanimity of opinion among (especially) the theater command staffs on this question was overwhelming--<u>not a single voice was raised in the negative</u>. At the same time, there was much less unanimity of opinion about the many other questions that must be answered if the bombers are retained. However, the preponderance of opinion was that, no matter how these additional questions are answered, it is vital to our national interest that the bombers be retained and dedicated to the conventional role. . . . But the extent of that need and the numbers of bombers required to satisfy [the] same is the subject of extensive debate.[2]

Unable to predict the outcome of this debate, we have found it necessary to estimate the size of the future conventional B-52 force.

The conventional B-52G force size will be between the extreme positions of retaining all 150 B-52Gs for conventional operations and retaining no B-52Gs. Mathematically, 75 aircraft is an ideal compromise between the two extremes. Realistically, a force of approximately 75 B-52Gs appears to be an obtainable compromise. Retention of a fleet much smaller than 75 would be impractical due to the costs of maintaining such a small fleet in comparison to the capabilities such a fleet would provide. A fleet much larger than 75 probably would be allowed only at the expense of the desired modifications necessary to improve the B-52's capability in conventional warfare. Thus, a fleet of 75 aircraft appears to be a reasonable compromise between airframes and equipment and weapons.

Additionally, due to the high costs of future systems and munitions, this paper assumes that SAC will obtain only funds to partially modify the B-52G fleet. Thus, although it may be desirable to put all of the possible modifications on each of the 75 aircraft, cost-wise, it is not realistic. In fact, it is unlikely that any single B-52 can be equipped with all of the modifications to be discussed. Overall then, our force will consist of 75 B-52Gs, each equipped with only some of the modifications that would enhance its conventional capabilities.

The final question to be answered is: What is the mission of the B-52G conventional force? To answer this question we must make some more assumptions. For example, this paper assumes that the B-52 will be retained for both missions and situations for which it is uniquely qualified and for missions that would enhance the capabilities of other US military forces. Unique missions would capitalize on the B-52's extraordinary range and flexibility. Contributing missions (those that use B-52s in conjunction with other weapon systems) would emphasize the B-52's large payload and enormous firepower.

The B-52 conventional force, like all other military assets, is expected to be useful in many different roles and against as many different threats as possible. In this way the B-52 force should be prepared to operate across the entire spectrum of nonnuclear conflict. This spectrum would vary from a worldwide conventional war between the East and the West to a surgical strike against a terrorist organization. To achieve maximum flexibility and optimum utilization, the B-52 force must be capable of operating against targets in the most highly defended areas of the world as well as in the most remote and undefended regions. Sometimes the B-52 force would operate independently, and sometimes it would operate with the full support of all US military forces. The ultimate goal is to prepare a force which emphasizes flexibility.

To satisfy these requirements, we assume that the B-52 conventional force will concentrate on those roles and missions for which the B-52 has the greatest potential and for which there appears to be the most universal applicability. The missions selected in this study are strategic aerospace offense, counterair, air interdiction, and aerospace maritime operations.

How to Organize

We find it impossible to predict when and where the next threat to US national security will arise. Consequently, US military forces should be prepared to respond to any threat, at any time, and at any location. Given the limited assets available for national defense, the B-52 force (like all of our military forces) must be prepared to respond to both the most serious threats and the most probable threat. Unfortunately, military forces which are organized for the most serious threat (worldwide conventional war) are not always appropriate for use against the most probable threat (terrorist attacks).

Faced with this dilemma the United States must prepare the forces to be as flexible as possible. The B-52 conventional force can contribute significantly to a worldwide war against the Soviet Union. The challenge is to prepare the B-52 force to respond to lower levels of aggression by other foes. The way the force is organized will contribute greatly to this flexibility.

The B-52 can threaten enemy vessels at sea, mine ports and sea lines of communications (SLOCs), attack enemy air defenses, bomb strategic targets, interdict enemy forces, or even provide close air support for ground troops. But due to the increasing lethality of enemy defenses, the B-52 force will require numerous equipment and weapon modifications to perform these missions. Bearing in mind the limitations discussed in chapter 2, specialization may be the only way to accomplish the B-52's wide range of missions with a high degree of success.

Specialization improves performance but reduces flexibility. Although specialization is not desirable, it is necessary--primarily because of two limitations:

- Crew experience and staff expertise. The average B-52 crew is not experienced enough to accomplish every possible mission against every possible threat environment. Nor is the staff experienced or knowledgeable enough in conventional operations to provide the guidance necessary to train these crews for all of the possibilities. Over time these limitations can be resolved, but that will not happen immediately. The current low pilot retention rate and insufficient emphasis on conventional operations in the past will delay the learning process.

- Limited resources. Sophisticated high-technology equipment and weapons, flight time, and exercises are expensive. With a limited budget these items will be

restricted. It is unlikely that all crews and aircraft will be provided enough of these assets to become truly proficient in every mission. Consequently, another method must be used to achieve proficiency.

In the author's opinion, specialization is the only method of resolving these problems. By assigning one or two of the four missions previously identified to each wing of the conventional B-52 force and allowing these crews to focus on their assigned mission, specialization permits crews and aircraft to accomplish each different mission against many different enemy forces with a high degree of success. Individually the aircraft and crews may be specialized and somewhat limited, but the entire B-52 conventional force will have a great deal of flexibility and can respond across a wide spectrum of conflict. A mission-specialized B-52 conventional force and a new numbered Air Force are ways SAC could organize to reduce these problems and to achieve the ability to respond to various acts of aggression. Let us now examine the mission-specialized B-52 conventional force.

Mission-Specialized B-52 Conventional Force

To divide the force into the four previously identified missions--aerospace maritime operations, counterair, strategic aerospace offense, and air interdiction--the Air Force should consider primarily the need, the benefit that can be derived from each mission, and the number of aircraft available. Based on the perceived need, resources should be allocated according to the benefits gained from each mission.

There are presently two B-52 wings equipped with Harpoon missiles, one at Loring AFB, Maine, and one at Andersen AFB, Guam.[3] B-52s equipped with the Harpoon also carry numerous mines. With this capability they can conduct aerospace maritime operations against enemy maritime forces as well as conduct operations against land-based enemy forces. They can attack both surface vessels and mine SLOCs and harbors with or without Navy assistance. They can reach certain areas of the world long before Navy assets can steam to these locations, or, working in conjunction with in-place Navy assets, they can increase the Navy's striking power.

Geographically, these bases are well situated to respond to any area of the world. From Loring AFB B-52s can reach the Greenland-Iceland-United Kingdom gap or areas farther north. From Guam B-52s can cover the Strait of Malacca in Southeast Asia or other chokepoints in the

Pacific. If deployed to Diego Garcia, they can cover the Indian Ocean and its many vital SLOCs from the Persian Gulf, westward around Africa in one direction, and eastward through Southeast Asia in an opposite direction. With such an enormous present capability, it would appear reasonable to maintain the same capability at the present locations.

Starting with the assumed baseline of 75 B-52s, this means two wings totaling approximately one-third of the conventional B-52 force (25 aircraft) would be assigned the mission of aerospace maritime operations.

That leaves 50 aircraft to fulfill the remaining three closely related missions: strategic aerospace offense, counterair, and air interdiction. To successfully conduct air-interdiction missions or strategic aerospace offense missions, some degree of air superiority is required. In some environments this is achieved simply because the enemy has no significant air defenses. However, due to the proliferation of numerous sophisticated air defense systems, these environments are becoming more scarce. Thus, to successfully conduct either strategic aerospace offense or air-interdiction missions, the B-52 force must receive counterair operational support from other units or from within the B-52 force itself.

Because counterair resources are so important and limited in number and range, it seems reasonable to develop counterair capabilities within the B-52 force itself. This decreases the B-52's dependency on other counterair assets and provides the B-52 force with a counterair asset that is compatible with the B-52 in both range and operation. Additionally, these B-52 counterair assets can be used to support other aircraft much like the EF-111s and Wild Weasels.

The technology is being developed which greatly increases the B-52's effectiveness in counterair missions, primarily offensive counterair and suppression of enemy air defenses. However, the price of such systems is high, and all of it cannot be employed on a single B-52 without reducing the aircraft's payload. Therefore, a B-52 fully equipped for counterair operations would be radically different from other B-52s. The General Research Corporation and others have suggested that these B-52s be developed and designated as EB-52s.[4]

The following statement appeared in the Air Force Times in early 1988:

> The Air Force has considered putting jammers and other electronic countermeasures equipment on some of the bombers to make them EB-52s, a suggestion made by a number of contractors, but SAC is not now pushing this concept.[5]

Although the Air Force is not "pushing this concept," neither has the Air Force rejected the idea. Because an EB-52-type aircraft can greatly increase the survivability and enhance the performance of all US aircraft, and not just conventional B-52s, the concept is worthy of serious consideration.

The mission assigned to the EB-52 force envisioned by this author differs slightly from the one envisioned by other authors and would be primarily counterair. By using ECM systems, decoys, and long-range smart missiles to attack SAM sites, ground-controlled intercept (GCI) radars, enemy airfields, and command, control, and communications (C^3) networks, EB-52s would blast corridors in the enemy defenses through which other B-52s could penetrate. Equipped with air-to-air missiles, they could even attack airborne warning and control system (AWACS) platforms and interceptors. Besides enabling other aircraft to penetrate enemy defenses, such a force would provide the added benefits of destroying enemy air forces and of helping to achieve air supremacy. When one-third (approximately 15 aircraft or one wing) of the remaining force (50 aircraft) is assigned to counterair missions, EB-52s would provide tremendous benefits to all US forces.

Subtracting the EB-52 wing from the B-52 force leaves 35 aircraft--two or three wings--with the missions of strategic aerospace offense and air interdiction. With such a small force dedicated to such important missions, these aircraft must be able to survive and to perform numerous sorties against the enemy. For B-52s to operate and to survive in the most highly defended regions of the world, improved internal defenses as well as support aircraft, such as the EB-52, are essential. Thus, it would seem reasonable to equip all B-52s with some offensive counterair (OCA) and SEAD capability to improve their survivability.

Overall, our B-52 conventional force would be comprised of the following:

- 75 aircraft divided into five or six wings.

- Two wings assigned aerospace maritime operation (probably Loring and Andersen with approximately 25 aircraft total).

- Two wings (possibly three) assigned strategic aerospace offense and air-interdiction mission (located near the East and West coasts, totaling 35 aircraft).

- One wing assigned counterair mission (primarily OCA and SEAD).

The actual location of the conventional B-52 wings should be determined by the wing's mission and geography. However, arms limitations and other political constraints probably will require the physical separation of conventional B-52s from nuclear B-52s. Given this limitation and fiscal constraints, the five (or six) conventional B-52 wings probably would be located at the various B-52 bases which are presently in operation.

On the other hand command and control of the conventional B-52 wings should be different from the current procedures. According to recent senior-level thinking, "SAC forces will be assigned, or 'chopped', to the theater commander in chief, a change in previous policy."[6] Following this guidance SAC would maintain control of the conventional force during peacetime and would send the conventional force to the appropriate commander in chief (CINC) during wartime. In this manner SAC would train, organize, and equip the force to meet the needs of theater CINCs.

But this structure does place the conventional force in conflict with the nuclear force. According to Lt Col John E. Frisby and Maj Grover E. Myers:

> During peacetime it is the function of the SAC headquarters staff to plan, develop, program, support, and supervise the training of its forces in both nuclear and conventional mission areas. Unfortunately, the competing demands for time, money, and man-hours [have] led to the relegation of the conventional support functions to levels of secondary importance, in most but not all cases.[7]

Fortunately, Colonel Frisby offers a solution to this problem--the formation of a new numbered air force.

A New Numbered Air Force

SAC headquarters, numbered air forces, and air division staffs are presently heavily tasked. With the deployment of the B-1, MX, and B-2, the staff will be even more heavily tasked. Under such circumstances the conventional B-52

force (or any other part of SAC) may receive insufficient attention and support. To achieve an optimum knowledge of conventional operations, the staff must spend all of its time and effort concentrating on conventional operations. The present staff structure precludes this possibility.

A possible solution to this problem could be "a rebirth of the Second Air Force, along with minor revisions assigning existing air divisions and units to the Second Air Force, which might create a better 'mission oriented' command structure."[8] This reorganization was supported by the findings of the General Research Corporation report:

> In summary, it was suggested both by the advantages and disadvantages of each concept and the views of the several senior headquarters staffs with which bomber force organization was discussed that the separate numbered air force concept should be adopted.[9]

By setting up a command structure that could concentrate on conventional operations, SAC could rapidly gain an in-depth knowledge of B-52 conventional operations and could sooner achieve a maximum level of proficiency. The lessons learned by the conventional force staff then could be transferred to the nuclear wings that have a secondary mission of conventional operations. In this way the capabilities of the entire US military force would be improved, and not just the conventional B-52 wings.

To integrate the theater CINCs and to use the B-52 force in the optimum manner, B-52 staffs must be assigned to the theater CINC's staff during peacetime. The size, composition, and function of each B-52 staff would vary with the B-52's anticipated role in each theater. However, some responsibilities are generic to every staff.

B-52 staff members assigned to theater CINCs will be responsible for the following tasks as well as many others. They must advise CINC of B-52 capabilities in their respective theaters. The B-52 staff members need to identify missions, targets, potential forward operating bases, and logistical requirements for the B-52 force. They also need to merge the B-52 force with other command assets and to integrate B-52 forces in joint training exercises. Last, they need to identify through their numbered air force the theater commander's desired capabilities for the bomber force.

After accumulating and analyzing the requirements identified by theater CINCs, the numbered air forces and SAC headquarters would determine what types of missions B-52s can perform to provide the greatest collective benefit for CINCs as a whole. Armed with this knowledge SAC would provide funding for equipping and training conventional B-52 forces.

The numbered air force would be responsible for tasking the wings with the various missions and requirements as well as coordinating the joint training between conventional B-52 wings and other military forces. They also would be responsible for allocating resources such as flying time, simulators, and practice munitions to the appropriately tasked wings. The numbered air force would coordinate with the Navy for maritime training and with the Army and tactical air forces for counterair, air interdiction, and aerospace strategic offense training.

Conventional wings would be responsible for achieving the desired capabilities and for developing the wing's warfighting skills. Beyond the basic aircrew qualification skills identified by Headquarters SAC and the numbered air force, the wing would be responsible for developing the other skills required by the individual units. The wings would also identify back through the chain of command the requirements to accomplish their assigned missions.

In wartime, the wing staff (or an appropriate portion of the staff), like the aircraft and aircrews, would be assigned to the theater CINC. Working with the B-52 staff already assigned to the theater CINC, they would integrate rapidly into the theater force and would begin coordination of B-52 strikes with the other assets within the theater. They would exercise yearly with the theater CINC's other forces and provide the necessary wartime staff support for fully integrated air power.

Conventional wings would be required to develop the ability to mobilize rapidly and to operate at new forward-located bases as well as from their home base. They would also have to develop the ability to plan missions rapidly in order to keep up with the changing environment in conventional warfare. The system used for developing the current single integrated operational plan (SIOP) missions is much too slow to be useful in a conventional war beyond anything except the first day's sorties. A mobile automated combat mission folder system (ACMFS) is just the first step.[10]

ACMFS would need frequent intelligence updates, and it would require a larger intelligence staff and the associated communication systems at the wing and theater CINC level. In this way the targets identified at the theater level could be attacked by a route which avoids the known threats. Since this would be a constantly changing situation in wartime, the wing staff needs to practice rapid mission planning on a routine basis. Further discussions of this topic are included in the training section of this chapter.

How to Equip

The way in which B-52s are equipped for conventional operations will be crucial to their ability to accomplish their assigned missions successfully. The suggestions offered on this issue follow the same three fundamental assumptions presented in the previous section:

- The assigned missions will be strategic aerospace offense, air interdiction, counterair, and aerospace maritime operations.

- The B-52 force will be required to operate in high-threat environments.

- While funds will be available for new equipment and munitions, the funding will be limited.

Based on these assumptions the B-52 fleet will be equipped differently according to the assigned mission. Before investigating the configuration of each type of conventional B-52, we will examine several general considerations that apply to the entire fleet.

All B-52s will require sufficient munitions at their home bases to conduct several sorties from their bases into the various theaters without waiting for munitions to arrive. In theaters where forward deployment of the B-52 force is probable, munitions stockpiles should be established at these bases to reduce the deployment requirements during wartime. In this manner aircrews and maintenance personnel will receive practice with the weapons during peacetime and will be ready for rapid employment in wartime. This procedure will increase costs (due to an increase in the amount of weapons purchased) but will significantly increase flexibility and also will significantly improve response time.

All B-52s will also need improved communications equipment. This was one of the shortfalls identified in excerpts from the General Research Corporation report:

> The fundamental point is that the full potential of the bombers cannot be realized with the communications and data handling capabilities they now have. Some alleviation of the problem may be achieved through systems planned for the EB-52s, but the individual bombers may remain woefully deficient in C^3I [command, control, communications, and intelligence] capabilities even after presently planned modifications are achieved. The cited SAIC [Science Applications International Corporation] C^3I study [strategic conventional standoff capabilities reports conducted for Boeing Military Aircraft Company by SAIC] is an excellent source book on the actual equipments required to overcome those deficiencies.[11]

In addition to the aircraft C^3I gear, each conventional wing will need improved systems to interface with the wing's aircraft as well as the theater CINC's headquarters. Included in this equipment should be the systems necessary to communicate intelligence data and even satellite photos rapidly to the wing for mission planning.

The last equipment modification required by the entire fleet is improved electronic countermeasures (ECM) systems. Due to the increasingly hostile air environment, all B-52s will require improved defensive systems. The amount and types of B-52 defensive systems will vary greatly with the aircraft's mission, but overall, each B-52 will require new ECM systems to counter the enemy's new defensive systems. Further discussion on improved B-52 ECM systems is included in subsequent sections.

Aerospace Maritime Operations

B-52s equipped with Harpoons and mines can successfully conduct maritime operations with their present equipment. However, two relatively inexpensive changes can improve the B-52's capability. The first change would be in improved C^3I equipment. Due to the identification limitations previously discussed, B-52s should operate with Navy P-3s or other types of systems to ensure maximum effectiveness. Secure communications between the Navy and B-52s are essential to the effective coordination needed in such a mission.

The second change is even more basic. B-52s must have a sufficient stockpile of mines and Harpoons at their bases to respond rapidly in a crisis. However, if B-52s must wait on munitions to reach their operating location before they can launch, there is a serious possibility of the Soviet fleet avoiding chokepoints by penetrating through these locations prior to minefields' being laid. A rapid response provides the best possibility of trapping enemy forces in their home waters and protecting the SLOCs that are essential to the survival of the West.

The cost of such a change should be relatively small because a sufficient number of weapons has already been procured, and the change is simply one where weapons are stored and maintained. Admittedly, there will be some additional expenses due to the small increase in weapon numbers to provide stockpiles at both B-52 home bases and potential forward operating locations such as Diego Garcia. However, the total cost of these two changes would be insignificant in comparison to the near-term increased capabilities achieved.

The next logical equipment improvement would be in the development of future Harpoon-type weapons. The next generation of Harpoon weapons will require greater range, improved electronic counter-countermeasures (ECCM), selective targeting, and perhaps even greater speed. This would keep the B-52 outside of enemy defenses and complicate the enemy's defensive problems. It is safe to assume such research is under way already.

If funding allows, the procurement of a system to allow the B-52 to operate independently of naval forces would be the next level of improved capabilities. Improved capability is achieved by enabling the B-52 to positively identify enemy vessels without resorting to flying within sight of the enemy vessels. Against surface vessels this ability could be achieved by modifying the B-52 with synthetic aperture and inverted synthetic aperture radar (SAR/ISAR) sets. According to the following extract from the General Research Corporation report, SAR/ISAR sets would allow the B-52 to identify and to attack enemy surface vessels without outside assistance:

> For the B-52Gs to be able to engage the entire target spectrum expected in most conventional warfare scenarios require that its radar have high resolution and target discrimination capability. While laser radar and other techniques have been discussed as possible means of obtaining high resolution, synthetic aperture radar (SAR) appears

> to be about the only viable option for all operating conditions. In a like manner, active target discrimination (especially maritime target discrimination) appears to depend largely on inverted synthetic aperture radar (ISAR) functions.[12]

Breaking the requirement for the B-52 to operate with the P-3 would enable the P-3 to operate against other enemy threats at the same time the B-52 covered regions where naval support is not immediately available. The cost of SAR/ISAR sets has been estimated by the General Research Corporation at roughly $4 million apiece.[13]

Other possible solutions abound to this identification problem. For example, B-52s could identify targets with improved electro-optical viewing systems (EVS) or they could use drones for target identification. They also could receive target information from space-based reconnaissance systems. However, these identification systems have their own limitations.

Improvements in EVS would enable the aircrew to positively identify targets from greater ranges but would still be limited by weather conditions and line of sight. Identification from line-of-sight ranges places aircraft within the lethal range of many defensive systems. Drones would allow the B-52 to identify targets while the aircraft remained outside of the range of enemy defenses but suffer from some of the following limitations. First, drones reduce the aircraft's weapon payload. Second, they must be protected against enemy defenses and jamming, which could preclude communications between the drones and the B-52. Third, drones also may alert the target vessels and enable the ship to prepare for an attack. Fourth, drones may be guided by the operator after launch, and when this happens the operator may not be free to attend to other duties. And fifth, data received from the drones require analysis prior to weapon launch, which complicates the operator's job. A space-based reconnaissance system has the greatest potential since it could be used by all maritime-tasked forces, but it would be vulnerable to Soviet antisatellite weapons and would be the most expensive. Due to problems in the US space program, the deployment of a maritime-targeting satellite system is probably not in the near future.

In consideration of these problems, the SAR/ISAR set modification appears to be the most likely candidate for improving the B-52's performance in maritime operations. This equipment would not improve B-52 capabilities against subsurface vessels. To achieve this capability, the B-52

would require the same systems as are currently used on the Navy's P-3 aircraft. The cost of such an extensive modification is probably prohibitive. Against subsurface vessels, B-52s will require outside assistance and will be limited either to delivering mines at locations directed by the Navy or to delivering weapons against subsurface vessels located by the Navy.

The B-52's minelaying role is limited also in high-threat environments. To mine heavily defended enemy ports and waters, the B-52 will need additional assistance to defeat enemy defensive systems. This assistance can be provided by Navy counterair forces, tactical counterair assets, or the proposed B-52 counterair fleet.

Counterair

B-52s assigned to counterair operations would be concerned primarily with OCA and SEAD. By conducting successful OCA and SEAD operations, the B-52 enables other forces to accomplish their assigned missions. To optimize the B-52's performance in OCA and SEAD requires extensive equipment modifications.

AFM 1-1 defines offensive counterair as "aerospace operations conducted to seek out and neutralize or destroy enemy aerospace forces at a time and place of our choosing."[14] The most efficient method of accomplishing this against enemy aircraft is to attack the enemy aircraft when they are most vulnerable--when they are on the ground. Once airborne enemy aircraft are most difficult to find and to neutralize. If these enemy aircraft are interceptors, the B-52 becomes the hunted and not the hunter.

To prevent this undesirable turn of events, the B-52 must be equipped with long-range standoff munitions that trap the enemy aircraft on the ground. In this way air superiority is temporarily achieved, and the enemy aircraft remain vulnerable to attack for a longer time period. Unfortunately, closing a runway for even a short period is a difficult task.

Interceptors can take off from relatively short runways or even taxiways. Some may even operate from packed dirt strips or paved roads. Thus, the entire aerodrome area must be at least partially damaged to prevent aircraft movement. To achieve this objective with standoff weapons requires either multiple warheads or extremely powerful munitions. Because nuclear weapons are not part of conventional warfare, the choice is narrowed down to multiple warheads.

The B-52 can attack an airfield with multiple warheads either by launching numerous standoff missiles against the airfield or by putting a cluster bomb unit (CBU) warhead on a few standoff weapons. The latter choice appears to be the most cost-effective decision. A few long-range standoff missiles, armed with a mixture of CBUs and small mines, can temporarily stop operations. CBUs will damage or destroy soft portions of the aerodrome such as exposed aircraft, fuel cells, personnel, equipment, radar antennae, SAM/AAA sites, and unhardened surfaces. Mines will seriously delay repair operations and prevent aircraft movement until a sufficiently large path can be cleared. The delay caused by such an attack would enable US aircraft to penetrate through the airspace protected by the trapped enemy aircraft or enable other aircraft to attack the hardened spots of the aerodrome (such as aircraft shelters and command centers) with hard-target munitions.

Unfortunately, successful closure of an aerodrome does not entirely eliminate the possibility of enemy aircraft intercepting the attacking force. Some aircraft such as the Soviet Mainstay (an airborne warning and control system) or interceptors launched prior to the airfield attack may be in position to attack the penetrating cell. To reduce this potential threat, the B-52 could destroy the enemy aircraft with air-to-air missiles or neutralize them with decoys.

B-52s armed with Phoenix missiles or advanced medium-range air-to-air missiles (AMRAAMs)[15] could destroy either enemy airborne interceptors or Soviet AWACS. But to do so requires the installation of an intercept radar system, its associated weapon control system, and an operator. EB-52s could be modified for this role by replacing the fire control system (FCS) with air-to-air missiles--its appropriate radar and control system--and by retraining the gunner in missile operation.

Another option available for offensive counterair is the use of decoys. Because intercept aircraft are limited in range, by the time they intercept the decoys they will not have sufficient range to intercept the actual attacking force. Decoys also distract the ground defenses (SAM/AAA) and further deceive the enemy. As the enemy defenses are distracted in the direction of the decoys, it is possible to sneak by the defenses in the opposite direction.

SEAD is another important ingredient in the formula that enables B-52s to penetrate and attack heavily defended targets. The primary opposition in this area is GCI, C^3

systems, SAMs, and AAA sites. EB-52s armed with high-powered offensive and defensive ECM systems can significantly degrade enemy air defenses.

Defensive ECM requires very high-powered jammers that disrupt and confuse enemy communications and radars. For enemy defenses beyond the range of the EB-52, ECM drones can be used that parallel the penetrating bombers' route and help jam other enemy defensive positions. Destruction of the enemy defensive systems can be accomplished with offensive ECM systems.

Long-range cruise missiles targeted against enemy defensive centers as well as offensive ECM systems such as the Tacit Rainbow can be used for SEAD. Tacit Rainbow would be launched from EB-52s before the attacking force reached the enemy's acquisition area. They would orbit in areas of known defensive systems and would attack these sites as soon as the enemy turned on their radar sets. Mobile SAMs within range of the Tacit Rainbow also would be vulnerable. In this way the enemy defenses are confused by the defensive ECM systems and attacked by the missiles of the offensive ECM systems.

By using a combination of these methods, the counterair EB-52 would sufficiently degrade enemy defenses and would enable the attacking force to penetrate effectively enemy airspace defended by intercept aircraft, SAMs, and AAAs.

Strategic Aerospace Offense and Air Interdiction

The fundamental difference between strategic aerospace offense missions and air-interdiction missions is the types of targets attacked. Aircraft equipped to attack strategic aerospace offense targets can attack air-interdiction targets with a simple change in munitions. Because the B-52 can carry a variety of weapons, it can attack both types of targets. But to do so, the aircraft as currently configured must penetrate the enemy's defenses and overfly the target. Against lightly defended enemy targets the B-52 can accomplish this mission, but against heavily defended targets it requires additional assistance to survive.

The EB-52 previously described will improve the B-52's ability to penetrate the enemy's heavy defenses. But the EB-52 will not escort the attacking aircraft all the way to the target. Instead, the EB-52 will help the attacking cell to ingress and egress through the enemy's border defenses and--through the use of drones, decoys, and standoff munitions--disrupt inland fixed defenses. The attacking B-52

cell still will require its own defenses to protect it from en route defenses beyond the effective range of the EB-52, from unanticipated mobile defensive systems, and from the point defenses of the target itself.

To survive in a hostile environment, the B-52 will need to use all of the tricks of the trade. As much as possible, B-52s must attack at a time and place that will provide surprise, mass, initiative, and offense. They must fly at very low altitudes during nighttime, select routes that avoid known enemy defenses and enhance terrain masking, eliminate electronic emissions to avoid detection, employ effective ECM (offensive and defensive) against enemy defenses if detected, and attack point-defended targets from outside the range of the defenses.

Penetrating B-52s will require several equipment changes to follow this guidance. Radar, which is used for terrain avoidance (TA) and navigation/bombing, can also reveal the aircraft's position and must be restricted in use. This can be done by turning the radar off (except when absolutely necessary, such as during inclement weather or during the target attack phase) and by teaching the crews to fly visual terrain-following profiles at night. Night-vision goggles will be required for the pilots as well as a lighting system that enables the pilots to read their instruments with their goggles on. The navigators will assist the pilots with visual terrain following if improved electro-optical viewing systems are installed on the aircraft. Accurate navigation/bombing can be achieved with an extremely accurate inertial navigation system or with the global positioning system (GPS). If crews encounter inclement weather, terrain-avoidance radar procedures will be necessary on an assumed risk basis.

The B-52's ECM gear needs several changes. New warning receivers and jamming packages must be installed on the aircraft as new defensive threats arise. Offensive ECM systems such as the high-speed antiradiation missile (HARM) can be installed on the bombers, can receive targeting information from threat receivers, and can be launched against the threat at the same time the electronic warfare officer begins deceptive jamming. These ECM modifications will significantly reduce the threat of mobile SAM/AAA systems.

The last group of equipment changes involves the munitions themselves. Despite the previously discussed methods of degrading enemy defenses, any flight over enemy territory is dangerous. Long-range standoff munitions reduce the exposure time of aircraft operating in enemy

airspace. Additionally, due to multiple and redundant enemy defenses, overflight of certain targets may not be possible. These heavily defended targets can be effectively attacked only with standoff weapons. Due to the limitations of standoff munitions (cost, range, quantity, missile size, and payload) these weapons require diverse warheads to be effective against a variety of targets. To effectively employ long-range conventional standoff munitions (LCMs) and to be economical, the B-52 must be able to carry a multitude of different LCMs. Each B-52 also must carry a mixed payload of LCMs specifically tailored for the particular targets to be attacked.

A single high-explosive LCM with precise guidance (such as the Have Nap) would be effective against small hard targets such as a command post, bridge, tunnel, or ammunition dump. Several LCMs would be effective against specific portions of industrial plants, power plants, or railyards. Other LCMs with cluster bomb warheads or mines would be effective against soft portions of these targets as well as troop concentrations, communication centers, and radar sites. LCMs with multiple-mine warheads would temporarily close down transportation lines such as highways, railroads, airports, and crucial geographic chokepoints. Cruise missiles, such as the Tomahawk, could strike vital targets deep within the enemy's interior and could disrupt his operations. With these types of munitions, the B-52 could effectively strike either air-interdiction targets or strategic offense targets.

The common characteristic of these targets is their relatively fixed geographic location. The B-52 and LCMs, as described, are effective only against relatively fixed targets. Fixed targets may include mobile targets such as massed troops if they are temporarily immobile, but such targets must be assigned to B-52s only if their location is known. Improved C^3 equipment would allow the B-52 to be retargeted against temporarily immobilized targets or advised of new intelligence data while en route to the target area. Except for a target of opportunity (such as occurs when the B-52 launches a HARM against a mobile SAM), the B-52 should not be used in a search-and-destroy role. The equipment modifications required to enable the B-52 to survive in this role are like those required to fit the B-52 for antisubmarine warfare operations, so extensive and expensive as to make them impractical for that role.

New equipment and munitions based on evolving technology do have their own problems. Even if technology does provide the answer to some of the problems previously identified, it may not become available before it is needed

for the next crisis or may be so expensive that the Air Force cannot afford to purchase the new systems. With these considerations in mind, SAC should equip conventional B-52s with a mixture of proven conventional weapons and equipment that will be technologically feasible in the near term (a variety of dumb ballistic bombs, smart bombs, and long-range cruise missiles). In the future improved munitions should be added to the list if proven technologically reliable and economically practical.

Stephen Hosmer and Glenn Kent have made the following proposal:

> We propose an evolutionary approach: The B-52s should be provided the capability as soon as possible to accomplish the easier missions set forth in the report and then gain additional capabilities on an evolutionary basis.[16]

Although Hosmer and Kent seem most concerned about the evolutionary development of equipment for B-52s, they are equally concerned for the aircrews that will operate the equipment. If crews are not sufficiently trained in the aircraft or in conventional tactics, they will not be ready to operate future weapons in the most effective manner. Technology can improve performance, but new technology combined with more skilled aircrews can perform even better.

Training Concepts

Hosmer and Kent's "evolutionary" approach to equipping B-52s is also applicable to aircrew training. The evolutionary approach to training will enable SAC to overcome some of the serious problems confronting the development of a conventional B-52 force. Two of the most serious problems are the Air Force's overall lack of knowledge about strategic bombers in conventional operations and the relatively low level of experience among the crew force. These two problems require a gradual training program which will enable the crew force to develop conventional warfare skills at the same time the staff develops improved conventional tactics, engineers develop improved conventional weapons, and planners develop better plans for the use of strategic bombers in conventional warfare.

To accelerate the learning curve and to prepare the conventional B-52 force for combat before the need arises, an evolutionary training program must begin at once because the training crews receive teaches them to use their

equipment, to gain flight proficiency, to develop "air sense," and ultimately to apply their skills in combat. Proper training will do much to prepare the B-52 force for conventional warfare.

To do this rapidly SAC must begin to train the force even before the new weapons and equipment are procured. To train the crew force efficiently, the Department of Defense, the Air Force, SAC, and theater CINCs must answer several crucial questions such as:

- How much funding and how many aircraft will be available?

- What are theater CINCs' needs and what missions will the B-52 be assigned to?

- Who will command the B-52 conventional force during peacetime or wartime?

To suggest ways to train the conventional B-52 force without knowing the answers to these crucial questions, we must make several assumptions, including the following:

- SAC will retain overall command and control and the responsibility for training, equipping, and organizing the entire B-52 force during peacetime.

- Conventional B-52s will "chop" to the appropriate theater CINC during conventional war. Command of the nuclear force will be retained by SAC at all times.

- To obtain equal footing with the nuclear force and undivided attention of an appropriate headquarters staff, conventional B-52s will be assigned to a dedicated numbered air force within SAC.

- The numbered air force will be tasked with developing the conventional B-52 force structure that can satisfy the needs identified by the theater CINCs.

- B-52s will be assigned the missions of maritime operations, counterair, strategic offense, and air interdiction (although in times of extreme crisis, they could be tasked against any air mission).

Based on these assumptions, it is possible to address training concepts for the conventional B-52 force.

Nuclear versus Conventional Training

Gen John T. Chain, Jr., has said, "To enhance SAC's near-term conventional capability to meet increasing theater requirements, I have directed all bomb wings to immediately achieve the capability to conduct conventional as well as nuclear operations."[17] Given the complexity of the SIOP mission itself and the numerous limitations previously identified, the latest SACR 51-52 does a remarkably good job of preparing crews for both conventional and nuclear operations. However, it is unreasonable to expect nuclear qualified wings to be as proficient in conventional operations as are wings not tasked with the nuclear mission.

A nuclear B-52 wing is restricted by several limitations that do not apply to the conventional B-52 force. In a nuclear wing the primary mission is SIOP and conventional operations are secondary in importance. In a nuclear wing, crews spend roughly one-third of their time on alert, which reduces the amount of time available for flight training. The nuclear crews cannot practice or experiment with the actual weapons they will use in wartime. And even more than a conventional war, an all-out nuclear war of national survival is more difficult to imagine, much less to simulate for training purposes.

B-52 missions executed under SIOP are required to launch in response to an enemy attack. Due to the extreme nature of the national emergency, they must attempt to accomplish their preplanned mission regardless of the obstacles. The mission itself is so critical that attrition is not a factor (except during the initial planning of the sortie). Because the situation is so desperate and the mission so critical, SIOP-executed B-52s will attack at a time of the enemy's choosing and will confront a prepared enemy.

Since conventional war is different from nuclear war, conventional B-52 missions do not need to operate under the same constraints. Depending on the value of the particular sortie/targets, conventional B-52s can attack at a time of their own choice and when conditions favor their success. In some cases, the sorties can be delayed until night or until friendly forces have reduced the enemy's air defenses. At other times, sorties can be aborted or recalled if the situation changes, if the enemy response is too strong, or if aircraft equipment failure reduces the probability of mission success. On certain occasions this flexibility will not be possible; but in general, attrition will be much more of a consideration during conventional operations.

Because SIOP missions and conventional missions are different and have different limitations, aircrews preparing for these missions must train differently. The conventional bomber force can contribute most to theater CINCs if it can operate in such a manner that it cannot only accomplish a particular sortie but can also survive and can fly numerous subsequent sorties. To survive, the conventional bomber force must train in such a manner that its attrition is kept at a very low level.

By assigning certain wings to conventional operations, it is possible to provide training that develops higher levels of proficiency in conventional operations and reduces expected attrition. But to do so, given the numerous constraints identified in chapter 2 and with the present crew force, requires some degree of specialization, a training program designed to take advantage of the opportunities realized through specialization, and a manning policy that assigns the most experienced crewmembers to the most demanding positions. This manning policy is discussed in a later section.

Due to budget constraints, staff and aircrew conventional operations experience, and limited resources, the four previously identified missions will require specialized training. For example, aircrews assigned to maritime operations do not require the same skills as aircrews assigned to air-interdiction missions. Thus, the training program for each conventional wing will vary depending on the assigned mission. However, several skills are common to all of the four missions. We will identify these generic skills and discuss training concepts that apply to the entire force before examining the individual programs for each type of mission.

Fundamental Training Concepts

As previously mentioned, SACR 51-52, B-52 Aircrew Training, contains a very well-thought-out and comprehensive training program. However, it was designed for the nuclear B-52 force with secondary tasking for conventional operations. As such, it does not create an appropriate training program for conventionally tasked B-52 wings. A separate conventional B-52 aircrew training regulation is required for that.

Material extracted from the present SACR 51-52 which applies to conventional operations can serve as the basis for the conventional force regulation. SACR 51-52 should prescribe and Headquarters SAC/DOTTA should retain

responsibility for initial B-52 qualification training, requalification, upgrade, and instructor qualification as is currently accomplished at Castle AFB, California. But wing-level training, to include Qualification Training Level D, and Continuation Training Levels A, B, and C,[18] needs to be designed by each wing as stated in the following extract from SAC 51-52.

> Each unit must prepare a detailed plan for completing training level D for both individuals and integral crews. The plan will be designed to provide an orderly training program and prevent regression of individual proficiency gained in CCTS [Combat Crew Training Squadron]. . . . The squadron commander will ensure that crews individuals receive all training necessary to maintain the desired level of proficiency to successfully accomplish the unit mission.[19]

Following this guidance each wing will develop the training program required to prepare its crew force for the wing's assigned missions. These individualized programs will change as conventional operation requirements, expertise, and equipment modifications evolve. The numbered air forces should evaluate and should approve the individualized training programs to ensure that they satisfy the needs of the theater CINCs and SAC.

These individualized training programs will place greater demands on the squadron commander and the staff. To offset this problem the squadron training staff will require increased manning or will have to be supplemented more by the wing staff. Either of these actions will enable the crews to receive the training most applicable to their needs.

The initial development of the wing's training program may encounter numerous problems. However, many of these problems can be avoided by consulting training experts from Headquarters SAC as well as experts in conventional tactics from within SAC and the other units in the Air Force, Army, and Navy. For example, Navy experts in maritime-aerospace operations could provide insight into conducting antiship operations. Working with B-52 training experts, they could develop a strong foundation for an excellent training program. This same type of information exchange not only would improve B-52 training but also would provide the other units with increased knowledge and understanding of B-52 capabilities. Through an evolutionary process the training program could rapidly improve.

Although training programs would be individualized for each wing based on its assigned mission, some aircrew skills are common to all B-52 operations. For example, pilots need to know how to take off and land, air refuel, and fly in formation. Navigators must be able to navigate and to drop weapons. Electronic warfare officers (EWOs) need ECM skills and ECM crew coordination. Gunners need system operation skills and air combat proficiency. As individual units identify skills necessary to conduct their missions, skills common to all units will emerge and will comprise the core training needs. Skills identified by SAC as desirable for all B-52 wings will also be designated as core events.

Due to the anticipated reductions in flight hours, the list of core events should be minimized, reducing the amount of training devoted to core events and allowing each wing to devote more attention to the skills required for its particular mission. Consequently, the identification of core events will not be an easy process. It will require careful examination and cooperation between Headquarters SAC/DOTTA, the conventional numbered air force, and training experts from the various wings.

As an example look at SACR 51-52 requirements for low-altitude flight. Proficiency in training events such as N009 TA/EVS Navigation Leg, N010 TA Operational Check, and N015 Low-Altitude Navigation Leg (day/night)--as well as numerous other events--is required for the pilot, copilot, radar navigator, and navigator to become qualified for low-altitude terrain-avoidance flight in the B-52.[20] Although proficiency in this event is certainly required for B-52 crews performing missions which require low-altitude, terrain-avoidance flight, such as air interdiction or strategic aerospace offense, it is not required for other missions, such as maritime operations.

Because proficiency in terrain avoidance is very difficult to acquire, it demands a great deal of initial training and continuous practice. If crews assigned to maritime operations must obtain and maintain proficiency in these events, the amount of flight time available for training in other events is reduced. However, B-52 crewmembers not proficient in terrain avoidance require a great deal of training if transferred to a wing that needs proficiency in this skill. Thus, identification of core events will be difficult because it will require a compromise between the ideal (all B-52 crewmembers proficient in every phase of flight operations) and the obtainable (crewmembers proficient in activities required to accomplish their assigned mission).

Using SACR 51-52 as a guide again, the following training events are recommended conventional B-52 core events:[21]

A Events--Academic Courses
- A001 CCTS Academic Course
- A002 PUP Academic Course
- A009 Difference Course (unit specific)
- A010 Instructor Academic Training
- A020 Initial AFSATCOM Academics Training
- A021 B-52 Requalification Course
- A044 CFIC Preattendance Workbook
- A075 Initial Fighter Intercept Activity Briefing

B Events--Bombing Events
- B001 High/Low-Altitude Bomb Run
- B002 High-Altitude Conventional Bomb Run
- B050 STR Scored Bomb Run
- B060 Sync Bomb Run
- B061 Alternate Bomb Run (if required for conventional operations)
- B063 Degraded Bomb Run (if required for conventional operations)

C Events--Missile Activity
- C009 STR Scored Missile Run
- C012 AGM-86/129 Procedure Low-Altitude Run (if generic to all conventional wings)
- C013 AGM-86/129 Procedures High-Altitude Run
- C016 Simulated Bomb Bay Missile Jettison
- C017 Simulated Pylon Jettison

D Events--Crew Training Sorties
- D003 Command Directed Training Sortie

E Events--Electronic Warfare Events
- All events in SACR 51-52

F Events--Fighter Defenses Events
- F001 Fighter Intercept Exercise
- F002 Gunner Proficiency Exercise
- F005 Conventional Profile Exercise
- F006 Warning Receiver Exercise
- F009 Station Keeping Exercise
- F013 FCS Equipment Check
- F014 Fighter Intercept Run
- F016 AFSATCOM Exercise
- F017 Fighter Intercept Activity

G Events--Ground Training Activities

All of the items listed in SACR 51-52 except:

G001 Initial Air Weapons Training
G003 Unit Alert Procedures
G020 Initial Command Control Procedures (Phase I)
G021 Initial Command Control Procedures (Phase II)
G028 Nuclear Weapons Preflight
G102 Flash Blindness Protection
G301 Air Weapons Refresher
G304 Harpoon Missile Training
G310 Recurring EWO Study
G312 Command Control Procedures
G340 EWO Preparation for Certification
G90X EWO Integrated WST Missions
G924 Gunner EWO Procedures Independent WST
G925 EW Independent EWO WST
G927 EW Independent EWO WST
G928 EW Independent EWO WST
G929 EW Independent EWO WST
G929 CTD Mission

I Events--Instrument Procedures

All events in SACR 51-52

N Events--Navigation Requirements

N090 *Programming/Navigation Exercise*
N093 Air Alignment
N094 Ground Alignment
N096 Degraded Systems Navigation Leg
N00? New event emphasizing precise high/low navigation and time control with minimum use of radar

P Events

All events listed in SACR 51-52 except:

P017 Flaps Up Touch-and-Go Landing
P019 Effects of Airbrakes 6 on Unstick
P024 MITO
P029 Instructor Team Coordination
P043 Low-Altitude Stream Formation
P067 Go Around Capability, Flaps Up
P068 Go Around Capability, Flaps Down
P085 Rudder/Elevator Out Approach
P086 Stab Trim Out Approach and Landing
P089 EWO Departure
P106 Wear of PLTZ Goggles In-flight
P110 Cell Formation Mission, Emission Option 3
P111 Cell Formation Mission, Emission Option 4

Q Events--Qualification Activities

- Q002 Emergency Procedures Exam
- Q003 Difference Open Book Qualification Exam
- Q004 Instrument Evaluation Exam
- Q005 Cockpit Procedural Trainer Valuation
- Q013 Qualification/Instrument Valuation
- Q014 Difference Certification (specific for each wing)
- Q015 Conventional Certification
- Q040 Night-Vision Goggle Mission Certification

R Events--Rendezvous and Refueling Activities

- R001 Air Refueling
- R002 Point Parallel Rendezvous
- R003 Electronic Rendezvous
- R004 Receiver Directed Rendezvous
- R005 Air Refueling (night)
- R008 Heavyweight Air Refueling
- R010 Cell Rendezvous and Refueling
- R011 Air Refueling Breakaway
- R013 Overrun Procedures
- R016 Manual Boom Latching
- R017 Air Refueling Procedures
- R036 On Course/En Route Rendezvous
- R050 Air Refueling, Tanker Autopilot Off
- R051 Air Refueling, Receiver Autopilot Off
- R056 Air Refueling, Emission Option 1
- R057 Air Refueling, Emission Option 2
- R060 Air Refueling (day)
- R062 Simulated Bomber Engine Out, Air Refueling
- R064 Pressure Disconnect
- R070 Lightweight Air Refueling

T Events--Tactics Training Activities

- T001 Terrain Feature Offset
- T016 Simulated Equipment Malfunction Run
- T019 Long-Offset Release
- T020 Degraded FCS Exercise
- T026 Doppler Out Exercise
- T050 Weapons Control Panel Inoperative Exercise
- T051 Radar Navigation Management Panel Inoperative Exercise
- T060 Avionics Processors and IME's Recycle Exercise
- T084 Bomber Target Change
- T085 Low-Altitude Conventional Time Control Exercise
- T092 Cell Position Change

Due to future equipment modifications and mission differences between the four types of conventional B-52

units, some training events listed elsewhere may not be applicable to each unit. If that is the case, those particular events should be deleted and replaced with appropriate items. Event C013, AGM-86/129 Procedures High-Altitude Run, illustrates this point.

Training event C013 is a simulated launch of an air-launched cruise missile (ALCM) above 18,000 feet. To complete this event, navigators follow the appropriate checklists, turn the proper switches, and simulate launching a missile. If all conventional B-52s do not have the equipment installed to accomplish this simulated launch, then training event C013 should be replaced with another missile training event (C00?) that would exercise missile launch procedures generic to every B-52 unit. If there are no missile launch procedures common to the entire fleet, then there is no need to identify missile launch procedures as a core event.

A training program composed of the proper mixture of identified core events would qualify an individual for flight in the B-52 and would serve as the foundation upon which the individual wings develop the training necessary to complete their assigned mission. Portions of the listed core events identified by crew position (pilot, copilot, radar navigator, navigator, electronic warfare officer, and gunner) requiring a proficiency skill level would form the basic aircrew skills (BAS) for each crew position.

Evaluation and Qualification

Proficiency in basic aircrew skills would become the minimum level of skill necessary for qualification in the B-52. Unqualified individuals would need to train at Castle AFB before reaching their new assignment. Individuals qualified in the B-52 would transfer between units without requiring requalification at Castle AFB. Unit training flights would base Difference Training, Qualification Training Level D, and Continuation Training on the foundation established by proficiency in basic aircrew skills.[22]

Annual flight evaluations, administered by standardization and evaluation personnel, would test these same skills. Individuals found nonproficient in BAS events would require requalification at the unit. The qualification and identification of crews and individuals proficient in skills above the BAS events (skills above the BAS events level constitute continuation training) would be the responsibility of the squadron commander and staff. All

wing instructors and evaluators would treat continuation training events as aircrew skills that are being continually improved.

Operational readiness inspections (ORIs) should be designed to test each wing's ability to conduct its assigned mission. Since each wing would have a different mission, each ORI would be different or would evaluate the wing's role in a composite mission scenario. As an example, a wing assigned the mission of strategic aerospace offense would need an ORI that tested its ability to mission-plan very rapidly, assign the appropriate number of aircraft and weapons against a particular type of target to achieve the desired damage expectancy, generate the aircraft, fly the designed mission, penetrate through simulated enemy defenses, and destroy the assigned targets. Success or failure would be determined by the wing's ability to destroy the assigned targets. Wing rating would be based on the attrition encountered and the amount of "overkill." Counterair-tasked wings would be evaluated by their performance in support of the attacking wing's mission. Maritime-tasked wings would be evaluated by their performance against a Navy task force.

These ORIs would be complex, would require careful coordination, and would not fully simulate wartime conditions, but they would provide a realistic appraisal of the wing's capabilities as well as provide additional training. Some events, such as simulated enemy defensive threats and weapon launch procedures, may require evaluation in the various simulators. Results in the simulator would be added to the results in the air to derive overall unit performance. The unit's effectiveness in the periodic joint exercises also could be factored into the wing's readiness rating.

Joint Exercises

Participation in joint exercises would be an important portion of the wing's training program. Since conventional forces are designed to operate together, training should be conducted jointly to ensure adequate coordination and integration. Frequent participation by conventional B-52 wings in joint exercises would identify problems and shortfalls and eventually would improve conventional force capabilities.

The participation of each wing in the various joint exercises would depend on the wing's assigned mission and its role in support of a theater-based exercise. Some

conventional wings may participate in almost all of the exercise, while other wings may have a much more limited role. For some units joint exercises may be the most important part of their training; for others, it may be more of an evaluation and less of a training activity. We now turn to these types of differences in unit training.

Maritime Operations Training Concepts

Besides the core events which would be determined by Headquarters SAC and the conventional numbered air force, aircrews assigned to maritime operations would require proficiency in mine delivery, locating and identifying ships, launching the Harpoon missile, and working with Navy units. Except for maintaining proficiency in BAS, maritime crews should concentrate on continuation training and on obtaining proficiency in the skills necessary to complete their mission.

Maritime crews do not require proficiency in terrain-avoidance operations, but they do need to learn to operate at low altitudes over water. Low-altitude flight over water allows the B-52 to fly closer to ships without being detected on radar and to launch Harpoon missiles against these targets. To accomplish this, maritime crews need a training event that practices the skills to descend from high to low altitude over the water and to operate at low altitudes for extended periods visually or with radar. Maritime operations crews also need a continuation training event which emphasizes coordination between Navy targeting vessels, both ships and aircraft, and the B-52. This event would primarily be a coordination exercise in which the Navy identifies the target and the B-52 releases the appropriate munition against the specified target. This type of coordination exercise would be required for B-52s launching Harpoons, for laying mines, or for conducting antisubmarine operations.

Training events extracted from SACR 51-52 that apply specifically to maritime operations include: A046 Initial AGM-84 Course, B026 Low-Altitude Mine Run, C021 AGM-84 Vector-Assisted Attack, C022 AGM-84 Coordinated Attack, D013 Sea Reconnaissance/Surveillance Sortie, and G304 Harpoon Missile Training.

Counterair Training Concepts

Training for B-52s assigned to counterair missions will vary depending on the equipment installed on the aircraft.

This section assumes that EB-52s will be equipped with unique offensive counterair, defensive counterair (DCA), and suppression of enemy defenses systems that will not be installed on other types of conventional B-52s. This equipment includes ECM decoys and drones, a second ECM crew station, an air-intercept radar system, a weapon control system, and an air-to-air missile. Possible weapon systems include a long-range conventional standoff missile for ECM support, the AMRAAM for self-defense and targeting of Soviet AWACS and, as a decoy, the Tacit Rainbow for SEAD.

The aircrew consists of a pilot, a copilot, two EWOs, a navigator, and a gunner. To make room for the additional ECM equipment and weapon systems, the terrain-avoidance system and its associated equipment may be sacrificed. Removal of the TA equipment and one navigator position would restrict the EB-52 to low-level operations in visual conditions and to conducting operations from outside of enemy airspace.

ECM training obviously requires the most attention. Incorporation of EF-111 training events could provide some insight into the training necessary to accomplish this mission. To provide security for ECM capabilities, much of this training will have to be accomplished in a simulator. Simulator training will emphasize offensive and defensive ECM and also programming and launching of the Tacit Rainbow, AMRAAM, and the ECM long-range conventional stand-off munitions.

Flight training should emphasize permissible ECM training, coordination between the EB-52 and the other types of aircraft, cell formation procedures, and offensive/ defensive air-combat procedures. Participation in joint exercises will be an important part of this training. Night visual low-altitude operations also will be required.

Besides maintaining BAS proficiency, pilots require proficiency in cell procedures, day and night visual low-altitude flight, and air-combat maneuvers. The EWOs need proficiency in electronic combat for OCA, SEAD, and DCA. They also would operate ECM missile systems, assuming this activity would not interfere with the operation of other ECM systems. (It is also assumed that the Tacit Rainbow, ECM decoys, and drones would be launched prior to starting ECM jamming procedures.) The navigator needs high- and low-altitude navigation skills and maybe even the ability to launch some of the missile systems. The gunner needs proficiency in air-combat procedures and training to operate and launch the AMRAAM system.

Due to the complexity of the task facing the defensive team, at least one of the two EWOs and the gunner should be highly experienced crewmembers. Pilot and navigator skills are not as demanding (in comparison to the skills required by the pilots and navigators in the penetrating role) and could be accomplished by individuals of average experience levels. A manning policy which assigns experienced EWOs and gunners to the EB-52 wing would provide the EB-52 wing with the highly qualified individuals it needs. A similar manning policy would also apply to the other crew positions.

Experienced pilots and radar navigators should be assigned to wings that require more highly skilled pilots and radar navigators to accomplish their missions. Because of the shortage of highly experienced B-52 crewmembers, the pilot retention problem, and the probable reduction of flying hours, the most qualified individuals should occupy the most demanding positions. SAC could initiate this manning policy by assigning most of the newly qualified crewmembers from Castle AFB to the nuclear-tasked B-52 wings. After gaining three or four years of experience at the nuclear wings, many of these individuals could then receive subsequent assignments to the conventional B-52 wings.

Individuals returning to the cockpit from nonflying assignments, after requalifying at Castle AFB, could be sent to either nuclear or conventional wings. Because of their previous experience and their rank--senior captain through junior lieutenant colonel--they would be able to fill higher-ranking positions in both the nuclear and conventional wings such as in bomb/navigation, tactics branch, or wing staff. The overall effect of this manning policy would be to increase the experience level at conventional wings while reducing the experience level at nuclear wings. Although this manning policy does have some problems--primarily the reduction of crewmember experience at the nuclear wings--I believe this policy is possible for the following reasons: First, the nuclear B-52 mission is currently very demanding. However, if future plans are followed, and the B-52H does become primarily an ALCM carrier and not a penetrating bomber, the mission will be much easier and will not require the most skillful operators. Consequently, the future B-52H nuclear mission can be accomplished by less-experienced crewmembers. Second, the proposed manning policy will take time to be effective. This time delay will permit the B-52H to phase into its ALCM-carrier role without degrading its present capabilities. Third, the B-1 crew force will mature during this time period and will be able to pick up the more demanding nuclear missions released from the B-52H force.

Fourth, the B-2 will become operational and probably replace the B-52H force (if that force is not retained for conventional operations). And fifth, SAC can track crewmember experience to ensure that the experience level at any wing does not decline to an unsafe level.

This proposed manning policy will increase the capabilities of the B-52 conventional force. Because conventional war is more likely than nuclear war, the conventional B-52 force is more likely to be called for combat. If the conventional B-52 force has more skillful crewmembers, it will be more capable and more effective in combat, thus, increasing United States conventional warfighting capabilities as well as contributing to nuclear deterrence. This manning policy, combined with an effective training program, will enable B-52 crewmembers to obtain the skills for combat.

We now return to the subject of aircrew training; in particular, the training events all crew positions require to accomplish the counterair mission. These events include the following items identified in SACR 51-52:

C018 AGM-86/129 Flex Targeting Exercise (CSM)
C019 AGM-86/129 Manual SAIR Exercise
D009 Special Mission Conventional Training Sortie
D010 Red/Green/Maple Flag Sortie
F011 Fighter/Bomber Ground ECM Environment Exercise
N015 Low-Altitude Navigation Leg
R058 Air Refueling, Emission Option 3
R059 Air Refueling, Emission Option 4
T100 Tactical Gear Down Descent
T101 Night-Vision Goggles (NVG) Exercise

Strategic Aerospace Offense and Air Interdiction

Aircrews assigned to strategic aerospace offense and air-interdiction missions have a difficult task. When the defensive threat environment permits, they accomplish strategic offense and air-interdiction missions using inexpensive ballistic bombs. As the enemy defensive threat increases they need increasingly more assistance in penetration and in the ability to attack certain targets from beyond the reach of the enemy's point defenses. Thus, aircrews assigned to these two missions require proficiency in numerous weapon systems, proficiency in low-altitude terrain avoidance and terrain masking, proficiency in cell-formation flight at high and low altitudes, and proficiency in threat avoidance, detection, and countermeasures (both offensive and defensive ECM).

Because many of these skills are very difficult to master, they require extensive training both in the air and on the ground. In the air, pilots require frequent practice in visual night terrain-masking flight and terrain-avoidance flight with TA equipment. They also need frequent practice in low- and high-altitude cell formation. Navigators require the same amount of training for TA flight and low-altitude flight. Bombing and navigation training also require flight time. The EWO can practice specified procedures at the same time. The entire crew requires additional flight time to practice defensive air combat skills.

The Strategic Training Route Complex (STRC) and the Red/Green/Maple Flag exercises will be an essential portion of the flight training. At the various flag exercises, crews will integrate with other forces and practice against aggressor forces. At the STRC pilots can fly multiple routes against multiple-threat combinations. Mobile electronic stations which simulate enemy defensive threats and frequently relocate to different portions of the STRC would improve aircrew penetration skills and enhance crew training with respect to employing HARMs against tactical SAMs and AAA, maneuvering to escape detection, and employing ECM at unexpected times.

Besides flight activity the EWO and the navigators will require extensive simulator training. The EWO needs such training to practice against threats that cannot be simulated in the air. To achieve proficiency in the numerous munitions available to the B-52 for aerospace offense or air interdiction, navigator simulator training will emphasize weapon procedures. (Due to the high cost of some sophisticated long-range conventional munitions and the variety of different weapon systems, it would be impractical to attempt to gain and maintain proficiency in each of the various systems by actually launching these weapons in the air. However, the actual deployment of a weapon greatly increases the aircrew's confidence in weapon employment. This being the case, an occasional practice weapon launch or drop would improve the aircrew training program.) Some weapons may require guidance from the operator after launch. Weapon trainers that can simulate this portion of the missiles' flight will be essential in achieving proficiency with this type of weapon.

Overall, obtaining proficiency in these missions will require both extensive flight and simulator training, particularly in the pilot and navigator positions. To help

achieve the skills required in these positions, experienced pilots and navigators need to be assigned to the aerospace offense and air-interdiction missions.

Pilots' low-altitude training should emphasize visual night terrain-masking procedures over TA procedures. In addition, pilots and navigators require training for special tactics low-level cell procedures. Navigators require training events which emphasize precise low-altitude navigation with extremely limited use of the radar as well as TA procedures for inclement weather conditions. EWOs need an ECM event which gains proficiency in employing HARM missiles against unexpected threats. All crewmembers require training events which enable them to operate effectively with supporting aircraft such as the EB-52.

SACR 51-52 training events for the strategic aerospace offense and air-interdiction units include:

B066	Actual Weapon Release
B069	Navigator Bomb Run
C018	AGM-86/129 Flex Targeting Exercise (CSM)
C019	AGM-86/129 Manual SAIR Exercise
D008	Conventional Profile Training Sortie
D009	Special Mission Conventional Training Sortie
D010	Red/Green/Maple Flag Sortie
D024	STRC Sortie
F004	Live Fireout
F011	Fighter/Bomber Ground ECM Environment Exercise
G90X	EWO Integrated WST Missions
N009	TA/EVS Navigation Leg
N010	TA Operational Check
N011	EVS/Visual Contour Navigation Leg
N012	TA Only Navigation Leg
N014	Night TA/EVS Navigation Leg
N015	Low-Altitude Navigation Leg
N082	Low-Level Route Diversification
N087	Night Mountainous TA/EVS Navigation Leg
P110	Cell Formation Mission, Emission Option 3
P111	Cell Formation Mission, Emission Option 4
Q030	Night Flat and Rolling TA/EVS Certification
Q031	Night Mountainous TA/EVS Certification
Q037	Iron Shield/Special Mission Training Assessment & Validation
Q040	Night-Vision Goggle Mission Certification
R058	Air Refueling, Emission Option 3
R059	Air Refueling, Emission Option 4
T021	High-Target Exercise
T022	Low-Target Exercise
T025	Shortlook Maneuver
T028	EVS/Pilot Visual Aided Bomb Run

T099 Defensive Action Bomb Run
T100 Tactical Gear Down Descent
T101 Night-Vision Goggles (NVG) Exercise

Summary

In this chapter I assumed that sufficient funds would be approved by Congress in the near future to enable approximately 75 B-52s to be dedicated to conventional operations and to be modified with new weapons and equipment to accomplish the Air Force missions of maritime operations, counterair, strategic aerospace offense, and air interdiction. These assumptions enable the author to suggest the following organizational, training, and equipping concepts:

- SAC should maintain responsibility for the conventional B-52 force during peacetime through a newly established numbered air force. In wartime the numbered air force and conventional B-52 wings will be assigned to the appropriate theater CINC.

- Each conventional B-52 wing should be organized, equipped, and trained differently to most effectively accomplish the wing's assigned mission. This results in specialization.

- Specialization by mission will enable each conventional B-52 wing to become most capable of performing the wing's mission across the spectrum of conflict.

- New munitions and equipment such as the HARM missile, Tacit Rainbow, AMRAAM, long-range and intermediate-range conventional standoff munitions, precision-guided munitions, ECM decoys and drones, improved C^3I equipment, GPS, SAR/ISAR, and other equipment are required to improve the B-52's capabilities and enhance its survivability.

- Crewmembers will achieve and maintain qualification in the B-52 by becoming proficient in fundamental aircrew skills identified by SAC and the conventional numbered air force and called basic aircrew skills.

- Each wing will develop its own unique continuation training program starting with the foundation established by BAS.

- Equipment, flight time, simulators, personnel, and other resources will be provided to each wing according to its requirements. (Based on the wing's mission, some will require more flight time and/or more experienced pilots, radar navigators, EWOs, and gunners than other wings.)

- SACR 51-52 and the training events identified in this regulation should be the starting point for a conventional B-52 training regulation.

There are many other possible ways to organize, equip, and train the B-52G force for conventional operations. The concepts presented in this chapter merely brush the surface of these issues and need further development. Hopefully, the concepts identified here will stimulate others to address these same issues.

Notes

1. DOD Directive 5100.1, 26 January 1980, quoted in Capt Thomas Bradley, The Use of Air Power Maritime Operations, Research Report AU-ARI-84-9 (Maxwell AFB, Ala.: Air University Press, August 1985), 124-25.

2. Ronald E. Sawyer, "Bombers in the Conventional Role," Report GRC 87-3096 (McLean, Va.: General Research Corp., October 1987), 9, 13. (SECRET) (Information extracted is unclassified.)

3. Jeffrey P. Rhodes, "SAC's Sea Patrol," Air Force Magazine, October 1987, 48.

4. The EB-52 is a B-52 equipped for an electronic warfare role. The suggested configuration and mission of the EB-52 varies from one author to the next. The EB-52 visualized by the General Research Corporation can be found in "Bombers in the Conventional Role," 22-36.

5. David Fulghum, "Some SAC B-52s May Take on Aerial-Guerrilla Role," Air Force Times, 8 February 1988, 30.

6. Ibid.

7. Lt Col John E. Frisby and Maj Grover E. Myers, Strategic Forces in Transition: A Doctrine for Indivisible Aerospace Application, Research Report AU-ARI-85-2 (Maxwell AFB, Ala.: Air University Press, June 1985), 168.

8. Ibid., 169.

9. Sawyer, 105.

10. The Logicon Corporation is currently developing an automated system for mission planning. Logicon claims its system can create an entire mission package in two hours. The status of Logicon's system is not known to the author at this time.

11. Sawyer, 39.

12. Ibid., 43.

13. Ibid.

14. AFM 1-1, Basic Aerospace Doctrine of the United States Air Force, 16 March 1984, 3-3.

15. Sawyer, 68-69.

16. Stephen T. Hosmer and Glenn A. Kent, The Military and Political Potential of Conventionally Armed Heavy Bombers, Rand Report R-3508-AF (Santa Monica, Calif.: Rand Corp., August 1987), 35.

17. Gen John T. Chain, Jr., commander in chief, Strategic Air Command, remarks prepared for presentation to the Senate Committee on Appropriations Defense Subcommittee, Washington, D.C., February 1987.

18. Qualification Training Level D is the training required of an individual who is basically qualified in the B-52 to accomplish the wing's mission (either nuclear or conventional). Continuation Training Levels A, B, and C are levels of training which are required to maintain an individual's proficiency and currency in the unit's mission.

19. SACR 51-52, B-52 Aircrew Training, 28 September 1987, 3-1, 4-1.

20. Ibid., A3-2. Several other training events specified in SACR 51-52 are required to fully qualify an individual in low-altitude terrain-avoidance flight but only a partial listing is required to illustrate the point intended by the author.

21. Ibid., A2-1 - A2-17. A description of each of the training events is found in SACR 51-52, B-52 Aircrew Training. Additional guidance and a description is found in SACR 51-5, Electronic Combat/Defensive Training; JR 55-79, Aircrew/Weapons Controller Procedures for Air Operations; SACR 3-1, vol. V, B-52 Tactics; SACR 50-24, Aircrew Ground

Training Program; AFM 51-37, Instrument Flying; SACR 50-4, Bombing/Navigation/AGM Operations; SACR 60-4, Standardization/Evaluation Program; and other manuals.

22. Qualification training is the initial aircrew training individuals receive before being allowed to occupy a crew position in the B-52. Difference training enables an individual who is qualified in one model of the B-52 to fly another model of the B-52. Continuation training is the training accomplished by a crewmember after being qualified in the B-52. Continuation training is a perpetual process that stops only for actual operational flights or for another type of training.

CHAPTER 4

CONCLUSION

The organization, equipment, and training required to prepare B-52Gs for conventional operations depend on the answers to three questions:

1. How can the Air Force enhance the national security of the United States?

2. What are the resources available to the B-52 force?

3. Based on the funds available and the needs of the nation, which missions will be assigned to the conventional B-52 force?

The president of the United States, Congress, and senior leaders within the Department of Defense must answer these questions before the Strategic Air Command can most efficiently prepare B-52s for conventional operations.

If these three questions remain unanswered, SAC can only guess at the best ways to organize, equip, and train the B-52 force for conventional operations. Even if the questions are answered, there are still numerous problems to be overcome before the B-52 force fulfills its potential in conventional warfare. One of the most difficult problems involves funding.

If insufficient funds are allocated for organizing, equipping, and training a sizable B-52 conventional force, then SAC would be ill-advised to retain B-52s for conventional operations because the B-52's possible role in conventional warfare would be too limited. Without new weapons and improved systems, the B-52 is too vulnerable to the newest defensive systems and, thus, would be ineffective against the most serious threat to the United States--the Soviet Union. Likewise, if funds are misspent, then the B-52 force will be ineffective.

On the other hand, if sufficient funds are allocated and properly spent, the B-52 force will enhance the capabilities of the Air Force and improve the security of the United States. With the current concern about the capabilities of United States military forces, a moderately sized B-52 force (75-aircraft minimum) equipped with new weapons and improved systems will contribute greatly to

enhancing United States conventional power and to redressing the population's concerns.

The B-52 has several characteristics needed for conventional warfare in the future--flexibility, mobility, range, and firepower. Due to recent improvements in equipment and weapons, such as the offensive avionics system and the Harpoon missile, the B-52 is a better weapon system than it was 30 years ago. A relatively small investment will enable the B-52 to continue to perform as a potent conventional weapon for at least another decade. The Air Force must begin immediately to prepare the B-52 force for conventional warfare because future war, as Giulio Douhet warned, "will be a struggle in which the side which finds itself unprepared will have no time to get ready; and therefore it will be decided by the forces ready at hand when hostilities begin."

Faced with a growing threat to national security, the United States would be "penny wise and pound foolish" to retire the B-52G at a time when its full potential in conventional warfare can be realized at a modest cost.