The USAF F-15E (STRIKE EAGLE): Air Support for the AirLand Battle-Future Concept

A Monograph
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This monograph discusses the role of the U.S.A.F. F-15E "Strike Eagle" in providing air support for the Army AirLand Battle-Future concept. This highly capable aircraft will be a major source of air support in any future conflict.

A revision to current Army AirLand Battle doctrine, tentatively called AirLand Battle-Future (ALB-F), is a concept that will require close integration with TacAir assets. The F-15E can provide precision long range fires to support Army combat units using ALB-F concept.

This monograph looks at five major areas: first, air power theory and doctrine; second, the ALB-F concept; third, the F-15E "Strike Eagle" capabilities; fourth, a comparison of current TacAir fighter aircraft with the F-15E; fifth, a discussion of the best uses of the F-15E under the ALB-F concept.

The study concludes that the F-15E could be used in any of the four major TacAir missions. The aircraft should be used first in the counter air role to gain air superiority. The aircraft should then be tasked to support ground forces by attacking BAI targets. The aircraft could also be used as a dedicated aircraft to accomplish suppression of enemy air defense (SEAD) missions. The aircraft certainly will be used to accomplish air interdiction. Lastly, the aircraft could provide close air support for ground forces.

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ABSTRACT

THE USAF F-15E "STRIKE EAGLE": AIR SUPPORT FOR THE AIRLAND BATTLE-FUTURE CONCEPT by MAJ Robert C. Groesvenor. USAF. 59 pages.

This monograph discusses the role of the U.S.A.F. F-15E "Strike Eagle" in providing air support for the Army AirLand Battle-Future concept. This advanced and highly capable aircraft has achieved operational capability with two tactical fighter squadrons and will be a major source of air support in any future conflict.

The U.S. Air Force has supported the Army AirLand Battle (ALB) doctrine since its inception in 1982. A revision to this doctrine, tentatively called AirLand Battle-Future (ALB-F), is a concept that will require close integration with TacAir assets. The F-15E can provide precision long range fires to support Army combat units using ALB-F concept.

This monograph looks at five major areas: first, air power theory and doctrine; second, the ALB-F concept; third, the F-15E "Strike Eagle" capabilities; fourth, a comparison of current TacAir fighter aircraft with the F-15E; fifth, a discussion of the best uses of the F-15E under the ALB-F concept.

The study concludes that the F-15E could be used in any of the four major TacAir missions. The aircraft should be used first in the counter air role to gain air superiority. The aircraft should then be tasked to support ground forces by attacking BAI targets. The aircraft could also be used as a dedicated aircraft to accomplish suppression of enemy air defense (SEAD) missions. The aircraft certainly will be used to accomplish air interdiction. Lastly, the aircraft could provide close air support for ground forces.

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I. INTRODUCTION

The employment of land, sea, and air forces in time of war should be directed towards one single aim: VICTORY. If maximum effectiveness is to be obtained, these forces operate as components of one single product.[1]

Air Vice Marshal Guilio Douhet

In 1982 the U.S. Army adopted AirLand Battle (ALB) as its fundamental warfighting doctrine. As the term implies, ALB doctrine espouses close interaction between air and ground forces. U.S. armed forces continue to grapple with the interaction required between service components to successfully execute joint combat operations under ALB doctrine.

When first established as a separate service, the U.S. Air Force's (USAF) primary responsibility was to provide air power for defense at home and commitments throughout the world. Current USAF doctrine states: "The basic objective of aerospace forces is to win the aerospace battle—to gain and/or maintain control of the aerospace environment and to take decisive actions immediately and directly against an enemy's warfighting capacity."[2] From this basic objective, USAF missions have evolved. Current USAF doctrine, missions, and forces have supported ALB doctrine. USAF assets will continue to provide air power for all military operations and will support future Army doctrine.

The U.S. Army is studying a revision of ALB that will extend the doctrine into the twenty-first century. Tentatively named AirLand Battle-Future (ALB-F), the concept envisions fluid battles and highly lethal munitions delivered throughout the depth of the

battlefield. The depth of the battlefield and precision long-range fires envisioned by this concept will require air forces to be an even more integral part of any combat operations.

New technologies and resulting military applications will have a great impact on the ALB-F battlefield. The F-15E "Strike Eagle", an advanced multi-role aircraft, recently became operational and is available to provide air support for any theater of operations. Most USAF planners see the F-15E as primarily a deep strike aircraft to supplement the F-111 for air interdiction missions.[3] Employment of the F-15E and other advanced aircraft to support ground operations will significantly impact the success of the ALB-F concept.

RESEARCH QUESTION

As the F-15E weapon system evolves and its capabilities and limitations are better understood, the possibility may develop for changing roles, modifying the aircraft, or using additional weapons to support ground forces. This monograph will answer the question, "Under the AirLand Battle-Future concept, what are the best uses for the F-15E?" In the study, determination of the best uses for the aircraft will be based on the following criteria: 1) responses to changes in TacAir requirements under the ALB-F concept that will be identified in this study; 2) realizing the greatest benefit from F-15E multi-role capabilities while on the same mission; 3) optimal employment of unique advanced F-15E systems capabilities; and 4) minimizing the level of risk in the target area.

CONSTRAINTS AND ASSUMPTIONS

The following constraints and assumptions are inherent and serve to limit this study:

1) only USAF fighter aircraft will be considered—specifically: F-15E, F-16C, and F-111F.

2) nuclear and chemical weapons may be used on the battlefield, however, this study will consider only conventional conflicts.

3) if a protracted war develops, aircraft employment will be adjusted according to operational requirements and knowledge gained during the conflict.

4) in order to allow maximum distribution of this monograph, only unclassified references were used.

ORGANIZATION OF THE STUDY

The study contains seven sections. The present introduction comprises Section I. Also in Section I are several essential terms that are used throughout the study. Section II contains a discussion of U.S. air power theory, historical insights into air force support for ground operations, and a brief glance at both USAF and Army ALB doctrine. The purpose of Section II is to convey background information for understanding U.S. Army and Air Force integration on the battlefield. Section III is a preview of the AirLand Battle-Future concept with a look at probable TacAir requirements to support the ALB-F concept. The F-15E "Strike Eagle" description in Section IV gives basic information about the aircraft, including a summary of its capabilities. Section V is a comparison of the F-15E with two present day fighter aircraft. The discussion of the capabilities of the three aircraft will show how the F-15E compares with tactical aircraft currently performing missions supporting Army ALB doctrine. In Section VI the best

uses of the F-15E under the ALB-F concept are discussed based on established criteria. Lastly, section VII contains the conclusions for F-15E air support under the ALB-F concept.

TERMS

Several terms used in this study must be defined for a full understanding of air operations performed in conjunction with AirLand Battle.

> *TacAir* - Tactical Air: Air operations involving the employment of air power in coordination with ground or naval forces.[4] The term is further restricted in this study to aircraft controlled and operated by USAF tactical air forces (TAC, USAFE, and PACAF major air commands—CONUS based, European based and Pacific based respectively).
>
> *air force* - In this study, a military force using the aerospace environment to conduct combat operations: includes naval aviation forces, but does not include organic U.S. Army aviation. Air Force is used in some instances instead of U.S. Air Force (USAF).
>
> *multi-role aircraft* - An aircraft that is equally capable of performing different roles on separate missions or is capable of performing in several roles on the same mission. The term is sometimes used interchangeably with dual-role.

Additional terms, definitions, and acronyms are found in the glossary.

SECTION II. AIR POWER THEORY AND DOCTRINE

The aeroplane is a weapon of war. . . .the use of which we have not completely gauged. the value of which we have not fully appraised. So utterly unaccustomed are we to reckon with it in studying war. that we fail to realise its possibilities—fail to realise that success or failure in war may in the future depend on this. the latest weapon forged by man.

Sir Michael Beethan

Beginning in the early twentieth century. the airplane brought a revolutionary new capability to the art of war by incorporating the third dimension over the battlefield. Extending the battlefield vertically both increased. as well as complicated. the possible options for military forces. Aircraft were viewed as a new weapon of war that could prevent the World War I (WWI) stalemate by directly attacking a nation regardless of terrain or other earthly boundaries.

U.S. AIR POWER THEORY

Twentieth century air power theory began with concepts developed by the military pioneers of WWI. Many individuals throughout the world have had a great influence on the formulation of U.S. air power theory. Of the early air power proponents. three have had an enduring impact on U.S. air power theory.

The three early air power theorists who have significantly influenced U.S. air power theory are Air Vice Marshal Guilio Douhet of Italy. Air Chief Marshal Sir Hugh Trenchard of Great Britain. and Brigadier General William "Billy" Mitchell of the United States. Much of their thought was inspired by the devastating. defensive style trench warfare seen during WWI. The three visualized air power taking the battle past the trenches

directly to the enemy, both on the battlefield and into the interior of his country. A closer look at the ideas from the three theorists will give a basis for U.S. air power theory.

Guilio Douhet's theory had several main tenets regarding the use of air power. His central tenet was the concept of "command of the air."

> To have command of the air means to be in a position to wield offensive power so great it defies human imagination. It means to be able to cut an enemy's army and navy off from their bases of operation and nullify their chances of winning the war. . .In short, it means to be in a position *to win*. *To be defeated* in the air, on the other hand, is finally to be defeated and to be at the mercy of the enemy, with no chance at all of defending oneself, compelled to accept whatever terms he sees fit to dictate.[6]

"Command of the air" by today's definition means air superiority. Douhet's second tenet recommended establishing an independent air force to concentrate on "command of the air". He relegated the other military arms to the role of auxiliaries. In his view, the principal function of the ground forces was "to resist on the surface in order to mass our strength in the air."[7] Douhet's third major tenet concerned the offensive nature of air power.

> Viewed in its true light, aerial warfare admits of no defense, only offense. We must, therefore, resign ourselves to the offensives the enemy inflicts upon us, while striving to put all our resources to work to inflict even heavier ones upon him. This is the basic principle which must govern the development of aerial warfare.[8]

He believed in the employment of only bomber type aircraft, "battleplanes," using a combination of several types of bombs containing either high explosives, incendiaries, or poison gases. With an independent air force equipped with bomber aircraft, Douhet thought that once command of the air was gained, the air

force could attack enemy "vital centers" (Clausewitz's "center of gravity") to bring the war to a swift conclusion.

Like Douhet, Hugh Trenchard believed in the necessity of an independent air arm and the idea of the offensive use of air power. Through his efforts, an independent Royal Air Force (RAF) was established prior to the end of WWI. Trenchard also advocated attacking the entire enemy country. His memorandum after the war entitled "War Object of an Air Force" discussed the implications of bombing civilian populations. He concluded that bombing civilian populations was acceptable and legal when they were attacked in conjunction with military targets.[9] Trenchard also contributed to U.S. air power theory through his strong influence on General William "Billy" Mitchell.

Billy Mitchell has been described by different people as a crusader, a prophet, or a renegade. He was absolutely convinced of the supremacy of air power and aircraft over all other forms of waging war. He was so outspoken with his ideas that he was courtmartialed when he strongly criticized senior Army leaders who he did not feel were doing enough to encourage military aviation.

Mitchell, like the previous two theorists, strongly advocated the offensive use of air power. He is perhaps most remembered for his bombing experiments against captured German battleships, which demonstrated the destructive force of concentrated aerial bombardment. He also envisioned attacking throughout the entire country as evidenced by the list he made of a number of target types appropriate for aerial attack:

. . .enemy aerodromes, concentration centers, training camps, personnel pools, transportation centers whether rail, road, river or canal, ammunition and supply dumps, headquarters of staff commands, forts and heavily fortified positions, trains, convoys, columns of troops, bridges, dams, locks, power plants, tunnels, telephone and telegraph centers, manufacturing areas, water supplies and growing grain.[10]

These are the type targets modern day air interdiction (AI) or battlefield air interdiction (BAI) missions would be directed to attack. Mitchell foresaw using several types of aircraft attacking together, but he always remained a staunch supporter of offensive aerial bombardment.

Mitchell's influence was strongly felt at the Air Corps Tactical School which was the center of U.S. Army Air Corps doctrine and air power development between the wars. Here, bombing proponents stressed that "'strategic' bombing—aimed at a country's war-making potential rather than at its deployed armed forces—could destroy not only the *capability* of an enemy to wage war but also the enemy's *will* to fight."[11] This thinking carried into World War II (WWII) with the Allied air attacks on Germany and especially during the U.S. air attacks on Japan. The final air attacks on Japan, using atomic bombs, brought about the most significant changes to air power theory.

With atomic bombs, Air Force leaders believed they had the supreme weapon to further the concept of strategic bombardment. Air power theorists foresaw the decrease in conventional air forces in lieu of the strategic bomber. The early theorists' concept of massive strategic bombing without any realistic defense seemed much more probable. For the next two decades the dominant air power theory was nuclear deterrence provided by strategic

bombers armed with nuclear weapons.

Conventional air power declined with emphasis devoted to the Strategic Air Command. Tactical air power was relegated to the role of trying to defend the homeland from attacking strategic bombers. However, the Korean and Vietnam conflicts sharply demonstrated the need to integrate TacAir with land forces during combat operations.

Current conventional war theory considers air power necessary but not independently sufficient to successfully resolve modern warfare. "In the short history of air warfare," wrote National Defense University President Lieutenant General Bradley C. Hosmer, "no nation with superior air forces has ever lost a war to the force of enemy arms. Air superiority by itself, however, no longer guarantees victory."[12] Another military strategist, Colonel Harry S. Summers (USA, ret), wrote in a recent article for Air Force Times. "While most Army strategists (and many Air Force strategists as well) disagree with the notion that strategic air power alone can be decisive, there has never been any question that tactical air power is crucial to success on the battlefield."[13] Air forces can control terrain through firepower and prevent ground forces from occupying it, but air forces by themselves cannot hold terrain. Therefore, air and land forces together are critical elements in combat operations.

Aircraft added the third dimension to the art of warfare in the twentieth century. Some early theorists believed air power would become the dominant military force, relegating the other arms to support roles. Current theory postulates that integrating

air and ground forces is essential for success in modern combat operations. A look at recent military history will show how air and land forces have integrated closely throughout the theaters of operations.

In most recent military conflicts U.S. air forces have supported ground forces during major campaigns and operations. From WWI through present day, U.S. air forces have both directly and indirectly impacted operations on the battlefield.

One of the earliest and most useful missions for aircraft was to provide reconnaissance and observation of enemy ground forces. The aircraft could see a larger portion of the battlefield, than could an observer, and could discern enemy movement and intentions. This mission, now called tactical air reconnaissance (TAR), remains very important and has continued over the years. Subsequent combat operations have identified other missions aircraft can accomplish.

During WWII, U.S. air force support for ground forces was enormous. U.S. air forces protected friendly forces by fighting for air superiority, interdicting enemy supplies by attacking rear areas and lines of communication (LOCs), and conducting close support for ground forces in direct contact. These support requirements can be categorized into three types of missions. The first mission is counter-air, to gain air superiority. During WWII, the air superiority battle was fought through both air-to-air combat in the skies and with massive bomber raids attacking Luftwaffe airfields and aircraft production facilities. The second mission, interdiction (including battlefield area

interdiction). is best illustrated by attacks on enemy LOCs. These missions were particularly effective, especially in Normandy where Field Marshall Gerd Von Rundstedt stated:

> The main difficulties that arose for us at the time of the invasion were the systematic preparations by your air force: the smashing of the main lines of communications, particularly the railway junctions.[10]

An excellent example of close air support was XIX TAC using the armored column cover tactic in support of General George S. Patton's Third Army attack across France. General O.P. Weyland Jr. (XIX TAC commander at the time of the offensive) described the tactic:

> . . .fighter bombers, which preceded the [armor] columns,. . .would locate enemy opposition, tanks, troops, guns, or obstacles, or tank barriers. . .and in most cases [they] knocked out the opposition before the American tanks got there.[11]

Air and ground forces worked together very effectively throughout WWII. The close integration between air and land forces carried forward into succeeding U.S. military operations.

During the Korean conflict, U.S. air forces supported ground operations through many missions. Initial missions involved stopping the North Korean invasion and stabilizing the defenses around the Pusan perimeter. During the first months of the war, strategic bomber attacks with conventional munitions interdicted and slowed the flow of supplies to North Korean forces in the south. With only a limited number of enemy aircraft and very few enemy air attacks, concentrated counter-air missions were not necessary. The most effective use of air power during the Korean conflict was on close air support missions with ground forces in direct contact with enemy units.

More recently, the Vietnam War again saw U.S. air forces flying all types of missions to support ground forces. During operation "Rolling Thunder", aircraft interdicted supplies in both north and south Vietnam. The air effort attempted to cut enemy supply lines and isolate the enemy on the battlefield. While these efforts were generally not very effective, the reasons for this ineffectiveness are beyond the scope of this study. Confronted with a sophisticated enemy air defense system, especially surface to air missiles (SAM) in North Vietnam, the Air Force identified a new mission: suppression of en air defenses (SEAD) which has become part of the counter-air mission. SEAD missions using dedicated aircraft (F-105 and F-4 Wild Weasels) allowed fighter-bombers and B-52 bombers to attack targets without prohibitive losses. For CAS type missions with troops in direct contact, Colonel Harry Summers recently wrote: "...[in Vietnam] close air support by Air Force, Navy and Marine combat aircraft was remarkably effective."[16] Throughout the Vietnam War, air and ground forces were integrated into an effective combat force.

From the brief review of past air force support we have seen the necessity of integrating U.S. air and ground forces through the use of four types of TacAir missions: TAR, CA, AI, and CAS. Integration of combat forces is achieved through understanding each service's doctrine and making the doctrine as compatible (joint) as possible. Next, a brief look at how well USAF and Army ALB doctrine are integrated will provide the final background information before examining the ALB-F concept.

USAF DOCTRINE

Air Force Manual (AFM) 1-1, Basic Doctrine of the United States Air Force (equivalent to U.S. Army FM 100-1), defines basic doctrine as:

> . . .a statement of officially sanctioned beliefs and warfighting principles which describe and guide the proper use of aerospace forces in military action. . . .. Aerospace doctrine has grown from the need to establish common guidelines for military action. These guidelines are particularly important under the stress of combat."[17]

The guiding principle of USAF doctrine remains that USAF forces should be employed as an "indivisible entity based on objectives, threats, and opportunities."[18] The manual also defines three levels of doctrine: basic, operational, and tactical. The subsequent levels of doctrine are found in AFM 2- and 3- series manuals.

Modern USAF TacAir doctrine is found in TAC Manual 2-1, Tactical Air Operations (equivalent to U.S. Army FM 100-5). This doctrine "delineates the missions, functions and activities of all tactical air missions and supporting activities and shows how they interrelate in tactical air operations."[19] The manual quotes Air Force Regulation (AFR) 23-10:

> Tactical air operations involves the employment of tactical air power. . .to. . . gain and maintain air superiority. . .inhibit movement of enemy forces. . . seek out and destroy enemy forces and their supporting installations. . .[and] directly assist ground or naval forces to achieve their immediate operational objectives. . .[20]

In Chapter 4, entitled "Combat Air Operations: The Air-Land Battle"[21], TacAir missions are discussed in detail. They include the previously identified missions of 1) reconnaissance,

surveillance, and warning (present day TAR); 2) counter-air (including "defense suppression" which has evolved into SEAD by current terminology), air interdiction (including BAI), and close air support (see glossary for detailed definitions). The manual, written in 1978, shows that USAF Air-Land Battle operational concepts predate Army AirLand Battle concepts by several years. For many years USAF doctrine has officially recognized the close integration required with ground forces. Next, Army AirLand Battle doctrine is discussed in more detail.

AIRLAND BATTLE DOCTRINE

FM 100-5 is the basic U.S. Army warfighting manual. AirLand Battle (ALB) doctrine "... explains how Army forces plan and conduct campaigns, major operations, battle, and engagements in conjunction with other services and allied forces."[22] ALB doctrine takes a realistic view of the battlefield. The doctrine promotes a maneuver style of warfare in contrast to previous doctrine which emphasized an attrition style of warfare. The commander's emphasis is on the tenets of initiative, depth, agility, and synchronization.[23] In concert with the tenets of depth and synchronization, ALB doctrine views the battle as consisting of three operations: deep, close, and rear.

The most revolutionary change for the ground commander occurs in the area of deep operations. The ground commander is concerned with not only the main battle area, but he must also focus on enemy follow-on forces. He must attack second echelon forces to disrupt the momentum of the attack until his own ground forces are prepared to engage the fresher follow-on forces. Air

forces are usually more effective in attacking deeper targets whose destruction, disruption, or delay will deny the enemy the time and space to employ forces effectively. "The advent of the U.S. Army's AirLand Battle Doctrine has forced land commanders to broaden their battlefield perspective—which, in turn, has increased Army interest in the availability of tactical air (TACAIR) to support Army combat efforts."[24]

ALB doctrine recognizes that air force support is necessary to successfully conduct most military operations. Army FM 100-5, Operations, states:

> It is called AirLand Battle in recognition of the inherently three-dimensional nature of modern warfare. All ground actions above the level of the smallest engagements will be strongly affected by the supporting air operation of one or both combatants.[25]

As a minimum, land forces require protection from enemy air forces to insure their freedom of maneuver. Secondly, they require protection for lines of communication (LOCs) that sustain combat operations. Thirdly, air force attacks on enemy land forces can delay, disrupt and destroy enemy forces. "The control and use of the air will always affect operations; the effectiveness of air operations in fact can decide the outcome of campaigns and battles."[26] U.S. air forces must support land forces throughout the theater of operations. Thus, AirLand Battle has become joint operational doctrine for the U.S. Army and Air Forces. The important question now is: How do TacAir missions support Army operations conducted under ALB doctrine?

Supporting ALB doctrine requires U.S. air forces, and specifically TacAir forces, to conduct air operations within the

theater of operations as directed by the Joint Forces Commander (JFC). In a 1988 article for Defense magazine, TAC commander General Robert D. Russ stated:

> Supporting the Army is a vitally important part of the Air Force mission—whether it involves interdiction, close air support or counter air. Outside of strategic air defense, everything that tactical air does directly supports the AirLand Battle."

On the tactical level, TacAir executes four types of missions to support ALB doctrine: tactical air reconnaissance (TAR); counter air (CA); air interdiction (AI); and close air support (CAS). TAR missions provide reconnaissance and intelligence on enemy forces. Air superiority, a priority mission, must be attained through offensive action by attacking enemy air forces in depth. USAF CA operations attack enemy air forces wherever they are: at his airfields; defending his territory, or while he is operating against friendly forces. CA missions now include SEAD tasks due to the increasingly sophisticated ground defenses attempting to deny friendly use of the airspace. AI and BAI missions take the battle to the depths of the enemy's warfighting capabilities. These missions are essential to insure the enemy cannot gain overwhelming superiority anywhere on the battlefield. CAS missions are flown to augment ground forces's fires when friendly troops are in direct contact with enemy forces. CAS missions give the tactical ground commander massive firepower where he needs it most. The same four types of missions are required from TacAir under the ALB-F concept.

III. AIRLAND BATTLE-FUTURE

Victory smiles upon those who anticipate changes in the character of war, not upon those who wait to adapt themselves after the changes occur.[28]

Air Vice Marshal Giulio Douhet

"AirLand Battle-Future (ALB-F) [concept] focuses on the employment of the Army as the land component of U.S. military power in the 21st Century."[29] With the capability of today's forces for speed, mobility and lethality, the ALB-F concept envisions smaller, more destructive units on a nonlinear battlefield.

ALB-F CONCEPT

The ALB-F concept is an important evolution of AirLand Battle doctrine. This concept continues to emphasize the offensive, but is designed to avoid attrition type battles. The primary focus in the ALB-F concept is to destroy the enemy, rather than seize and hold terrain. The concept is based on the plan to successfully locate and track enemy units, attack the enemy with long range lethal fires, and follow up with combined arms forces that have massed from dispersed locations.

Future campaigns will involve considerable movement. "The commander must gain and maintain the initiative with a more agile force than the enemy can produce. The two prerequisites for such operations to be successful are: 1) the capability to know where significant enemy forces are almost all of the time and 2) the capability to destroy the enemy at long range."[30] Each combat unit will be responsible for large areas of operations (AOs). The ALB-F battlefield will see the forward line of troops (FLOT)

changing continuously. Units will be highly dispersed, and operate in physical isolation from one another. The distinction between front and rear will be blurred, requiring all-around defense and more self-sufficiency for each unit.

Combat operations will be conducted in four continuous and overlapping phases:

Phase I — Detection and Verification
Identify enemy locations and movement rates. Develop the enemy situation and acquire targets.

Phase II — Fires
Conduct massive indirect fires synchronized with air maneuver, and air force attacks (BAI) throughout the depth of the battlefield. "Precision long range fires are the major killer on the battlefield."[31]

Phase III — Maneuver
Decisive phase of the battle. Corps commander tailors forces for tactical superiority over opponent. Maneuver units destroy, exploit, and pursue designated enemy force.[32]

Phase IV — Recovery
Friendly forces disperse to supply locations brought forward by CSS elements.

TacAir will be an integral part of combat operations during each phase of the ALB-F concept, especially during the fires phase when the ground commander will largely depend on aerial firepower to disrupt and destroy enemy units.

TACAIR REQUIREMENTS FOR THE ALB-F CONCEPT

The future battlefield envisioned by the ALB-F concept may change TacAir requirements for support to ground forces. "A fluid battlefield with nonlinear operations may completely change the way air power is applied on the battlefield."[33] TacAir will need to be even more fully integrated into the battlefield than in the past. TacAir will still conduct the same missions of TAR, CA, AI,

and CAS, included in current doctrine and operations. However, the differences in the missions will blur due to the highly fluid and rapidly moving forces on the battlefield. The changes for TacAir requirements are in five areas.

First, in Phase II (Fires), the emphasis is on precision long-range fires. Near real-time intelligence and responsive weapon systems able to attack a mobile enemy will be necessary. "The problem, simply stated, is to achieve the ability to shoot immediately upon acquiring the target. The longer it takes after acquisition to shoot, the greater the probability that the target is no longer there."[34] Increased intelligence capabilities will give advanced weapon systems better opportunities to precisely attack enemy forces throughout the battlefield. Each weapon system will need exceptional capabilities to identify targets and also be able to integrate with attacks by multiple systems. Rather than solely using precision munitions such as Army tactical missile system (ATACMS) or cruise missiles to attack suspected "enemy target areas", TacAir could fly to the area with larger quantities of munitions and precisely attack specific "enemy forces" by using advanced target acquisition systems.

Second, in Phase III (Maneuver) CAS missions may be flown somewhat differently than they are presently flown. The distinction between CAS and BAI missions will become less important and less well-defined. With less identifiable friendly area of operations, aircraft can no longer afford to loiter in an area and make multiple attacks against enemy forces. CAS missions will be flown by aircraft capable of flying faster and employing

weapons that will allow the aircraft to "standoff" and launch the ordnance without directly overflying large portions of enemy forces. Future planned CAS aircraft will be capable of accurate weapons delivery using precision guided munitions or will use their advanced bombing systems to employ general purpose bombs more accurately. These aircraft and tactics will preserve future air support by increasing aircraft survivability against enemy air defenses.

Third, while attacking the target, TacAir must survive in areas with extremely dense air defenses. Threat forces have upgraded their detection and air defense capabilities significantly in the past decade. Enemy long range and mobile tactical system coverages overlap, so that not just one, but several systems can simultaneously engage aircraft over the battlefield.[35] With the multitude of advanced enemy air defense systems, TacAir must have the ability to degrade the entire spectrum of enemy air defense. "The tactic of avoiding enemy air defenses by flying below radar coverage has become less effective."[36] Aircraft will also need a high first-pass weapons delivery effectiveness to limit exposure when attacking heavily defended targets and to reduce the need to reattack the same target. This will require advanced systems and trained aircrew members to employ the systems.

Fourth, continuous operations on both sides will take place by either maneuver forces or the combat service support (CSS) assets moving supplies to sustain maneuver forces. TacAir must be available around the clock to provide defensive counter-air and to

attack targets regardless of marginal weather. Continuous TacAir combat operations under night and adverse weather is extremely stressful for the limited number of available aircrew members.

Fifth. TacAir may be employed as a maneuver force, just as ground forces are currently employed. Each fighter-bomber with conventional munitions has combat capability equal to a ground company team. An aircraft's major limitation is that it cannot remain in the same location for extended periods of time. With a large enough number of aircraft flying from a base relatively close at hand, TacAir could maintain an almost constant presence at a required position over the battlefield. The ground commander could give TacAir a mission to control a certain area just like a ground force. He could also use TacAir as the hammer in a classic "hammer and anvil" type operation. As a maneuver force, TacAir could significantly enhance combat power for the JFC.

Attack aircraft must be fully integrated into the battlefield. They have the capability to employ the full complement of weapons accurately and with sufficient quantities to achieve the required degree of effectiveness even under adverse environmental conditions. Continuous operations will stress all combat systems, making TacAir an essential element for firepower and even as a maneuver force. Flexibility in type of ordnance employed is very important to insure maximum effectiveness for every mission on the ALB-F battlefield. The nonlinear battlefield and the ALB-F concept will require highly advanced weapon systems that are extremely flexible and responsive. One such system is the F-15E "Strike Eagle".

IV. F-15E "STRIKE EAGLE"

The F-15 is so far and away the best airplane in the world you can't even call it an airplane compared to everything else.[37]

USAFE F-4 Pilot

The F-15E "Strike Eagle" is a high performance, all-weather, multi-role fighter aircraft. The aircraft is a derivative of the F-15A air superiority fighter which is currently deployed with ten tactical USAF wings. USAF plans call for producing 196 F-15Es, enough to equip two combat wings (72 assigned aircraft plus several attrition spares) and a training squadron. The only two operational F-15E fighter squadrons at this time are based with the 4th TFW at Seymour-Johnson AFB, SC. A description of the aircraft and its capabilities will highlight this outstanding aircraft.

The F-15E offers improved weapons system flexibility and avionics performance in the surface attack role without sacrificing its proven air-to-air capability. The aircraft has up to fifteen air-to-surface weapons stations, eight stations for air-to-air missiles and a maximum potential payload of over 24,500 pounds even with full internal and conformal fuel tanks (CFT). The greatest difference between the F-15E and earlier F-15 models is that it is "optimized for the strike role, with advanced avionics and a 'missionized' rear cockpit for a Weapons System Officer (WSO)."[38] It is a superb aircraft with many excellent capabilities.

The aircraft is equipped with the APG-70 high-resolution radar for use in both air-to-air and air-to-ground modes. The

radar, using a programmable signal processor, gives the F-15E the most advanced fighter aircraft radar in the world. The 4th TFW assistant deputy commander for operations, LtCol Robert L. Ruth, said "The APG-70 is the best radar in the world. If you can find a target on radar you can hit it."[39] The APG-70 gives the F-15E the capability to operate against the full spectrum of enemy threats and targets (see Figure 1). Although its primary mode is air-to-ground, the APG-70 radar can also search for airborne threat aircraft. The pilot uses the radar to acquire enemy aircraft and the radar guides the weapons to the target, allowing the F-15E to attack enemy aircraft at extended ranges with an exceptionally high probability of kill. A highly accurate 20mm internal cannon for close-in air-to-air combat is also available to use with or without the radar. For air-to-ground the APG-70 radar gives the F-15E the ability to employ a wide variety of ordnance to support ground forces.

The F-15E can effectively deliver all current air-to-surface weapons in the inventory and will be an excellent platform for any future weapons (see Figure 2). Guided bomb units (GBU), cluster bomb units (CBU), or air launched guided missile (AGM) weapons would be desirable for most missions. In contingency operations or prolonged conflicts, the limited quantities of advanced weapons could be depleted rapidly. If these type of weapons are not available, the F-15E can employ general purpose weapons very effectively with its advanced weapons delivery system. Illustrating this point is the result of the F-15E's first bombing competition, a TAC-wide Long Rifle held in June 1990. Using

several different types of ordnance. two teams flying the F-15E finished first and second among all fighter aircraft competing.[40]

The F-15E has a larger fuel capacity than most other current fighter aircraft making combat radius less of a problem. All USAF fighter aircraft are air refuelable. but tanker aircraft may not always be available to support missions or deployments. On a typical mission the aircraft can carry a 9,000 pound payload over a combat radius of approximately 750 nautical miles (nm). The F-15E can be fitted with conformal fuel tanks and/or it can carry three 610 gallon external drop tanks. When attacking targets at longer ranges, aircraft need more fuel to enable a high speed dash during the attack or for survivability against enemy defensive systems (aircraft. SAM. and AAA) while ingressing or egressing the target area at low altitude. As Figure 4 shows. the F-15E has a very good low altitude dash capability while still maintaining sufficient combat mission radius.

To improve target acquisition and enable the aircraft to use precision guided munitions. the aircraft can be equipped with the Low Altitude Navigation and Targeting Infrared system for Night (LANTIRN) navigation and targeting pods (see Figure 3). The pods link with the aircraft's on-board systems improving the aircrew's capability to navigate and fly precise routes at low altitude. The LANTIRN system increases the capability for the aircraft to fly night. low-level,"under the weather" missions that require attacks with pinpoint accuracy .

For self-defense the F-15E can employ air-to-air missiles against enemy aircraft. electronic countermeasures (ECM) equipment

against enemy electronic systems (SAM and enemy fighter aircraft radars), and chaff or flares to decoy enemy missiles or radar systems. The aircraft can employ all three types of air-to-air missiles (AIM-7, AIM-9, and AIM-120) in the current inventory. These missiles enable the aircrew to attack aircraft from short range (less than 1,000 meters) to medium range (more than 50 kilometers). ECM equipment is all mounted internally giving 360 degree coverage around the aircraft. Chaff and flares can decoy enemy defense systems by simulating the aircraft's radar and heat signatures, thereby confusing the enemy weapons' acquisition or guidance systems.

An additional potential capability (not operationally tested) would allow the F-15E to employ anti-radiation (ARM) or high-speed anti-radiation (HARM) missiles, enabling it to accomplish SEAD for its own mission or in support of other aviation missions. The aircraft could be modified to fly as a dedicated SEAD aircraft by adding threat radar receivers and associated computers to identify, acquire, and destroy enemy surface-to-air radars (like the F-4G Wild Weasel aircraft).

The F-15E is an outstanding weapon system. The aircraft retains exceptional maneuverability even though the additional external load (e.g., CFT, LANTIRN) increases weight and induced drag, which subsequently reduces performance in some areas. Next, Section V compares two current fighter aircraft with the F-15E.

V. FIGHTER AIRCRAFT COMPARISON

There are only two types of aircraft: Fighters and Targets!

USAF Fighter Pilot

The Air Force has recognized that specialized aircraft can perform specific tasks better than an aircraft designed to fly every type of mission possible. TacAir blends the capabilities of different aircraft by *packaging*, which means combining attack, fighter-escort and electronic warfare aircraft on each mission flown (depending on target area and expected enemy defenses). However, TacAir maintains flexibility with different types of fighter aircraft because losing a large percentage of one type of specialized aircraft would severely limit the ability of the remaining aircraft to accomplish required missions. As Richard Hallion points out in his book, *Strike From the Sky*, "The swing-role [multi-role] fighter-bomber has always performed more satisfactorily in the CAS/BAI role than the special purpose attack plane. Fighters have a natural dual-role air-to-air and air-to ground nature. . . ."[41] We will now turn to an analysis of three USAF fighter-bomber aircraft.

In the current USAF inventory, three different aircraft, the F-111, the F-16, and the A-10, are providing TacAir support for U.S. Army operations. The A-10s, previously dedicated CAS aircraft, are converting to the OA-10 and will be used primarily as FAC aircraft. After a brief description of the two remaining aircraft, an analytical comparison of the aircraft with the F-15E will highlight those capabilities necessary to fulfill TacAir requirements under ALB-F concept. First, a look at the F-111F.

F-111F "AARDVARK"

The F-111F is the most advanced model of the F-111 attack aircraft. Since entering the inventory in the late 1960s, it has been used primarily as an all-weather deep interdiction aircraft. On a typical mission the aircraft can fly a combat radius of approximately 800 nm while carrying 8,000 pounds of any type of air-to-surface ordnance including both general purpose or precision guided munitions. The aircraft's key feature is its capability to fly at very high speeds (in excess of 800 mph) while staying at very low altitude (below 200 feet) by using its on-board terrain following radar (TFR).

As a deep interdiction aircraft it has very good capabilities to locate targets with its onboard inertial navigation system (INS) and accurately attack the targets using its on-board radar bombing system or a Pave Tack laser designator for precision guided munitions.[42] The F-111F flying from Upper Heyford AB, England was the primary USAF attack aircraft on the raid into Tripoli, Libya in April 1986. The Libyan attack was very successful with most bombs impacting on target while only one aircraft was lost, possibly due to an enemy SAM.[43]

The F-111F aircraft has three systems for self-defense. For threat electronic systems (SAM and enemy fighter aircraft radars), the aircraft can carry an external pod with ECM equipment. Secondly, the aircraft carries a dispenser for chaff and flares that can be dropped to decoy enemy weapon systems. Thirdly, the aircraft has a limited capability to employ AIM-9 (infrared guided) air-to-air missiles against enemy aircraft. These systems

give the aircraft a good self-defense capability. Next, a brief description of the F-16C "Fighting Falcon."

F-16C "FIGHTING FALCON"

The F-16C is a dual-role aircraft with exceptional maneuvering capabilities. Its "fly-by-wire" (all electronic: no mechanical linkage) flight control system and high thrust-to-weight ratio makes the aircraft extremely maneuverable throughout most of its flight envelope.

The F-16C is an extremely accurate bombing aircraft capable of employing advanced munitions as well as all air-to-surface weapons in the current USAF inventory. On a typical mission the aircraft can carry a 4,000 pound payload over a combat radius of approximately 400 nm. The aircraft can also employ the LANTIRN system for increased target acquisition capability and precision weapons delivery. Even without the LANTIRN system, the F-16C is so accurate that in a typical F-16 wing the pilots have an overall circular error average (CEA) of approximately 16 meters for all types of weapons using a variety of attack profiles.[44]

The highly maneuverable F-16C has excellent self-defense capabilities. The pilot can engage enemy aircraft with the AIM-9 air-to-air missile or with an internally mounted 20mm cannon. More recently manufactured F-16Cs can also employ the AIM-120 radar guided missile. The aircraft can carry an ECM pod on the centerline stores station. Like the other aircraft, the F-16C has chaff and flare dispensers to decoy enemy missiles or radar systems. Based upon recent tests, the F-16 can also employ HARM missiles to attack and suppress enemy air defense radars. After

describing the two current fighter aircraft's capabilities, a comparison with the F-15E is in order.

ANALYTICAL COMPARISON

The comparison of the three aircraft will look at the factors of range, weapons payload, capability to effectively locate and attack targets, and self-defense capabilities. These factors demonstrate the aircraft's ability to perform missions in support of ground forces operating under the AIB-F concept. Figure 5 is a synopsis of the comparison of the three aircraft capabilities.

Aircraft range is a tradeoff between fuel capacity, weapons payload, and attack profile (altitude, speed, and type of attack). The three aircraft can all mount external fuel tanks to increase fuel capacity, but this directly reduces the amount of ordnance carried. The F-111F has the longest unrefueled combat radius of the three aircraft due to its large internal fuel capacity. All three aircraft can carry any variety of air-to-surface ordnance depending on the particular target. Seldom will any of the aircraft carry the maximum payload on a combat mission due to the reduced range and significantly reduced maneuverability. For a typical mission the F-15E can carry the largest payload, 9,000 pounds of ordnance, while its combat radius is only marginally less than the F-111F.

The attack profile is very important for combat range and weapons effectiveness. Flying at cruise speed, medium altitude, directly over the target would facilitate the longest range and highest probability of target destruction. However, with this

type of attack, enemy defenses would most likely inflict unacceptable losses on the attackers. Therefore, while over enemy controlled territory, most fighter-bomber attack profiles use a combination of high speed and low altitude until just prior to the target. Once in the vicinity of the target, the aircraft "pops up" at a predetermined point to acquire the target and release the ordnance. Precision guided munitions and advanced aircraft bombing systems do not require the aircraft to directly overfly the target, but allow launching the ordnance from a "standoff" position. This type of attack profile still gives a high probability of accurately striking the target, while increasing the aircraft's chances of successfully egressing the target area.

All three aircraft are capable of accurate weapons delivery against targets both at night or under adverse weather conditions. Attacking point targets with precision munitions is possible as demonstrated by the F-111F night attack on Tripoli airport in Libya. The LANTIRN system gives both the F-16C and F-15E an exceptional capability for accurately attacking point targets. With the rear cockpit WSO, the F-15E has an extra aircrew member dedicated to using both the LANTIRN system and the radar for the most accurate weapons delivery.

All three aircraft have multiple self-defense capabilities. Each can use chaff and flares as decoys against enemy weapon systems. The aircraft can all be equipped with ECM equipment to interfere with enemy air defense systems' electronics. An important point to again note is that the F-15E is the only aircraft with internally mounted ECM equipment. This is an

advantage because without the external ECM pod the F-15E can either carry more ordnance or fly a longer distance.

All three aircraft can employ air-to-air missiles for self-defense against enemy aircraft. The F-15E can employ every current type of missile while the other two are limited to one (F-111F) or two (F-16C) types of missiles. This is a significant advantage because with radar missiles, an aircraft can attack enemy interceptors at distances beyond visual range (BVR). Shooting BVR means you do not visually identify the aircraft before attacking, which allows longer range engagements and requires less aircraft maneuvering.

An additional self-defense capability is possible by employing HARM missiles for SEAD allowing the aircraft to destroy surface air defense radar systems that are protecting enemy forces. The F-16C has already completed testing with the HARM and has a limited operational capability. There are no plans to employ HARM on the F-111F. The F-15E could possibly employ the HARM and remains a strong candidate for the manned destructive SEAD (MDS) program which will select a follow-on aircraft for the F-4G Wild Weasel.[45]

All three aircraft have excellent capabilities to perform TacAir missions in support of ground forces. The F-111F, with its larger combat radius combined with its high speed, low altitude flight capability, will continue flying AI and longer range BAI missions. The F-16C will fly BAI and CAS missions because its combat radius, smaller payload, and better maneuverability make it more suited for missions more directly supporting ground forces.

The F-15E has the best overall capabilities with the following as its major advantages: two aircrew members to share the workload; excellent combat radius with the largest payload; most advanced APG-70 radar; ability to precisely acquire and attack targets even at night and in adverse weather; ECM equipment carried internally; the only aircraft that can employ all three air-to-air missiles; and, in all likelihood, the F-15E will be able to employ HARM missiles for SEAD. While the other two aircraft have considerable capabilities, the F-15E has the edge in overall weapon system capabilities. The next section discusses the best uses of the F-15E capabilities under the ALB-F concept.

VI. BEST USES OF THE F-15E UNDER THE ALB-F CONCEPT

The speed, range, and flexibility of aerospace forces allow commanders to move quickly from one course of action to another and to influence military operations with extensive, fundamental combat capabilities.

AFM 1-1

The fluid, nonlinear operations envisioned by the ALB-F concept will require highly flexible and responsive air support integrated closely with ground forces. The Air Force currently gains flexibility, but loses responsiveness by *packaging* forces to attack targets. The flexibility comes by using several different types of aircraft to accomplish specific mission tasks. The loss in responsiveness happens when different types of aircraft have to coordinate specific roles and actions in order to accomplish the mission. With the F-15E, the Air Force has an aircraft capable of almost autonomous operations; much like Douhet envisioned his "battleplanes". Advanced systems give the F-15E exceptional flexibility and responsiveness, enabling it to accomplish the variety of missions required under the ALB-F concept.

In Section V, the comparison of fighter aircraft shows that the F-15E overcomes several limitations of the F-111F and F-16C aircraft. The F-111F is very good at performing AI deep strike missions, but lacks advanced self-defense capabilities to defeat the many air defenses concentrated around enemy ground forces. The F-16C is highly maneuverable for dual air-to-air and air-to-ground roles, but does not have the range or payload capacity to deliver large quantities of ordnance throughout the battlefield. The multi-role F-15E has the flexibility to fly more types of

missions due to its excellent combat radius, larger payload capacity and precise weapons delivery capability while it also has the best overall self-defense capabilities.

In determining the best use of the F-15E under the ALB-F concept these four criteria were considered most important:

1) responses to changes in TacAir requirements under the ALB-F concept identified by this study.

2) realizing the greatest benefit from F-15E multi-role capabilities while on the same mission. By carrying different types of ordnance the aircraft can perform several functions while on a single mission.

3) optimal employment of advanced F-15E systems. The APG-70 radar, LANTIRN, and a dedicated aircrew member in the "missionized" rear cockpit allow the aircraft to perform each TacAir mission.

4) minimizing risk level in the target area. By only using several multi-role aircraft on a mission, the F-15E can attack heavily defended targets with a good probability of destroying the target while increasing aircraft survival rates; instead of using traditional aircraft strike packages against the same target.

In Section III, this study identified five changes in TacAir requirements under the ALB-F concept. First, there will be increased emphasis in using TacAir as aerial firepower during the fires phase. This calls for aircraft that can precisely attack targets with large quantities of ordnance throughout the entire theater, day or night. Second, during the maneuver phase, CAS missions may be conducted much differently than on the current battlefield. This will require an aircraft with excellent range and low altitude dash capability. Third, the increasingly lethal enemy integrated air defense system requires an aircraft that has self-defense capabilities against all types of enemy air defenses. Fourth, the prospect of continuous operations, especially at night

and under adverse weather conditions, will affect aircrews by increasing workload and mission stresses. Continuous operations will also affect aircraft by requiring high sortie rates with less time available for maintenance. Fifth, and last, TacAir will be used as an additional maneuver force. This will require a visionary JFC who thoroughly understands both TacAir and the integration of air and land forces. These changes will require highly flexible aircraft in order to fully integrate air support under the ALB-F concept.

The F-15E has excellent multi-role capabilities on any assigned mission. This is especially apparent during the counter-air mission. First, using the APG-70 radar, the aircrew can detect and engage airborne enemy aircraft with air-to-air missiles or its internal 20mm cannon. This will keep enemy aircraft from attacking ground units or friendly strike aircraft. For the second part of the counter-air mission, the F-15E can directly attack enemy airfields to destroy aircraft or ground support facilities, thereby reducing enemy air power. As an important part of the CA mission, the F-15E can also perform SEAD by using the HARM missile for its own self-protection. Once the counter-air campaign has succeeded in gaining air superiority, or at least air parity, the F-15E could then concentrate on performing other missions.

In addition to providing self-protection against enemy surface threat radars by using HARM missiles, the F-15E could be used as a dedicated SEAD aircraft. Along with HARM, the aircraft could attack enemy air defense systems with other air-to-surface

weapons. Another important point Richard Hallion discusses in *Strike from the Sky* concerns enemy defenses:

> The ground-to-air threat environment has always posed a serious challenge to battlefield air operations, and has now reached a stage where ground defenders have been able, as in Afghanistan, to occasionally inflict "air denial" upon battlefield attackers.[45]

On the dedicated SEAD mission, the F-15E could reduce the risk from enemy air defenses for other aircraft conducting missions in the area of operations (AO).

Several advanced aircraft systems give the F-15E the capability to attack any type of target with exceptional weapons effectiveness. The APG-70 radar and the LANTIRN system give the F-15E the capability to locate, acquire, and destroy all but the most heavily protected or concealed targets on the battlefield. The LANTIRN system coupled with the extensive combat range and large payload capacity still make the F-15E likely to perform AI missions. However, in the highly fluid and mobile battlefield of the ALB-F concept, attacking AI targets may not impact the battlefield as substantially or as quickly as on previous battlefields. "'Classic' (e.g., non-BAI) air interdiction has proven disappointing, and of questionable value in its impact on battlefield operations,. . . as a rule, *air interdiction works best only when it is synchronized with ground maneuver warfare*."[46] BAI targets have more immediate effect on the main battle area and, from the ground commanders view, will be more critical to successful attacks.

Under the ALB-F concept, friendly units well forward could require additional fire support assets. To support these units,

the F-15E could even perform CAS missions. F-15Es on airborne or ground strip alert could be brought in to attack targets using its highly accurate weapon systems. These CAS missions could provide additional fire support needed by friendly units to successfully conduct their missions.

The F-15E could also be extremely useful in performing TAR missions in support of the entire theater operation. By providing detailed aircrew reports, LANTIRN images, and gathering enemy electronic order of battle, the F-15E could contribute valuable intelligence on enemy forces and their movements.

The F-15E can accomplish all four types of TacAir missions. However, to make the best use of a highly capable, but limited number of F-15E aircraft, the air component commander (ACC) should have an overall mission priority for the F-15E. This prioritized list would be general in nature and cannot attempt to include all of the factors pertaining to each specific set of conditions on the battlefield. The ACC must consider a myriad of factors when he determines actual missions for all of the forces under his command. With this limitation in mind, the following discussion gives a rationale for employing the F-15E under the ALB-F concept. Mission priorities for the F-15E:

> #1 - For counter-air missions the F-15E should strike enemy air forces not effectively destroyed by other friendly aircraft. Using the F-15E on CA missions first will gain freedom of maneuver for both air and ground forces. Once the CA campaign has gained at least local superiority, then the F-15E can be used in direct support of ground forces.
>
> #2 - Attack BAI targets when ground forces need additional fire support effects on the battlefield. Ground maneuver commanders will depend on air force precision fires to attack throughout the depth of the battlefield. Attacking BAI targets with F-15Es will disrupt the enemy's plan and

deep strike operations throughout the battlefield. Flying the missions in the F-15E is easier than in other aircraft because the workload is shared by the two aircrew members. Continuous operations will be possible with less degradation in effectiveness. Finally, the F-15E is an aircraft that has the flexibility, firepower, and radius to act as a maneuver force and assist the JFC by controlling terrain for extended periods, thereby providing more than just additional aerial firepower. Under the ALB-F concept, the F-15E can use its multi-role capabilities to support operations throughout the entire theater. The F-15E has the flexibility to strike targets across the depth and breadth of the battlefield.

This study has looked at several elements to determine the best uses of the F-15E under the ALB-F concept. Air power theory and historical insights have shown that close integration between air and ground forces is necessary to be successful on the modern battlefield. While the ALB-F concept will require some changes for air force support, overall requirements and missions will remain the same. The multi-role F-15E can accomplish all four TacAir missions to support ground forces under the ALB-F concept. With the fluid nonlinear battlefield envisioned by the ALB-F concept, all U.S. armed forces will have to be closely integrated to insure successful combat operations. The F-15E gives the JFC a flexible weapon system whose responsiveness will significantly increase the ability of U.S. armed forces to successfully engage and destroy the enemy under the ALB-F concept.

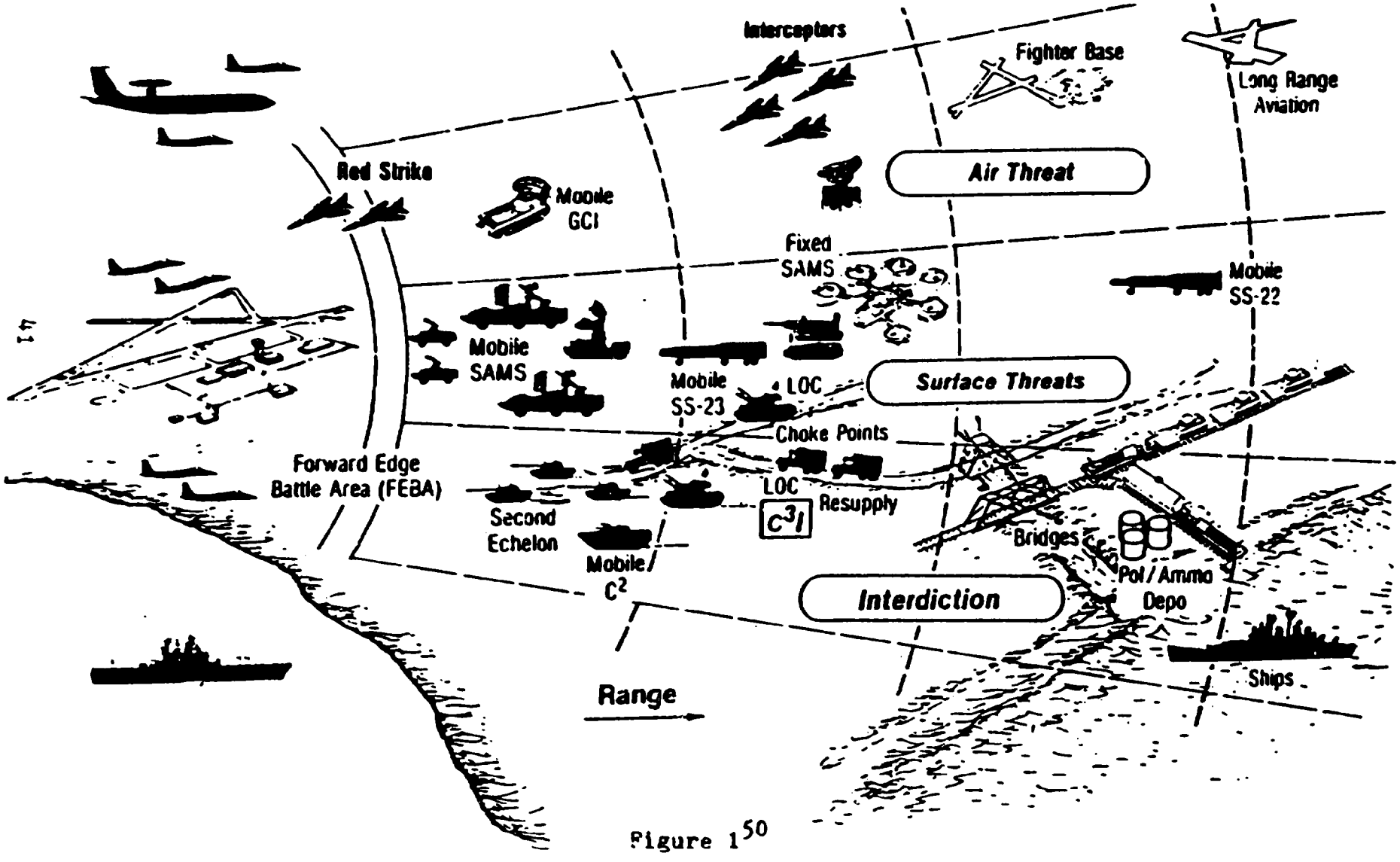

Interceptors
Fighter Base
Long Range Aviation
Red Strike
Mobile GCI
Air Threat
Fixed SAMS
Mobile SS-22
Mobile SAMS
Mobile SS-23
LOC
Surface Threats
Choke Points
Forward Edge Battle Area (FEBA)
LOC
Resupply
C3I
Second Echelon
Mobile C2
Bridges
POL / Ammo Depo
Interdiction
Ships
Range

Figure 1[50]

Weapons and Missions

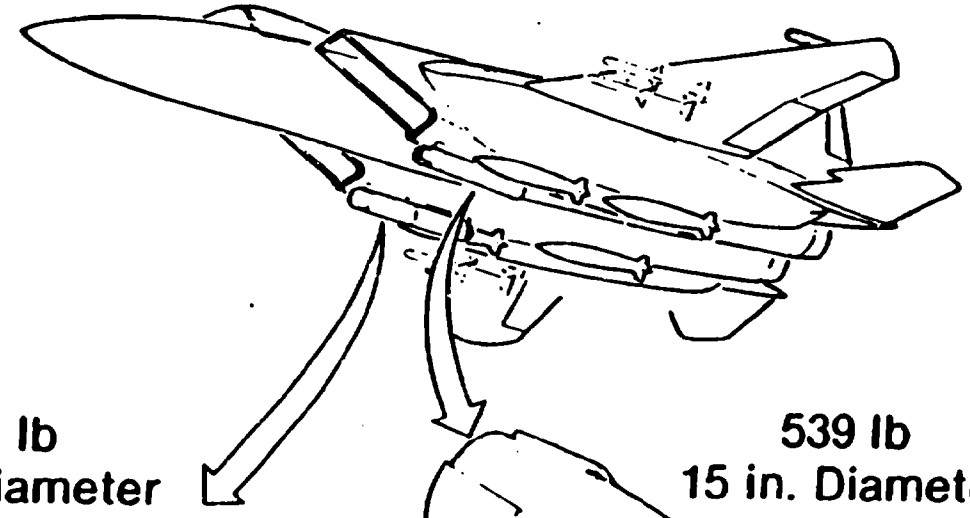
Mission	Interdiction	Battlefield Interdiction	Offensive Counter Air
Inventory Weapons	AIM-7, AIM-9 20 mm Gun MK-82, -83, -84 GBU-8/10/12 AGM-84 Harpoon* GBU-15	AIM-7, AIM-9 20 mm Gun MK-20 AGM-65 CBU-52/-58/-71	AIM-7, AIM-9 MK-82, -83, -84 Durandal (BLU-107/B)
Advanced Weapons	GBU-22 AGM-130* Sidearm (SPW)* AGM-88 HARM* AIM-120 (AMRAAM)	CBU-87/CBU-89 AGM-130* AGM-88 HARM* Sidearm (SPW)* AIM-120 (AMRAAM)	GBU-22 CBU-89 (Gator) AGM-130* AGM-88 HARM* Sidearm (SPW)* AIM-120 (AMRAAM)

* Potential

Figure 2[51]

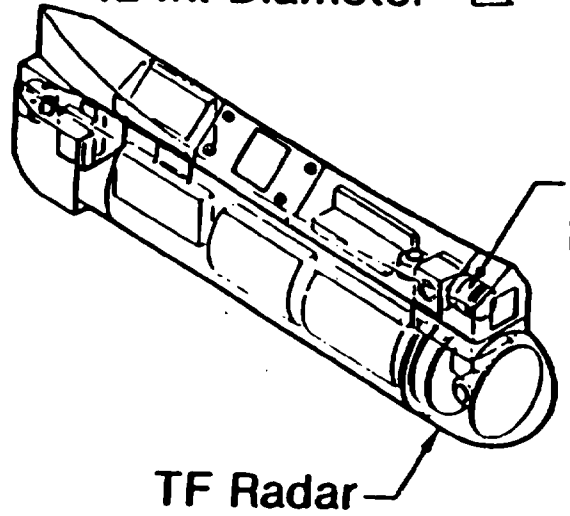
LANTIRN

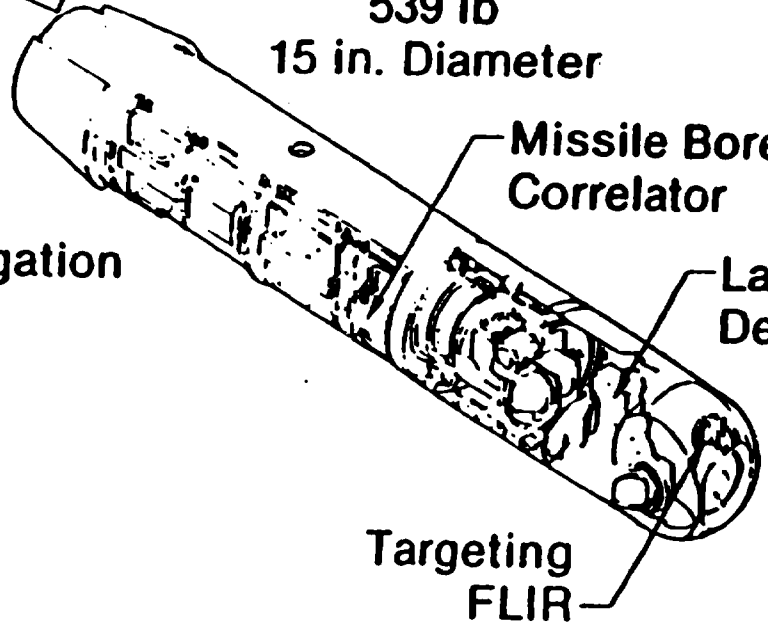
Low Altitude Navigation and Targeting Infrared System for Night



433 lb
12 in. Diameter

539 lb
15 in. Diameter



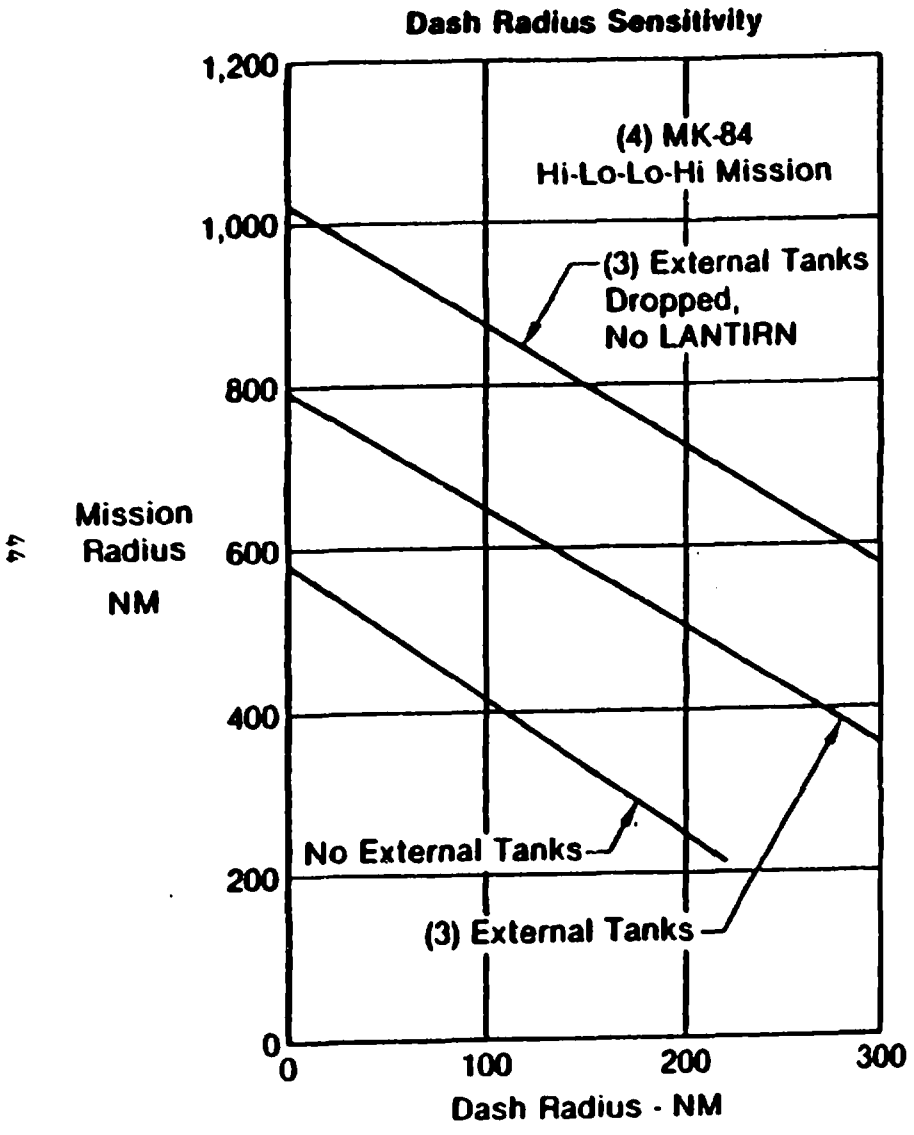


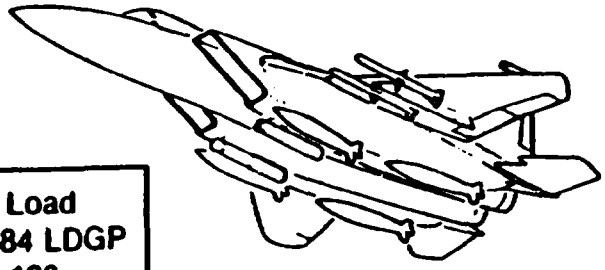
LANTIRN Navigation Pod

LANTIRN Targeting Pod

Figure 3[52]

Air-to-Surface Capability - MK-84 Payloads





Standard Load
(4) MK-84 LDGP
(4) AIM-120
LANTIRN Pods

Figure 4[53]

AIRCRAFT CAPABILITIES COMPARISON

CHARACTERISTIC	F-111F	F-16C	F-15E
CREWMEMBERS	2	1	2
RADIUS[1]	800 nm	450 nm	750nm
PAYLOAD[2]	8.000 lb	4.000 lb	9.000lb
TARGET ACQUISITION/ATTACK	RADAR OR PAVE TACK[3]	RADAR OR LANTIRN	RADAR OR LANTIRN
TERRAIN FOLLOWING RADAR	YES	LANTIRN REQUIRED	LANTIRN REQUIRED
ECM	EXTERNAL POD	EXTERNAL POD	INTERNAL
AIR-TO-AIR MISSILES	INFRARED ONLY[4]	INFRARED ONLY[4]	ALL TYPES
INTERNAL 20 MM GUN	NO	YES	YES
HARM	NO	YES[6]	POSSIBLE[7]

FIGURE 5[54]

NOTES:

1 Radius without aerial refueling. Aircraft carries standard combat load on a high - low - low - high flight profile, 100 nautical mile (nm) low aititude segment.
2 Payload includes air-to-air missiles, ECM and/or LANTIRN pods, and nominal bomb load. All three aircraft are capable of accurate attacks with general purpose or precision guided munitions.
3 Pave Tack is a laser designator used with precision guided munitions (GBUs).
4 No off-boresight capability, limited aircrew training in employment, and limited missile availability.
5 Block 30 (manufactured after 1984) and later aircraft capable of employing radar (AIM-120) air-to-air missiles.
6 HARM can be employed by F-16C, but is not part of the standard combat load on most missions.
7 HARM missile testing with the F-15E has not been reported. The weapon could be carried without modification.

Airland Battle Planning Lines

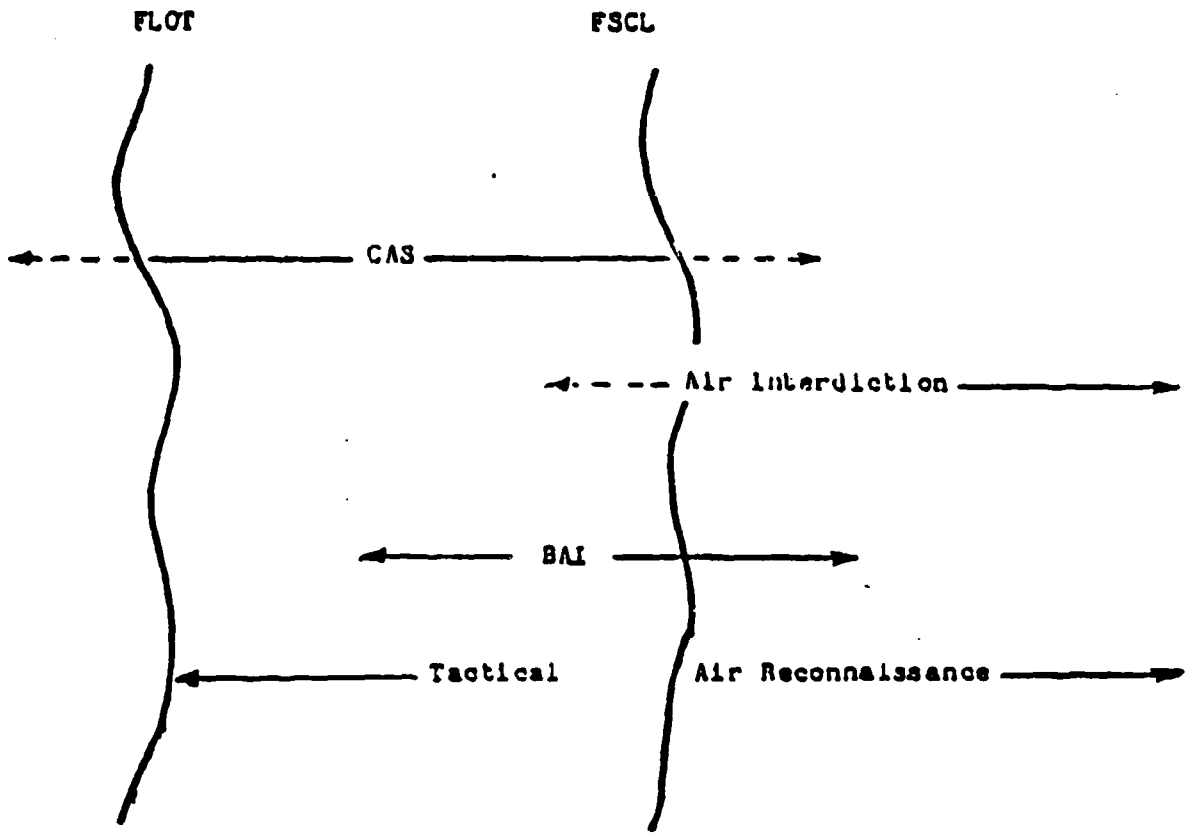


FIGURE 6-5

Note: Tactical air support missions presented above depict the interrelationship of each mission. Placement of these missions is "target dependent."

GLOSSARY

The following definitions are from AFM 1-1:[56]

Counter Air (CA) - Objectives are to gain control of the aerospace environment. The ultimate goal of counter air is air supremacy. Three specific mission types are:

Offensive Counter Air (OCA) - Aerospace operations conducted to seek out and neutralize or destroy enemy aerospace forces at a time and place of our choosing.

Defensive Counter Air (DCA) - Aerospace operations conducted to detect, identify, intercept, and destroy enemy aerospace forces that are attempting to attack friendly forces or penetrate friendly airspace.

Suppression of Enemy Air Defense (SEAD) - Aerospace operations which neutralize, destroy, or temporarily degrade enemy air defensive systems in a specific area by physical and/or electronic attack.

Air Interdiction (AI) - Objectives are to delay, disrupt, divert, or destroy an enemy's military potential before it can be brought to bear effectively against friendly forces. Air interdiction attacks are normally executed by an air commander as part of a systematic and persistent campaign.

Battlefield Air Interdiction (BAI) - Air interdiction attacks against targets which are in a position to have a near term effect on friendly land forces. BAI requires joint coordination at the component level during planning, but is controlled and executed by the air commander as an integral part of a total air interdiction campaign.

Close Air Support (CAS) - Air support against hostile targets in close proximity to friendly surface forces and requires detailed integration of each air mission with the fire and movement of those forces. CAS enhances surface force operations by providing the capability to deliver a wide range of weapons and massed firepower at decisive points.

Tactical Air Reconnaissance (TAR) - The collection of information of intelligence interest by observation from the air or through the use of airborne sensors.

(See Figure 6 for a depiction of missions in relation to the present day battlefield planning lines.)

Tactical Air Command (TAC) - The major command responsible for training, equipping, and employing CONUS based USAF forces in tactical combat operations.[57]

Dual capable - As used in NATO, an aircraft that can employ either conventional or nuclear weapons.[58]

LANTIRN - low altitude navigation and targeting infrared system for night—A system comprised of two avionics pods attached to an aircraft that will allow: 1) forward looking infrared displays in the cockpit for improved target acquisition at night and in adverse weather: 2) terrain following radar (TFR) for low altitude flight; and 3) the ability to self-designate targets for laser guided munitions.[59] (see Figure 3)

HARM - high speed anti-radiation missile (AGM-88) An air-to-surface missile that is used to destroy threat air defense radars.

Aircraft Weapon types -
- *AIM* - air intercept missile (e.g.. AIM-7)
- *AGM* - air launched guided missile (e.g.. AGM-65)
- *CBU* - cluster bomb unit (e.g., CBU-52)
- *GBU* - guided bomb unit (e.g.. GBU-15)

ACRONYMS

AAA - anti-aircraft artillery
ACC - air component commander
AFM - Air Force manual
AFR - Air Force regulation
AO - area of operation
BVR - beyond visual range
CEA - circular error average
CSS - combat service support
ECM - electronic countermeasures
FAC - forward air controller
FLOT - forward line of own troops
INS - inertial navigation system
JFC - joint force commander
LOC - line of communications
MDS - manned destructive SEAD program
SAM - surface to air missile
TFR - terrain following radar
TFW - tactical fighter wing
WSO - weapon system officer

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Note: The Air Force Systems Command F-15 Program Office at Wright Patterson denied my request for access to F-15E studies completed by either the Air Force F-15 system program office or by McDonnell Douglas Corporation (F-15 prime contractor). My ability to conduct primary research was therefore significantly constrained.