UNITED STATES AIR FORCE F-16 JOINT SUPPRESSION OF ENEMY AIR DEFENSE TRAINING: A MODEL FOR OPERATIONAL FAILURE

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ABSTRACT

AIR FORCE F-16 JOINT SUPPRESSION OF ENEMY AIR DEFENSES TRAINING: A MODEL FOR OPERATIONAL FAILURE by MAJ Jon A. Norman, USAF, 120 pages.

This thesis investigates the question: How should the U.S. Air Force (USAF) modify F-16 Suppression of Enemy Air Defense (SEAD) training to ensure pilots have the operational flying experience and proficiency required to conduct effective Joint Suppression of Enemy Air Defenses (J-SEAD) operations in combat? USAF F-16 SEAD pilots are not receiving the quantity and quality of training required to conduct effective J-SEAD operations in combat. USAF F-16 SEAD pilots must be trained for J-SEAD to prevent operational failure in combat.

The thesis analyzes and evaluates joint training requirements, programs, and combat employment cases to identify USAF J-SEAD training shortfalls. The current and planned trend for joint training is to replace high-cost, live training exercises with simulation-based exercises to reduce cost. This trend has significantly impacted operational readiness and has prevented effective J-SEAD training for USAF F-16 SEAD pilots.

J-SEAD must be identified as a mission essential task for the USAF. Pilots cannot afford to wait until combat to develop effective J-SEAD joint tactics, techniques, and procedures. Simulation training should be used to enhance flying training not replace it. The addition of J-SEAD objectives and forces to exercises can be accomplished by simply training smarter.

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LIST OF ABBREVIATIONS

AAA	antiaircraft artillery
AAR	after action review
ABCCC	airborne command control and communications
ACC	Air Combat Command
ACC/DO	Air Combat Command, Director of Operations
ACMI	air combat maneuver instrumentation
ACOM	Atlantic Command
AFDC	Air Force Doctrine Center
AFMET	Air Force mission essential task
AI	air interdiction
AJECT	Air Combat Command joint exercise coordination team
AMETL	agency mission essential task list
AOC	air operations center
AOR	area of responsibility
AQ	acquisition
ARM	anti-radiation missile
ASCIET	all-service combat identification evaluation and test
ATO	air tasking order
AWACS	airborne warning and control system
BCD	battlefield coordination detachment
C2	command and control
C4	command, control, communications, computers
CAS	close air support
CINC	commander in chief

CLF	commander, landing forces
CMTC	combat maneuver training center
CONUS	continental U.S.
CT	continuation training
DEAD	destruction of enemy air defenses
DOD	Department of Defense
EC	electronic combat
ECCM	electronic counter-countermeasures
ECM	electronic countermeasures
ELINT	electronic intelligence
EMCON	emission control
EW	electronic warfare or early warning
FSCC	fire support coordination center
FTX	field training exercise
FY	fiscal year
G	gravitational load factor
GBU	guided bomb unit
GCI	ground-controlled intercept
GP	general purpose
GPS	global positioning system
HARM	high-speed antiradiation missile
HTS	HARM targeting system
IADS	integrated air defense system
ID	identify/identification
IDM	improved data modem

IO	information operations
IR	infrared
ISR	intelligence surveillance and reconnaissance
J3	commander of operations
JAAT	joint air attack team
JCS	joint chiefs of staff
JDAM	joint direct attack munition
JFACC	joint force air component commander
JFC	joint force commander
JFEX	joint task force exercise
JFLCC	joint force land component commander
JID	joint integration directorate
JMET	joint mission essential task
JMETL	joint mission essential task list
JOA	joint operating area
JRTC	joint readiness training center
JSCP	joint strategic capabilities plan
J-SEAD	joint suppression of enemy air defenses
JSIMS	joint simulator system
JSOW	joint standoff weapon
JTF	joint task force
JTMS	joint training master schedule
JTP	joint training plan
JTS	joint training system
JTTP	joint tactics techniques and procedures

JWC	joint warfighting center
JWCA	joint warfighting capability assessment
LGB	laser-guided bomb
LO	low observable
MAGTAF	Marine air-ground task force
MAP	mission area plan
METL	mission essential task list
MTTP	multiservice tactics, techniques and procedures
NTC	national training center
OCA	offensive counter air
OCONUS	outside of the continental U.S.
O&M	operations and maintenance
OP	operational
OPCON	operational control
OPLAN	operations plan
OPSTEMPO	operations tempo
OSD	Office of the Secretary of Defense
RAP	rated aircrew program
RFMDS	Red Flag Measurement and Debriefing System
ROE	rules of engagement
RWR	radar warning receiver
SA	surface to air
SAM	surface-to-air missile/situational awareness mode
SEAD	Suppression of Enemy Air Defenses
SF	special forces

SIGINT	signals intelligence
SOF	special operation force
TACMEMO	tactical memorandum
TD&E	tactics development and evaluation
TTP	tactic technique and/or procedure
UJTL	universal joint task list
USAF	United States Air Force
UTTR	Utah Test and Tactics Range
VTC	video teleconference

CHAPTER 1

INTRODUCTION

Background

The purpose of this thesis is to refine the United States Air Force (USAF) suppression of enemy air defenses (SEAD) training program to ensure USAF F-16 SEAD pilots are sufficiently trained to conduct effective joint suppression of enemy air defenses (J-SEAD) operations in combat. The measures of effectiveness for the USAF SEAD training program assess the frequency, realism, and joint missions supported by current USAF J-SEAD training initiatives. The analysis concludes by recommending an effective J-SEAD training program for Air Force F-16 SEAD pilots. The improved training program is specifically designed to improve USAF F-16 J-SEAD operations in combat. To examine effectiveness and make recommendations for improvement, the thesis separates the J-SEAD training process into three basic segments for analysis: planning, coordination, flying training, and debriefing.

USAF F-16 SEAD pilots fly the Lockheed F-16 Block 50/52 aircraft equipped with a high-airspeed antiradiation missile (HARM) targeting system (HTS) pod and with an improved data modem (IDM) data link. USAF F16 SEAD pilots are not receiving the quality or quantity of J-SEAD training they require to operate effectively as part of a joint team in combat. This thesis exposes combatant commanders and USAF leadership to J-SEAD pilot training shortfalls. Combatant commanders have operational control (OPCON) of J-SEAD forces allocated to them. OPCON provides the authority to "conduct joint training and joint training exercises required to achieve effective employment of the forces of the command, . . . and establish training policies for joint operations required to accomplish the mission."[1] USAF F-16 SEAD pilots should not expect to have the luxury of six months of prewar training in theater as they did prior to the start of the Gulf War. Future adversaries will not allow U.S. forces to prepare in theater if they have

learned any lessons from the Iraqi mistakes prior to the Gulf War. Combatant commanders need USAF F-16 SEAD pilots to be combat ready when they arrive in theater. Combat is not the time or place for J-SEAD on-the-job training.

This thesis substantiates the need to develop an effective USAF J-SEAD training program and concludes by recommending a comprehensive J-SEAD training program to ensure USAF pilots are adequately trained for combat. The recommended USAF J-SEAD training program emphasizes effective joint coordination, planning, flying tactics weapons system employment against a realistic threat array, and J-SEAD package debriefings. The package debrief is an essential element of any effective training program. Package debriefs are sometimes referred to as after action reviews (AARs). The lessons learned during the J-SEAD debriefs are essential to the development of effective operational joint tactics, techniques, and procedures (JTTPs). The lessons learned should drive changes in doctrine as the J-SEAD forces determine successful force mixes and joint employment tactics. Additionally, lessons learned highlight future weapons system limitations, which lead to an improved requirement process.

The thesis documents USAF J-SEAD pilot training deficiencies that prevent USAF F-16 pilots from conducting operations efficiently with other J-SEAD weapon systems. The thesis focuses on USAF J-SEAD training at component command level and above-directed training exercises. USAF J-SEAD training in these exercises needs to focus on three core operational J-SEAD competencies to be considered effective. Successful J-SEAD training should improve J-SEAD premission coordination-planning, coordinated J-SEAD operational employment, and effective J-SEAD mission debriefings (AARs).

J-SEAD Training Elements

Operational J-SEAD training is essential to successful joint force employment. USAF pilots must understand the limitations and capabilities of assets supporting and employing with

them in J-SEAD operations. Operational J-SEAD training allows USAF pilots to plan for and employ J-SEAD forces in a manner that maximizes their weapon system capabilities while minimizing their inherent limitations. Mission coordination and planning are important training elements because they allow the pilots to develop effective JTTPs for use in combat. The flying training events are critical to effective training because they allow a pilot to practice the actual skills that are required to build experience and proficiency in this demanding mission. Training must be continuous throughout the fiscal training cycle to ensure proficiency and combat readiness. The debriefing is a fundamental component of J-SEAD training for pilots. The majority of learning occurs during pilot mission debriefs. The lessons learned enhance future J-SEAD employment by improving TTPs, doctrine, and system requirements.

Coordination and planning analysis is limited in scope to the J-SEAD coordination conducted by USAF F-16 SEAD pilots. The thesis outlines joint staff and joint task force guidance for unit-level J-SEAD mission coordination and planning. Research was conducted to identify possible J-SEAD training opportunities. The following questions are addressed during the coordination analysis. Are USAF J-SEAD pilots afforded opportunities to train with all SEAD assets from other joint services? Do J-SEAD forces initiate training operations from different locations, as they will in combat? Are the J-SEAD forces using the same planning and communication equipment they will have available to them in combat? The answers to these questions provide an assessment of the realism of the coordination and planning elements of J-SEAD training. Are they training like they will fight?

Coordination and planning J-SEAD training should address joint employment areas of responsibility, target deconfliction, frequency management, target prioritization, communications planning, and tactic selection. Ideal J-SEAD coordination and planning should be accomplished at a common location. Centralized planning allows all forces to directly coordinate and plan actions in person, resulting in less confusion or misunderstanding between participants.

Centralized tactical joint coordination and planning is not probable in most combat scenarios; therefore, pilots are forced to develop plans individually and then attempt to coordinate and deconflict employment actions by whatever means available. These means usually include computer-to-computer communications, telephone coordination, facsimile (fax), video teleconference, or any combination of the four. Unfortunately, communications paths and computer support at the unit level are far less capable than the capabilities at command and control locations. Communication limitations significantly impact joint coordination and planning activities for USAF pilots. Pilots compensate for communication limitations by developing standardized tactics, techniques, and procedures (TTPs) to minimize the quantity of information that must be coordinated. Realistic J-SEAD training places the same planning limitations on USAF pilots that they can expect in combat. Their experiences in these training scenarios allow them to identify weak areas in coordination and planning between J-SEAD players and develop TTPs to overcome these limitations. Regular J-SEAD training events provide pilots with an opportunity to continuously develop, refine, and practice their TTPs to ensure their validity.

Effective J-SEAD training should expose pilots to the capabilities and limitations of national- and theater-level collection assets tasked to support wartime J-SEAD operations. National- and theater-level collection assets are an essential element to the J-SEAD pilot mission-planning process. They provide information and data that are required to program both SEAD aircraft and weapon systems. The data is essential to mission planning, target identification, and the tactic selection process. Pilots require this data in real time to allow them to parallel plan with the battle management staffs. Pilots use intelligence data to resolve target ambiguity identification problems and to deconflict friendly and threat emitters. Pilots must have the opportunity to utilize the full spectrum of assets that will be available to them in combat during training exercises. Pilots have an inherent need to understand what is or is not available to them

in combat. They must have a clear understanding of the capabilities and limitations of these systems. Only then will they truly be able to take full advantage of their capabilities.

The F-16 Block 50 aircraft uses an IDM to data-link targetable SEAD data between aircraft. The RC-135 Rivet Joint aircraft utilizes IDM to pass and receive SEAD targeting data to supported aircraft. IDM has been incorporated into a limited number of EA-6B Prowler aircraft. Do these aircraft conduct J-SEAD training events that take advantage of this capability? Has the training incorporated U.S. Army or Marine Corps SEAD assets? The services are migrating to a common tactical data link called LINK-16. Joint planning and training are essential to ensuring that adequate capability and compatibility requirements are established by the warfighters prior to the fielding of the new joint data link, LINK-16. Effective J-SEAD planning should incorporate USAF F-16 data-link operations. Lessons learned from these training exercises will impact future TTPs and communications system requirements.

The research and analysis address J-SEAD training realism. The thesis assesses if joint training exercises allow pilots to employ J-SEAD tactics in a realistic training environment. Realism in training is an essential element of an effective training program. Realistic training ensures a combat ready force trained in the application of service and joint tactics. The common goal of tactical training is to allow USAF pilots to practice their art in a realistic combat-like training environment. Realistic training provides pilots with combat experience under peacetime conditions. Are USAF J-SEAD pilots afforded the opportunity to train against all forms of integrated air defense systems (IADSs)? IADSs have proliferated throughout the world since the end of the Cold War. USAF J-SEAD pilots must have the opportunity to gain J-SEAD training experience against these threat systems in peacetime. The first time the USAF J-SEAD pilot employs his weapon system against a specific threat should not be in combat.

The final element in the training analysis focuses on the J-SEAD debriefing or AARs by the Air Force F-16 J-SEAD pilots and other J-SEAD warfighters. The debrief is the culmination

point of training. The majority of learning is accomplished during this phase of training. Pilots analyze the mission from the initial planning stages through mission execution. They determine which TTPs were effective and which ones were not. If a TTP is ineffective, the pilots determine if the problem was due to improper execution of the TTP or if the TTP is not valid for a certain tactical situation. They discuss individual, flight, and team performance in each aspect of the mission. When the team determines that a task was not executed to the training standard, they determine what specific events caused the shortfall and how to fix it. The debrief focuses on how to prevent the same mistakes in future missions. The results are expressed in lessons learned. The lessons learned are both instructional and evaluation tools. The instructional aspect provides experience that allows the pilots to employ a different TTP in the same situation to ensure success. It may also highlight a sequence of events that may trigger the need for a different TTP. The evaluation aspect defines equipment, training, and doctrinal limitations. These evaluations are critical to future doctrine, JTTP, system, and interoperability requirements. They provide direction for all future J-SEAD requirements.

J-SEAD Training Refined

Tier I training for USAF F-16 SEAD units provides a baseline for the analysis of J-SEAD training. The baseline USAF SEAD training scenarios were compared to current J-SEAD training scenarios for this analysis. J-SEAD training should build in complexity using the USAF baseline training as a starting point (building-block approach). The analysis was conducted to determine if joint exercises build upon basic service SEAD skills to fully achieve synergy in joint operations. Effective J-SEAD flying training provides USAF pilots with a comprehensive understanding of equipment, weapon systems, tactics, and communication differences between all possible J-SEAD assets. Effective J-SEAD training allows USAF pilots to develop measures of effectiveness for various force compositions, employment tactics, and threat scenarios. The

experience pilots gain through adequate training directly impacts their decision-making process during J-SEAD planning and flying operations. Effective training has an added benefit of developing future leaders who are more effective. These J-SEAD trained leaders base their command decisions on actual experience, instead of on results provided by a civilian contractor-developed simulation or model. Leadership effectiveness is achieved when command decisions are based upon fact and experience instead of assumptions.

Realistic J-SEAD training defines effective combat capability and overall success for Air Force F-16 J-SEAD pilots in combat. Realistic training provides Air Force F-16 J-SEAD pilots with the opportunity to develop and refine their employment tactics while significantly reducing the possibility of operational failure. J-SEAD training results and lessons learned are then used to shape J-SEAD doctrine and TTPs. J-SEAD training results can be used as a reliable indicator of combat readiness and capability to both commanders and J-SEAD pilots. Joint force commanders need these training results and lessons learned to better plan, apportion and allocate J-SEAD assets based upon expected capabilities and effectiveness. Joint Publication 3-01.4 lists the "determination of the capabilities of available suppression assets" as the third primary planning objective under command and control.[2]

The USAF F-16 J-SEAD training recommendations are designed to ensure F-16 SEAD pilots have the opportunity to gain the experience and proficiency this mission demands to successfully operate in combat. SEAD is a critical element of any offensive air campaign and ultimately to achieving air superiority. "SEAD is any activity that neutralizes, destroys, or temporarily degrades enemy air defenses by destructive and/or disruptive means. J-SEAD is a broader term that encompasses all SEAD activities provided by components of a joint force in support of one another."[3] Successful J-SEAD operations provide pilots with the capability and the freedom to attack targets without fear of coming under attack. J-SEAD operations are an extraordinarily difficult and task intensive mission for fighter pilots. USAF F-16 SEAD pilots

must frequently participate in realistic J-SEAD training in order to be considered combat ready. Realistic and frequent J-SEAD training allows USAF F-16 SEAD pilots to train like they fight and ultimately, to fight like they have trained.

The skills USAF F-16 SEAD pilots develop during J-SEAD training are extremely perishable. Effective training should maximize every available J-SEAD training opportunity to ensure pilots maintain their proficiency in this demanding mission. The measure of combat effectiveness for Air Force F-16 SEAD pilots can be measured by their performance throughout these realistic combat-training operations. Training frequency is evaluated to assess currency and the overall level of USAF J-SEAD pilot proficiency. The research analysis results are used to determine how the USAF can maximize all available J-SEAD training opportunities for F-16 SEAD pilots.

USAF pilots conduct J-SEAD operations under the guidelines established in Joint Publication 3-01.4; command and control (C2) responsibility for J-SEAD weapon systems rests with Joint Force Commanders (JFCs). The JFCs may delegate command and control down the chain of command to the J3, joint force air component commander (JFACC), or other component commanders. Commanders and supporting commanders at each level need to understand how well prepared USAF F-16 SEAD pilots are to conduct this task intensive mission.

USAF pilots must be trained in a realistic J-SEAD environment if commanders expect them to successfully accomplish this demanding mission in combat. J-SEAD training should include scenarios that provide USAF F-16 SEAD pilots with the same assets JFCs expect to task in combat. The training should array the J-SEAD forces at separate operating locations and task them to conduct coordinated J-SEAD operations in pursuit of common J-SEAD Area of Responsibility and Joint Operating Area (AOR/JOA) air defense systems suppression, localized suppression, and opportune suppression objectives. J-SEAD training missions should fly against the same threat arrays they expect to encounter in combat. A core objective of effective J-SEAD

training is to identify limitations and compatibility issues to J-SEAD forces before they are tasked to accomplish J-SEAD in combat. Realistic training provides J-SEAD operators with the capability to develop tactics and procedures to overcome system and tactical weaknesses. They must know how to apply their forces in a manner that exploits the strengths of their specific weapon systems.

The assets participating in training scenarios define joint-training realism for this thesis. The analysis assesses J-SEAD training accomplished versus the total number of exercises that could provide J-SEAD training. An important subset of the training analysis concerns the J-SEAD force composition. Are USAF J-SEAD pilots provided an opportunity to train with all J-SEAD assets in the exercise, or are a large majority of the assets notional? Simulation is a valuable tool for modeling a scenario or weapon system, but has limited operational utility during effective joint-training scenarios. Simulation may be required due to asset availability; however, simulation should be minimized to maintain training realism. Simulation of joint force assets in J-SEAD training should be the exception not the rule.

Why is J-SEAD Training So Important?

The end of the Cold War triggered a significant increase in the proliferation of modern IADSs. The former Soviet Union actively markets IADSs that were not available outside of that country prior to the end of the Cold War. The United States, United Kingdom, Israel, France, China, and North Korea have all increased their foreign military sales programs during this period of reduced domestic military spending. IADSs proliferation has resulted in significant increases in defensive capabilities for countries procuring or upgrading their air defense systems. IADSs provide purchasing nations with a viable and cost-effective, self-defense capability when compared to the cost of training and maintaining an air force. The proliferation of advanced IADSs significantly impacts joint force air campaigns. USAF and JFACC planners must be

prepared for protracted SEAD campaigns in order to achieve air superiority. Do the USAF J-SEAD scenarios employed during training exercises replicate the IADS U.S. forces can expect to employ against in combat? Are Air Force F-16 SEAD pilots trained to employ J-SEAD tactics against both integrated and autonomous threat arrays? Accurate threat replication is a critical element of a realistic training program. J-SEAD assets must train against the same threats they can expect to see in combat. Those threats should replicate the actual emitter parametric characteristics as well as combat employment doctrine to prevent negative training. Replication should include antiradiation tactics, emitter decoys, and integration of land and air weapon systems and representative command and control measures. Realistic employment of threat systems allows J-SEAD forces to measure the relative effectiveness of the tactics they plan to employ in a combat-like environment.

The USAF suffered significant reductions in equipment, aircrews, experience, and training to conduct SEAD operations during the post-Cold War era. The USAF made conscious decisions to retire older weapon systems in order to maintain future weapon system upgrades and weapon system development programs. USAF pilot retention has fallen to 42 percent during the past four years.[4] The separating pilots average ten years of operational flying experience. The loss of these assets (experienced pilots) creates a significant experience void at the unit level.

Inexperienced operational SEAD units are challenged by reduced training opportunities. Training reductions can be attributed to increased contingency tasking and reduced operations and maintenance (O&M) funding. Operational units have less time at their home station to conduct basic SEAD mission training. USAF F-16 SEAD pilots have been unable to meet pre-1990 era training requirements primarily due to excessive contingency tasking, local training range limitations, and reduced flying hour budgets. Air Combat Command (ACC) has reduced the annual flying hour program for operational SEAD units and is considering further reductions by as much as 30 percent.

Air Force F-16 SEAD pilots are faced with significant challenges. Effective J-SEAD operations require coordinated tasking, planning, employment, and post-mission analysis. Most joint forces operate from geographically isolated locations. This poses a significant problem for electronic combat (EC) package planning and mission coordination. A lack of robust communications between J-SEAD tactical mission planners is a significant limitation to effective employment. Battlefield communications at the tactical level do not provide effective or reliable mission-planning communications capabilities. Future communication architectures should be designed to ensure unit-level coordination and mission-planning requirements are satisfied.

SEAD tasking is primarily the responsibility of the JFACC. The Joint Forces Land Component Commander (JFLCC) will task organic SEAD assets under JFLCC command for SEAD to support land component operations. JFACC and JFLCC SEAD assets should participate in joint-training exercises to ensure they are capable of effective localized J-SEAD. USAF SEAD assets should be tasked to conduct coordinated J-SEAD missions with all J-SEAD assets. USAF F-16 SEAD pilot training should include J-SEAD mission coordination, planning, employment, and post-mission analysis training with other J-SEAD assets. The thesis emphasizes USAF J-SEAD training shortfalls. The conclusions identify solutions that can offer essential J-SEAD training opportunities for USAF F-16 SEAD pilots.

The USAF is challenged with maximizing flying training opportunities to ensure its remaining forces are capable of effective J-SEAD operations. Force reductions and budget reductions will continue to shape USAF J-SEAD doctrine and employment capability. J-SEAD is not listed as a Joint Chiefs of Staff (JCS) universal joint task list (UJTL) operational, strategic or USAF tactical (OP, ST or TA) task. J-SEAD is not a joint mission essential task list (JMETL) requirement. J-SEAD is an absolute necessity for USAF pilots in future operations employing airpower against a threat possessing an IADS. Effective suppression of enemy air defenses provides the forces conducting other offensive counterair (OCA) missions with the freedom of

movement required to achieve air superiority. It is highly unlikely air forces will attain air superiority when opposed by an advanced IADS without an effective SEAD or J-SEAD campaign. Any future USAF participation in a SEAD campaign will require the application of joint forces. J-SEAD is an absolute requirement and should receive training priority in all major exercises.

Summary

This thesis identifies the lack of sufficient and realistic JSEAD training opportunities provided to USAF F-16 SEAD pilots. The recommendations for training improvements advocate a comprehensive J-SEAD training program to ensure USAF F-16 SEAD pilots are prepared to conduct effective J-SEAD operations in combat. To be effective, all J-SEAD assets should have the opportunity to train together against expected threat IADS in a realistic training environment. Comprehensive J-SEAD training should include all aspects of the J-SEAD campaign from command and control through mission execution while ensuring those assets planned for in combat are available for training. Effective joint training provides command and control, operators, and support assets with the experience necessary to achieve the synergistic benefits of joint warfare. Ultimately, Air Force F-16 SEAD pilots must be trained like they will fight, so that in combat they can fight like they have trained. Effective J-SEAD training ensures Air Force F-16 SEAD pilots have been afforded the opportunity to prepare themselves for joint warfare. Effective and realistic training is synonymous with combat readiness.

Research Question

The primary research question is: How should the USAF modify F-16 SEAD training to ensure pilots have the operational flying experience and proficiency required to conduct effective J-SEAD operations in combat?

Definitions

Air Defense. All defensive measures designed to destroy attacking enemy aircraft or missiles in the earth's envelope of atmosphere, or to nullify or reduce the effectiveness of such attack.[5]

Battlefield Coordination Detachment (BCD). An Army liaison provided by the Army component commander to the Air Operations Center (AOC) or to the component designated by the joint force commander to plan, coordinate, and deconflict air operations. The battlefield coordination detachment processes Army request for tactical air support, monitors and interprets the land battle situation for the AOC, and provides the necessary interface for exchange of current intelligence and operational data.[6]

Campaign. A series of related military operations aimed at accomplishing a strategic or operational objective within a given time and space.[7]

Close Air Support (CAS). Air action by fixed- and rotary-wing aircraft against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces.[8]

Electronic Warfare (EW). Any military action involving the use of electromagnetic energy and directed energy to control the electromagnetic spectrum or to attack the enemy. The three major subdivisions within electronic warfare are electronic attack, electronic protection, and electronic warfare support.[9]

Intelligence. The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information concerning foreign countries or areas. Information and knowledge about an adversary obtained through observation, investigation, analysis, or understanding.[10]

Joint. Connotes activities, operations, organizations, etc., in which elements of two or more military departments participate.[11]

Joint Force Air Component Commander (JFACC). The joint force air component commander derives authority from the joint force commander who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The joint force commander will normally designate a joint force air component commander. The joint force air component commander's responsibilities will be assigned by the joint force commander (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision). Using the joint force commander's guidance and authority, and coordinating with other service component commanders and other assigned or supporting commanders, the joint force air component commander will recommend to the joint force commander apportionment of air sorties to various missions or geographic areas.[12]

Joint Force Commander (JFC). A general term applied to a combatant commander, subunified commander, or joint task force commander authorized to exercise combatant command (command authority) or operational control over a joint force.[13]

Joint Suppression of Enemy Air Defenses (J-SEAD). A broad term that includes all suppression of enemy air defense activities provided by one component of a joint force in support of another.[14]

Mission. The task, together with the purpose, that clearly indicates action to be taken and the reason therefore. In common usage, especially when applied to lower military units, a duty assigned to an individual or unit: a task. The dispatching of one or more aircraft to accomplish a particular task.[15]

Observed Fire. Fire for which the point of impact or burst can be seen by an observer. The fire can be controlled and adjusted on the basis of observation.[16]

Rules of Engagement (ROE). Directives issued by competent military authority which delineate the circumstances and limitations under which United States forces will initiate or continue combat engagement with other forces encountered.[17]

Suppression of Enemy Air Defenses (SEAD). That activity which neutralizes, destroys, or temporarily degrades surface-based enemy air defenses by destructive and/or disruptive means.[18]

Surface-to-Air Missile (SAM). A surface-launched guided missile for use against air targets.[19]

Theater. The geographic area outside the continental United States for which a commander of a combatant command has been assigned responsibility.[20]

Unmanned Aerial Vehicle (UAV). A powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload. Ballistic or semi-ballistic vehicles, cruise missiles, and artillery projectiles are not considered unmanned vehicles.[21]

Assumption

The primary assumption for this thesis is that Air Force F-16 SEAD pilots are not receiving the quantity and quality of training required to conduct effective J-SEAD operations in combat. USAF SEAD missions must be conducted as part of a J-SEAD package to achieve any assurance of success.

Limitations

The major limitation in this thesis relates to the scope of the research question. The thesis research and analysis concentrate on training improvement recommendations for

component, combatant command, and larger training exercises. J-SEAD training opportunities are available for unit-level training events on an ad hoc basis. J-SEAD training should always receive emphasis during home station continuation training (CT) missions. Joint task force (JTF) staffs should emphasize J-SEAD objectives during planned training exercises for forward-deployed forces. This thesis does not intend to limit JTF or unit-level training solutions for J-SEAD forces. Major exercises were selected as a thesis focus primarily to narrow the scope of research and analysis for J-SEAD training opportunities available to USAF F-16 SEAD pilots.

J-SEAD training is not unique to the USAF or its F-16 SEAD pilots. The thesis focuses on the training of USAF F-16 SEAD pilots in J-SEAD operations to highlight a critical shortfall in the USAF's joint warfighting capability. The contemporary single-service SEAD employment doctrine supporting landing operations and close air support (CAS) missions will not protect aircraft against modern air defense threats. The division between single-service SEAD operations and J-SEAD is vanishing as modern IADSs continue to proliferate. SA-10s and 12s will soon threaten Marine Corps, USAF, and Army aircraft conducting CAS missions although these threats will be located in areas traditionally associated with deep operations. Increased emphasis on J-SEAD training is required to protect U.S. forces from advanced threat systems. The conclusions developed in this thesis are applicable to all-service J-SEAD training programs.

The final limitation is the lack of unit-level joint-training requirements. Training events are normally requirement based. The USAF has not received joint staff guidance requiring unit-level joint training experience or proficiency in any of the events listed in the UJTL. The decision to require the services to conduct a specified amount of joint-training events during a training cycle must be made by the joint staff. The thesis provides information that supports the development of a joint-training requirement program for warfighters. The requirement may be articulated in the form of a directive to component commanders or as a requirement, that targets specific weapons systems. The thesis does not address a joint-training events requirement

implementation strategy, instead the focus is on specific improvements to J-SEAD training for USAF F-16 SEAD pilots. The intent is to highlight training shortfalls to commanders at all levels. The personnel responsible for ensuring U.S. forces are prepared for combat should use the limitations identified in this thesis to improve all warfighter training.

Delimitations

Most of the capabilities and limitations of the weapons and systems discussed in the thesis are classified. To ensure the widest possible dissemination, classified information will not be addressed. All information used in the thesis was obtained through open sources. The second delimitation is the cost to improve USAF J-SEAD training. The thesis did not analyze the cost of modifying existing exercise scenarios to maximize J-SEAD training for USAF F-16 pilots. The recommended changes to USAF F-16 SEAD pilot training attempts to maximize current training exercises to support J-SEAD training requirements.

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[1] Joint Chiefs of Staff, Joint Pub 0-2, *Unified Action Armed Forces* (Washington: U.S. Joint Chiefs of Staff, 24 February 1995), III-9.

[2] Joint Chiefs of Staff, Joint Pub 3-01.4, *JTTP for Joint Suppression of Enemy Defenses (J-SEAD)* (Washington: U.S. Joint Chiefs of Staff, 25 July 1995), I-1.

[3] Ibid., I-1.

4 Air Force Personnel Center, *Fiscal Year 98 Pilot Retention*, 23 February 1999 [database on-line]; available from http://afas.afpc.randolph.af.mil/retention/98take.htm; Internet; accessed 2 March 1999.

5 Joint Chiefs of Staff, Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington: U.S. Joint Chiefs of Staff, 23 March 1994), 14.

6 Ibid., 54.

[7] Ibid., 64.

[8] Ibid., 76.

[9] Ibid., 147.

[10] Ibid., 217.

[11] Ibid., 230.

[12] Ibid., 233.

[13] Ibid., 233.

[14] Ibid., 240.

[15] Ibid., 283.

[16] Ibid., 311.

[17] Ibid., 377.

[18] Ibid., 421.

[19] Ibid., 422.

[20] Ibid., 439.

[21] Ibid., 459.

CHAPTER 2

LITERATURE REVIEW

Background

The Air Force, Navy, Marine Corps, and Army all list SEAD as a capability in their respective service doctrine. J-SEAD is not specified as an employment capability in all services' doctrine. Army doctrine does not adequately describe the process for requesting or applying J-SEAD capabilities in support of their doctrine. J-SEAD is not listed in the services' mission essential task lists (METLs), JMETLs, or in the UJTL for the USAF. Combat camera is listed as an OP task on the UJTL, but not J-SEAD. The capstone doctrine document for J-SEAD is Joint Publication (JP) 3-01.4 *Joint Tactics, Techniques, and Procedures (JTTP) for J-SEAD*. This thesis uses JP 3-01.4 to establish the framework for USAF F-16 J-SEAD pilot-training requirements. This thesis supports the doctrinal concept of J-SEAD employment by identifying USAF F-16 J-SEAD training shortfalls and recommending improvements. The conclusions developed in this thesis will improve USAF F-16 J-SEAD training and overall joint service training for J-SEAD operations.

Research Sources

The thesis research started with a review of official Department of Defense (DOD) publications. Research was conducted to analyze the DOD JCS joint doctrine, joint tactics techniques and procedures (JTTP), JMETLs, UJTLs, joint warfighter capability assessments (JWCAs), joint monthly readiness reviews (JMRRs), and annual defense reports from 1995 through 1998. Research and analysis was used to determine the level of emphasis placed on J-SEAD employment capabilities and training by the JCS.

The on-line database of the Joint Warfighting Center (JWFC) at Atlantic Command (ACOM) and the annual joint-training plans (JTPs) were analyzed to determine the scope of the J-SEAD training effort for USAF F-16 SEAD pilots. The joint-training program managed by the JWFC at ACOM uses joint doctrine, UJTLs, JMETLs, service METLs, operation plans (OPLANs), and combatant commander requirements to develop joint training events and exercises. Service doctrine was analyzed to assess the importance placed upon the J-SEAD mission by each of the joint services. Component command sponsored exercises were analyzed to determine the emphasis placed on J-SEAD training by comparing exercise objectives, exercise participants, and AAR published lessons learned. Literary research was conducted both at the Combined Arms Research Library and on the Internet.

Historical analysis of SEAD and J-SEAD employment includes information available from official DOD reports, government reports, books, journals, and articles found on the Internet. There are no published books, manuscripts, research papers, magazine articles, or official journals with J-SEAD training as a topic. Internet searches led to a plethora of articles related to training, force readiness, joint force employment, and exercises. These articles are used throughout the thesis as supporting evidence for both analysis and conclusions. Supporting evidence was also obtained from professional journals. Personal interviews were conducted throughout the research period to qualify and verify data obtained through open-source and on-line publications. The Office of the Secretary of Defense J-SEAD office at Nellis Air Force Base provided some source material. The research concludes with an analysis of official United States Government Accounting Office (GAO) assessments of various J-SEAD training related topics.

J-SEAD effectiveness is a critical METL item for any commander in chief (CINC) who expects to employ airpower in a theater that has an air defense system. Air superiority is unattainable without an effective J-SEAD campaign. Effective J-SEAD operations are true force multipliers because they prevent aircraft from being shot down by IADS and allow unrestricted

use of the air above the enemy. This thesis answers a fundamental question every combatant commander should want to know: Are the J-SEAD forces in theater adequately trained to effectively perform the mission they will be tasked to accomplish?

Ultimately the combatant commander is responsible for establishing J-SEAD as a mission essential task and as a required training event to the joint staff. ACOM should translate these requirements into exercise and training objectives. The services should ensure their forces are adequately manned, equipped, and trained to support expected wartime tasking. In the United States, USAF SEAD training is the responsibility of the Air Combat Command Director of Operations (ACC/DO). The ACC/DO is responsible for assessing USAF SEAD training and ultimately for determining which USAF units will participate in scheduled training events. Combatant commanders have not specified J-SEAD as a wartime task and ACC has not listed J-SEAD as an Air Force Mission Essential Task (AFMET). This has resulted in a lack of emphasis on J-SEAD training for Air Force F-16 SEAD pilots.

The air, land, sea application center (ALSA) produces a consolidated publication of service doctrine focused on current operational capability. Their product is the Multiservice Tactics, Techniques, and Procedures (MTTP) document. Historically, several MTTPs have served as the foundation for joint doctrine and joint TTPs, to include Joint Publication 3-01.4. The commander of the Air Force Doctrine Center, with Commanding General Training and Doctrine Command, CG Marine Corps Combat Development Command, and Commander, Naval Doctrine Command, authorize ALSA to publish MTTPs. ALSA was a valuable source of research material for this thesis.

The Office of the Secretary of Defense (OSD) J-SEAD program is conducting J-SEAD deep operations tests and evaluations through fiscal year 1999 at Nellis Air Force Base, Nevada. These tests focus on sensor-to-C2-to-shooter concepts. The scope of the exercises does not allow USAF F-16 SEAD pilots to train to all J-SEAD mission areas or integrate USAF SEAD missions

with all possible J-SEAD forces. USAF F-16 SEAD participation is often limited by scripted scenarios. Results from the OSD J-SEAD test will support the development of JTTPs for C4ISR elements. The USAF has conducted one limited J-SEAD tactics development and evaluation (TD&E) test. The results are published in the classified *SEAD II TD&E* final report, 1996. The J-SEAD results in this test have been incorporated into the *USAF MCM 3-1*, Volume V, *Tactics, Techniques, and Procedures* manual. The USN is currently conducting two SEAD tests. One test is developing TTPs for the use of improved data modems (IDMs) in passing data between EA-6B and F-16 Block 50 HTS aircraft. The results will be published in a tactical memorandum (TACMEMO). The second USN test will develop tactics to enhance organic battle group reactive HARM operations. Both USN operational tests should be complete prior to the end of fiscal year 1999. The Army has not published a current unclassified summary report on J-SEAD testing or training.

Summary

There was an adequate amount of reference and source material available to develop the analysis and conclusions produced in this thesis. J-SEAD training research was conducted and coordinated with ACC DOO, Air Force Joint Exercise Coordination Team (AJECT) and ACOM. Coordination of the thesis research and analysis was critical in order to ensure the conclusions and recommendations developed are accurate and operationally feasible. The thesis research conducted on J-SEAD training for USAF F-16 pilots is extensive and thorough. The information contained in this thesis represents the first research conducted on the topic of USAF J-SEAD training for F-16 SEAD pilots. Further studies and research should build upon the analysis and conclusions developed in this work.

CHAPTER 3

METHODOLOGY

Background

The primary research question for this thesis asks, how should the USAF modify J-SEAD training for F-16 SEAD pilots to ensure they have the operational flying experience and proficiency to conduct effective J-SEAD operations in combat? Effective suppression of enemy air defenses is an unconditional requirement for air superiority. The Air Force lost its ability to perform SEAD as a single-service mission when it retired the EF-111 Raven. USAF F-16 SEAD pilots must rely upon Navy and Marine EA-6B aircraft for electronic radar-jamming support to effectively engage most modern surface threats. USAF F-16 SEAD pilots must employ as an element of a J-SEAD package to ensure success against most modern IADS. A formal unit-level J-SEAD training program does not exist even though USAF F-16 SEAD pilots must employ as part of a J-SEAD package under all current operation plans (OPLANs). The division responsible for USAF flying training at ACC, informally expressed concern about a lack of unit-level joint-training requirement guidance by ACOM for USAF F-16 SEAD pilots.

The JCS delegated joint-training responsibility to ACOM in 1993. ACOM develops an annual joint training plan (JTP) as part of the joint-training system (JTS). The JTP is a requirements based program. Exercise and training events are developed based upon requirements derived through JCS guidance, standing OPLANs, UJTLs, joint mission essential tasks (JMETs), service mission essential tasks (METs), and combatant commander requirements. Combatant commanders, ACOM and the USAF do not list J-SEAD as JMET, USAF MET or additional training requirement. J-SEAD is not listed as a OP or USAF TA task in the UJTL. There are no standing requirements for J-SEAD training.

Each F-16 SEAD squadron is responsible for training its pilots to their USAF-assigned unit mission. The training requirements are expressed in the rated aircrew program (RAP). The RAP was developed by the USAF to provide a more accurate picture of unit-level readiness to the combatant commanders. The RAP does not contain joint training events or proficiency requirements. The research methodology required to develop an effective J-SEAD training program for USAF F-16 SEAD pilots required an analysis of established joint-training exercises, programs, requirements, combatant commander requirements, and USAF requirements in order to develop a program that effectively satisfied them all. The research and analysis sections assess current training opportunities available for J-SEAD training that satisfy tactical, operational, and strategic J-SEAD employment requirements for USAF F-16 SEAD pilots.

Effective J-SEAD training must allow USAF F-16 SEAD pilots to train to the mission aspects required to employ as part of a joint force package. These include coordinating and planning J-SEAD operations with SEAD components of the sister services. USAF J-SEAD pilot training should provide proficiency and experience in each of the SEAD missions employed by these forces. The majority of these missions support JP 3-01.4 defined localized and opportune suppression operations. J-SEAD flying training is essential to effective joint employment. USAF SEAD pilots need to understand the capabilities and limitations of other J-SEAD weapon systems. Validated TTPs are required to effectively integrate USAF F-16 SEAD with J-SEAD forces and can only be developed through actual employment training. J-SEAD forces must operate as a well-rehearsed team to be effective in combat. An effective J-SEAD flying training program is required for joint forces in order to build trust in each other's capabilities. Trust builds confidence, which leads to effective teamwork. Effective training programs must emphasize debriefs and AARs. The lessons learned from an effective training exercise guide all future employment doctrine and development programs. The thesis addresses the aspects of an

effective J-SEAD training program by evaluating the training benefits of integrating J-SEAD training into currently funded service and joint exercises.

Secondary Research Questions

The secondary thesis questions address three elements of effective J-SEAD employment training for USAF F-16 SEAD pilots. Effective training should allow the pilot to train for the *before*, *during* and *after* aspects of a mission. The *before* aspects cover the J-SEAD coordination and planning events that are required to successfully employ as part of a coherent J-SEAD effort. The *during* aspect of a training mission is the employment or flying portion. This is the mission execution phase. J-SEAD forces employ in accordance with a coordinated plan of attack. Strict adherence to briefed roles and responsibilities ensures a high level of situational awareness, increased mutual support, and overall mission effectiveness. The *after* portion of a mission is the debrief. The real learning occurs in the debrief. A thorough debrief provides a performance evaluation of each individual participant, the flights, the package, and the overall mission. The debrief allows the participants to analyze which aspects of the planned employment tactics worked and which ones did not. If a tactic did not work as expected, the debrief is used to collectively determine if failure was due to improper tactical execution or invalid tactics. Every aspect of the mission, from initial coordination through execution, is analyzed in detail. Pilots determine their overall mission effectiveness, tactical employment effectiveness, and develop lessons learned during debriefs to improve future employment operations.

Several secondary questions apply to J-SEAD coordination and planning. Are USAF J-SEAD pilots afforded opportunities to train with all SEAD assets from the joint services? Are the J-SEAD forces coordinating missions from geographically separated operating locations during training? Are the J-SEAD forces using the same planning communication equipment they will have available to them in combat? Are the J-SEAD forces planning to deconflict airspace,

frequencies, and targets? Are the J-SEAD forces planning to integrate forces jointly or are they dividing J-SEAD areas of responsibilities between services? Do J-SEAD forces have access to national and theater intelligence, surveillance, and reconnaissance (ISR) data at the operational level? Are the requests for intelligence support answered in time for tactical J-SEAD employment planning? Is the J-SEAD training a stand-alone exercise, or is it an integrated element of another exercise? Planning and coordination training for J-SEAD training operations are effective if the answers to the above questions are yes. If they are not, then the training should be modified to provide more realistic and effective training.

Numerous secondary questions apply to J-SEAD flying training. Are USAF J-SEAD pilots afforded opportunities to train with all SEAD assets from the joint services? Do the J-SEAD training scenarios utilize scripted threat scenarios? Are the J-SEAD forces planning to integrate forces jointly, or are they dividing J-SEAD areas of responsibilities between services? Are the IADS representative of an expected threat IADS? Do J-SEAD forces have access to national and theater ISR data at the operational level? Are the USAF F-16 SEAD pilots training with all J-SEAD forces that can be expected in a similar combat scenario? Are the J-SEAD forces notional or simulated? Is the J-SEAD training a stand-alone exercise or is it an integrated element of another exercise? Are the employment scenarios representative of all J-SEAD missions (localized and opportune suppression missions in support of Army, Navy, Air Force, and Marine Corps operational missions)? Flying training (mission employment) portions of J-SEAD training operations are effective if the answers to the above questions are yes. If they are not, then the training should be modified to provide more realistic and effective training.

J-SEAD mission debriefings should be thorough. The secondary question simply asks if J-SEAD participants are conducting joint debriefings for J-SEAD missions. The exercise design should program enough postmission time to allow participants to completely analyze mission events and team performance prior to initiating the next training mission. The training should

provide the means for face-to-face debriefs by video teleconference or other means. Ideally, debriefings should be conducted in person for effective team building. These types of debriefs encourage dialog and consensus among participants. An automated mass-debriefing system should support the exercise or training ranges. All participants and threats should be outfitted with a weapons and vehicle-tracking system. These systems allow J-SEAD participants to evaluate their employment and survival effectiveness against the various threat systems. The Air Force utilizes the Red Flag Measurement and Debriefing System (RFMDS) or air combat maneuver instrumentation (ACMI) as primary exercise debriefing systems. Both systems track aircraft parametrics, threat parametrics, and weapons release events for postflight analysis. These systems provide a time-sequenced mission replay capability. The Air Force is developing a self-contained global positioning system (GPS)-based mission debrief system that will provide the same capabilities during any training mission. Future joint training missions should employ a compatible system to enhance post-mission evaluation capabilities. Threat IADS must report the effectiveness of the J-SEAD tactics and weapons. Timely feedback is essential to the debrief process.

The methodology includes an analysis of books, magazines, professional journals, unclassified on-line database material, joint publications, unclassified readiness assessments, unclassified training analysis, DOD training programs and plans, historical SEAD effectiveness studies, personal interviews, DOD annual defense reports, U.S. GAO reports on defense readiness related issues, and published research material. The data from these sources was used to develop an analysis of the service requirements for SEAD, J-SEAD requirements, joint training opportunities, future joint training trends, and the future of J-SEAD. The data establishes the requirement for J-SEAD in future conflicts that require the use of airborne weapon systems. The thesis concludes by establishing the lack of emphasis on J-SEAD training for USAF F-16 SEAD pilots and closes with a recommended J-SEAD training course of action.

CHAPTER 4

RESEARCH and ANALYSIS

Introduction

The quantity and quality of J-SEAD training for USAF F-16 SEAD pilots in peacetime are directly related to their operational readiness. Based on the lack of J-SEAD training for USAF F-16 SEAD pilots, their operational readiness is low. Developing an effective J-SEAD training program should not be a daunting task for military leaders. Effective J-SEAD training should be developed to ensure USAF F-16 SEAD pilots have been provided every opportunity to practice their warfighting skills prior to combat. Effective J-SEAD training ensures these pilots do not require on-the-job training (OJT) to employ effectively upon arrival in a combatant commanders joint theater of operations. Fiscal reality demands efficient use of declining training events and money. J-SEAD training improvements do not initially require the development of new exercises. Current exercises can be modified to provide essential J-SEAD training opportunities. Significant J-SEAD training improvements will be realized by simply training smarter.

Changing joint training requirements and programs requires a basic understanding of the joint training process. Joint training is designed, funded, and executed to ensure the military is prepared to operate effectively as an integrated joint force in each of its warfighting mission areas. Exercise training objectives are developed to evaluate military warfighting tasks. This chapter uses an analytical approach to assess each aspect of the JTS as it relates to J-SEAD training. The JTS is described at a macrolevel to emphasize the aspects that relate directly to USAF J-SEAD training requirements. The process and requirements guiding the JTS are analyzed to answer the primary research question: How should the USAF modify F-16 SEAD training to ensure pilots have the operational flying experience and proficiency required to

conduct effective J-SEAD operations in combat? The JTS is further analyzed to determine if or how USAF F-16 SEAD training is nested into J-SEAD training. The service SEAD portion presents the various service mission areas that are linked to USAF F-16 J-SEAD employment.

This analysis presents information that supports the primary research assumption. USAF F-16 SEAD pilots are not receiving the quality and the quantity of training required to conduct effective J-SEAD operations in combat. The SEAD requirements in joint and service doctrine determine which missions and service unique weapon systems require USAF F-16 SEAD training support to ensure future J-SEAD employment effectiveness in combat. The analysis examines the need for change by assessing the future of joint training, current readiness, and recent J-SEAD employment effectiveness. The final section of the analysis ties the JTS process, J-SEAD training requirements, and the effectiveness of USAF J-SEAD training together to provide an unambiguous picture of USAF F-16 J-SEAD training shortfalls. Effective suppression of enemy air defenses is a necessary first step for all aerospace forces operating over areas defended by air defense systems. J-SEAD operations are nested in all USAF wartime mission areas. USAF F-16 J-SEAD training must receive joint training emphasis and priority. Air superiority cannot be achieved without a successful J-SEAD campaign.

USAF J-SEAD Training

Air Force Doctrine Document 1, dated September 1997, states “Air superiority normally should be the joint force commander’s first priority for air forces . . . air superiority remains a critical prerequisite for all joint force operations . . . without air superiority, air and surface operations would be exceedingly hazardous, if doable at all.”[1] Colonel John Warden, who was responsible for developing the air campaign during the Gulf War, echoes the importance of air superiority. "Air superiority is a necessity. Since the German attack on Poland in 1939, no country has won a war in the face of enemy air superiority, no major offensive has succeeded

against an opponent who controlled the air, and no defense has sustained itself against an enemy who had air superiority. Conversely, no state has lost a war while it maintained air superiority."[2]

A J-SEAD campaign must defeat all aspects of an enemy's air defense system to achieve aerospace control. In order to achieve aerospace control, USAF F-16 SEAD pilots must conduct successful SEAD missions. "Since the heavy U.S. losses to enemy air defenses experienced at the outset of the Vietnam War, DOD has recognized SEAD as a critical component of air operations. Now when a crisis arises, SEAD assets are among the first called in and the last to leave."[3] USAF F-16 SEAD pilots must employ in J-SEAD operations to ensure aircraft are free to exploit the use of the aerospace medium for offensive operations. USAF F-16 SEAD pilots are utilized in all three J-SEAD mission areas: (1) AOR/JOA Air Defense Systems Suppression, (2) Localized Suppression, and (3) Opportune Suppression. USAF F-16 SEAD pilots receive J-SEAD tasking from their combatant commanders. The combatant commanders rely upon the JCS to ensure forces are adequately trained. Combatant commanders need their forces combat ready when they arrive in theater. They cannot afford, nor are they prepared to provide OJT to these forces in combat. The JCS has delegated joint training responsibility to ACOM. ACOM develops and manages the chairman of the JCS (CJCS) JTS to ensure all forces are provided adequate training in their wartime tasks. The annual JTP and CJCS joint training master schedule are developed through a requirements-based process. All joint training is based upon the warfighting requirements established in the UJTL, JMETLs, service METLs, combatant command requirements, and OPLAN requirements.

General Richard E. Hawley, Air Combat Command commander, stated during an interview at Shaw Air Force Base on 11 February 1998 that: "SEAD is one of the most important missions we have in the Air Force. It opens the door for all other forces to do their work. It takes down those surface-to-air missile defenses so other weapons systems can attack the targets we

would be after in the event that we have to execute when we get there. It's hard to overstate how important that is."[4]

It is surprising then that the Air Force has not listed J-SEAD as a TA task within the UJTL or as an AFMET. General Hawley's statement is not consistent with recent budget decisions implemented by the Air Force or the DOD. The DOD acknowledges SEAD has been and will continue to be a critical component of military air operations for many years. However, the military has recently made a number of budget decisions that result in reduced SEAD capability. "DOD is abandoning deployed SEAD capabilities that have significant military value and has dropped plans to improve SEAD capabilities to meet new threats."[5]

The USAF retired the EF-111 RAVEN and F-4G WILD WEASEL from operational service to save scarce defense dollars. The HARM, Joint Direct Attack Munition (JDAM), and Joint Standoff Weapon (JSOW) development programs have been delayed by reduced development funding. The HTS has not received a needed antenna upgrade due to budget reductions and funding priorities for programs, such as the F-22, Joint Strike Fighter, Joint Stars, unmanned aerial vehicles (UAVs), and the B-2. Flying training hours at USAF F-16 SEAD units have been reduced and may be further reduced by as much as 30 percent. Commanders are forced to trade training dollars to support a growing number of contingency deployments. General Hawley's vision is to replace 30 percent of current flight training with flight simulator training. All of these factors are negatively affecting USAF F-16 SEAD pilot readiness and employment capability. "Dedicated SEAD assets are dwindling without replacement. Asset erosion has rendered single service SEAD approaches ineffective as an IADS counter."[6] USAF F-16 SEAD pilots are not able to conduct single-service SEAD missions primarily due to the retirement of the EF-111. J-SEAD is not just a congressionally mandated requirement; it is a necessity in the Air Force. If the Air Force is expected to fight jointly with Army, Navy, and USMC SEAD assets on tomorrow's battlefield, they must train jointly today.

During the post-Cold War era, IADS have proliferated throughout the world. IADS have evolved from the 1970s era systems the U.S. military faced during the Gulf War into multilayered systems capable of engaging multiple targets at all altitudes. Advanced SAMs are designed with inherent electronic counter-countermeasure (ECCM) and extended-range, high-velocity motors. Threat radars feature advanced technologies designed to counter U.S. electronic jamming and antiradiation missiles. These radars employ advanced frequency-hopping techniques and power management features to enhance their survivability in an antiradiation missile (ARM) environment. The air defense networks incorporate redundant communication links and both passive and active sensor arrays. The IADS employ cooperative emission techniques to further confuse U.S. sensor arrays. "New, integrated air defense systems have advanced electronic features that are difficult to counter. These systems pose a serious challenge to the quick and successful prosecution of an air campaign. Several potential adversaries have chosen to emphasize acquisition of ground-based air defenses as the highest-leverage method of countering U.S. air power."[7] The threat is real and is increasing as countries move away from aircraft toward IADS to protect their sovereign airspace. A common misconception in the application of J-SEAD doctrine is that only surface-based systems must be targeted in a J-SEAD campaign. Airborne and space systems will play an increasingly important role in future IADS. An effective J-SEAD campaign must target the eyes, ears, and teeth of an enemy's IADS. The IADS threat is evolving and proliferating throughout the world. The USAF has failed to keep pace with this expanding threat.

The USAF has evolved into a force-projection force since the end of the Cold War. Deployments have increased fourfold as the active-duty force size has decreased 36 percent. "On the day of battle, soldiers and units will fight as well or as poorly as they are trained. Training to high standards is essential in both peace and war; never can U.S. forces afford not to train and maintain the highest level of readiness. Every commander, every soldier, every unit in a force-

projection military must be trained and ready to deploy. Leaders have the responsibility to train subordinates. This may be their most solemn responsibility."[8]

The Threat

Many third world nations have modern fighters, but they are bought in limited numbers and employed even less. "Recent history shows conservation of aircraft and reliance on surface-based air defense assets for protection by Third World Countries."[9] Future threat nations have learned from the Iraqi shortfalls during the Gulf War. The Iraqi's IADS used 1970s vintage equipment. Emerging nations are fielding 1990s era IADS. These newer IADS are promoted based upon their capabilities against U.S. designed weapon systems. "This mono-polar, post-Cold War world has created an environment where weapon systems are measured and marketed by their comparison to or ability to defeat U.S. weapons."[10] The current trend is away from threat aircraft and towards IADS employing low observable (LO) detection capabilities, advanced ECCM, and anti-ARM tactics. U.S. fighter and bomber aircraft cannot expect to achieve a safe sanctuary at medium altitude like they enjoyed during the Gulf War without successful J-SEAD operations. The threat to air superiority today and in the future is an enemy's IADS and not necessarily their air force. "A Radar being displayed at the Paris Air Show in 1994, claimed the ability to see stealth, immunity to jamming and insusceptibility to ARMs."[11]

Countries that cannot afford to or are unable to upgrade older air defense systems have developed effective tactics to counter U.S. SEAD tactics. SA-6s in Bosnia-Herzegovina were able to shoot down both a modern U.S. and French fighter aircraft equipped with advanced electronic countermeasure (ECM) pods. These same SA-6 systems later survived 785 dedicated SEAD sorties employing 56 AGM-88 HARMS during an eleven-day air campaign specifically designed to destroy them. The SAMs in Iraqi survived U.S. J-SEAD missions during Operation Desert Fox and the majority of J-SEAD missions following that operation. The threat has

evolved. J-SEAD forces must train to counter this advanced threat. Training must be realistic and often enough to allow pilots to become proficient at their art while gaining essential combat experience in a peacetime training environment. The threat is not diminishing like the DOD's SEAD capability. Improved IADS and J-SEAD countertactics are threatening the U.S.'s future capability to conduct effective aerospace operations. The USAF is no longer capable of conducting single-service SEAD operations. J-SEAD is a reality for all future suppression missions by USAF F-16 SEAD pilots. Combatant commanders need to understand their joint warfighting capability relies upon effective USAF F-16 J-SEAD operations.

J-SEAD Training Requirements

The Goldwater-Nichols Act requires the services to operate jointly. The services must train together in peacetime if they expect to operate effectively in combat. J-SEAD training is essential for the effective conduct of J-SEAD operations in combat. "Ultimately, J-SEAD may prove to be one of, if not the most critical functions on the battlefield. In many respects it is the cost of doing business--a necessary first step to the successful conduct of close and deep area operations."[12] The joint staff has not adequately addressed J-SEAD operational training requirements for USAF F-16 SEAD pilots. Operational J-SEAD training "demands a shift from the service-based approach to SEAD to the development of an informed, innovative, non-parochial approach to J-SEAD."[13] The JCS and ACOM training emphasis and funding must radically change from its present path. The JTS has focussed primarily on the training of joint warfighting staffs. The focus on the tail at the expense of the teeth has seriously impacted USAF F-16 SEAD joint force employment readiness and future USAF J-SEAD combat employment effectiveness.

The training battle managers receive is primarily simulation based. The simulations employ models that are often based upon unproven assumptions. Operational commanders must

validate the accuracy of the planning models they train with prior to combat. Simulation models are often based upon inaccurate assumptions of system employment capabilities, J-SEAD employment TTPs, and generalized weapons effects. A rigorous operational J-SEAD exercise-training program would provide countless opportunities to validate battle staff simulation models. Commanders need the experience of live operations to truly understand the capabilities, limitations, and vulnerabilities of their forces. Command decisions in combat should be based upon factual experience not upon the capability assumptions modeled through simulation. J-SEAD will play a pivotal role in the execution of offensive operations in the next conflict. Combatant commanders must fully understand how to employ these forces.

Effective J-SEAD employment ultimately provides force protection for forces operating in enemy air and space mediums. Americans expect results similar to what was reported by the media during the Gulf War. The mass media's reach is global and nearly instantaneous. U.S. forces will find it very difficult to achieve operational surprise in future battles. U.S. forces must rely on J-SEAD operations to achieve tactical surprise. Successful J-SEAD operations provide tactical surprise. This limits the enemy's ability to defend itself from a tactical attack. Americans have become conditioned to expect success from military forces without a great loss of American lives. "The American people simply are not going to tolerate high casualties in military operations they don't view as critical to our national security."[14] J-SEAD forces can satisfy the will of the American people. J-SEAD specifically protects air and space forces while allowing them to achieve the effectiveness Americans have come to expect. J-SEAD success makes it very easy for the American public and Congress to support military operations without interference. Operational J-SEAD training must be exercised across the spectrum of conflicts ranging from war to military operations other than war in order to ensure victory in combat.

Successful J-SEAD operations are a force multiplier for combat weapon systems operating in air and space mediums. J-SEAD forces are responsible for destroying or degrading enemy air

defense systems. If a strike aircraft is forced to react to SAMs or air-to-air missiles, the pilot must jettison ordnance in order to increase aircraft maneuverability and survivability. If the pilot is forced to react for survival, the mission is a failure and will require additional assets to re-attack the intended target. If the pilot reacts to SAMs or AAA in the target area during weapons release, the probability of hitting the intended target is significantly reduced. A missed target requires additional assets and risk to reattack. "The measure of effectiveness of the J-SEAD effort is safe passage and return of offensive air forces."[15] J-SEAD success ensures the pilots enjoy unobstructed access to and from the target area. Successful J-SEAD operations reduce the effects of combat-related stress and improve weapons employment accuracy dramatically. It is tactically sound to reduce enemy defenses prior to attacking high-value targets. Effective J-SEAD increases the probability of successful attacks without prohibitive losses. "The Eighth Air Force's mission to Schweinfurt, Germany on 14 October 1943--sustaining 20 percent bomber losses--is a familiar and dramatic example of what happens when enemy air defenses are fully functional and effective."[16]

JCS

General John M. Shalikashvili stresses the need for joint employment in his introduction to joint publication one. "The nature of modern warfare demands that we fight as a joint team. This was important yesterday, it is essential today, and it will be even more imperative tomorrow."[17] The JCS is ultimately responsible for training all DOD forces. Joint training requirements are developed from the tasks listed in the CJCSM 3500.04A, Version 3.0, UJTL document. SEAD is listed as an operational-level task, but J-SEAD is not addressed in the strategic, operational, or USAF tactical-level task sections. The analysis illustrates that J-SEAD is a parallel task linked vertically between all levels of war and horizontally between the different operational- and tactical-level warfighting tasks for aerospace operations. J-SEAD training must

receive joint training priority based upon its impact to all other aerospace operations. USAF F-16 SEAD pilots will not be assured J-SEAD joint training priority until J-SEAD is listed as a mission essential task by the JCS, combatant commanders, and the USAF.

Joint Vision 2010 provides a comprehensive vision for how the DOD intends to achieve new levels of effectiveness in joint warfighting. Training effectiveness and efficiency is required to achieve this vision. Joint training must cover the entire spectrum of training audiences, from the individual soldier, sailor, airman, or Marine, to the JTF commander and his staff. The services must be provided with training opportunities that allow them to employ their advanced technologies in a peacetime environment. The commander in chief, U.S. Atlantic Command (CINCUSACOM) is responsible for providing training support to the CINC/Joint Task Force commander and his staff in fighting wars or responding to military operations other than war tasking. Joint training is executed through the JCS J7 Directorate and as of the first of October 1998, the Joint Warfighting Center (JWFC) at ACOM. "The Joint Staff estimates that the cost of joint training is $400 to $500 million annually."[18] Secretary of Defense, William Perry's guidance to the services and other components for the fiscal year 1998 budget was to provide enough funding for training to ensure their forces were ready to carry out missions at acceptable levels of risk. CINCUSACOM established major focus areas to ensure the command clearly understood the priorities and intents of the combatant commanders. One of the major focus areas addressed the joint training process. The goal of ACOM was to develop and implement a DOD-recognized training program that produces joint forces trained to appropriate common standards. The J7 Directorate established objectives to help the CINCs meet this joint training goal. Distributed joint training is one of several initiatives implemented to achieve the objectives of the Joint Training Program by ensuring the fusion of technology with training is consistent with and meets the needs of both the training audience and the supported CINCs. The CINCs have not articulated a J-SEAD training requirement. The current Joint Training Program does not support

J-SEAD training because it is not stated as a requirement. J-SEAD is not listed as an Air Force tactical level task under the UJTL. It has not received the training emphasis or priority it demands. "The main criterion for including a task in a service task list is whether service forces are capable of performing the task at that level of war (with or without the involvement of forces from another military service)."[19] The USAF is incapable of conducting single-service SEAD. J-SEAD is a task that should be placed on the UJTL as both an operational- and tactical-level task. Effective J-SEAD is and will continue to be a warfighting requirement as long as threats possess IADS.

Universal Joint Tasks List

The UJTL was designed as a common language for joint forces. The CJCS developed and approved the UJTL as the basis from which joint force commanders establish their JMETLs. The UJTL provides a structured listing of tasks that describe the functional capabilities joint force commanders may require to execute their assigned missions. Levels of war (strategic, operational, and tactical) organize the tasks contained in the UJTL. The strategic level of war is divided into two parts: national and theater. To facilitate the linkage between service component training and joint training, services develop tactical task lists to complement the UJTL. These lists include tasks that enable respective service units to accomplish their missions in support of the JFC. "The TTL along with the UJTL provide a common language for linking service tactical level tasks to joint operational level and strategic level tasks."[20]

Doctrine

The services establish doctrine based on experience and expertise in their mediums of operation. Joint doctrine guides the integration and use of service systems and forces in joint operations. "Joint doctrine offers a common perspective from which to plan and operate, and

fundamentally shapes the way we think about and train for war."[21] Doctrine provides standardized tactics, techniques, and procedures for the application of forces covered at all levels. Doctrine is not designed to restrict operational initiative. It is developed to provide a common ground for operational commanders to employ their art of war. Commanders rely upon doctrine as a starting point from which to build. "All doctrinal manuals and wire diagrams are meaningless unless the joint forces continually and seriously train for J-SEAD."[22] Joint forces must be trained to effectively accomplish the missions detailed in their service and joint doctrine manuals. Joint forces require training that provides a common framework for employment.

> Jointness is not created by doctrine, joint or otherwise. People bring it about, good and bad. A higher proportion of good people, well trained in their service capabilities and how to employ them, creates successful joint operations. Common tactics, techniques, and procedures are vital to training. Just as critical to success in battle are people who while operating in accordance with their training can do exceptional things. Trust and understanding are derived from service competence. That is the only foundation on which genuine jointness can be built. The Joint Staff should not impinge upon the flourishing of separate service cultures or the healthy competitiveness that they naturally engender. Given the current direction of the Joint Staff and ACOM, this will soon become a major problem. Jointness is not the dumbing down to a common standard of employment. Employment capitalizes upon all of the strengths of each services weapon systems and tactics.[23]

J-SEAD

There are three categories of J-SEAD. They provide a macrodescription of the J-SEAD responsibilities of forces tasked to complete them. The three categories are AOR/JOA air defense system suppression, localized suppression, and opportune suppression. The USAF F-16 SEAD pilots must be trained in each mission area with each of the services prior to combat. Each mission area may use different tactical employment TTPs. The USAF J-SEAD training program should focus primarily on localized and opportune suppression missions because they are the most demanding and most likely. Localized and opportune suppression missions are essential to service combat operations.

J-SEAD is a subset of offensive counterair operations. J-SEAD is any activity that neutralizes, destroys, or temporarily degrades enemy surface-based air defenses by destructive or disruptive means. A better definition would delete the reference to *surface based* threats. An air- or space-based system can be part of an enemy's air defense system. An effective J-SEAD campaign attacks all aspects of an enemy's air defense system. Effective J-SEAD campaigns systematically target enemy command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) elements, while attacking operational weapon systems. Surface systems include all classes of SAMs; AAA; early-warning; acquisition (EW/AQ) radars; airborne command control, and communications (ABCCC) platforms; airborne warning and control system (AWACS)-type aircraft; enemy defensive aircraft; and enemy space communications, reconnaissance, and surveillance systems. The U.S. warfighting community has not recognized the importance of J-SEAD or how it is a functional part of information operations (IO) or space operations. J-SEAD is the one mission that allows U.S. forces to conduct all other missions. J-SEAD is directly nested within dominant maneuver and air and space dominance.

USAF F-16 J-SEAD missions employ two primary joint suppression measures: destructive means and disruptive means. Destructive means seek to destroy target systems or operating personnel. Destructive J-SEAD missions use general-purpose (GP) bombs, laser-guided bombs (LGBs), global-positioning system (GPS)-based weapons and area munitions to attack targets. Disruptive means temporarily deny, degrade, deceive, delay, or neutralize enemy air defense systems. Disruptive J-SEAD missions use active and passive weapons to achieve operational objectives. The active weapons include HARM, directed energy weapons, jamming, chaff and flare, tactics, and unmanned aerial vehicles (UAVs). The passive measures include emissions control, camouflage, infrared shielding, stealth, radar absorbing material or LO.[24]

SEAD

SEAD is any activity that neutralizes, destroys, or temporarily degrades enemy air defense systems in a specific area to enable air operations to be successfully completed. SEAD is critical for all airborne operations. CAS, air interdiction (AI), strike missions, and attack operations in support of surface operations require SEAD fires against the many threat systems that comprise an IADS. A critical element in performing SEAD is locating enemy air defense weapons and facilities. The USAF F-16 HTS is the only U.S. tactical fighter aircraft capable of autonomously locating, identifying, and targeting all mobile SAM and AAA weapon systems in real-time. This unique capability makes the F-16 HTS a valuable asset to any J-SEAD operation.

> The operational objective of SEAD is to neutralize air defense forces through lethal and non-lethal means. The primary operational tasks are to defeat fixed and mobile surface-to-air threats. Lethal SEAD platforms must be capable of both reactive suppression and preemptive destruction of an enemy's Integrated Air Defense System (IADS). Reactive suppression requires fighters to detect, identify (ID) and locate surface-to-air threats, employ weapons in a time critical environment to protect friendly forces from hostile engagement. The preemptive destruction mission allows more flexibility in targeting (off-board targeting is possible) with the objective being to locate and destroy mobile and fixed targets in advance of a strike package at a time of our choosing. Non-lethal SEAD platforms assist attack force assets in accomplishing missions by employing ECM against radars and communications (voice/datalink) systems, IFF, ATC systems, AWACS and navigation systems to allow the lethal SEAD and attack assets to marshal, penetrate, and egress selected target areas, thereby increasing their survivability. Specifically the operational task consist of radar jamming by EA-6B aircraft and counter C2 by EC-130 Compass Call aircraft.[25]

Joint Training Planning

The Under Secretary of Defense for Personnel and Readiness is responsible for providing overall policy and program review for all military training programs. For joint training, this office has confined its oversight to reviews of funding requests for planned exercises. The Joint Staff is ultimately responsible for joint training. Its is responsible for integrating combatant forces into an efficient team of land, naval, and air forces. The JCS is responsible for developing joint doctrine and joint training policies. The JCS advises the Secretary of Defense on joint training priorities, oversees CINC activities, and establishes a uniform system for evaluating joint

training. The JCS has designated ACOM as the joint staff focal point to monitor and coordinate joint training policies with the Office of the Secretary of Defense, CINCs, and the services. Ultimately, joint training relies on the efficient and effective execution of joint exercises and training events.

CINCs are responsible for determining joint training requirements for forces within their areas of operation, developing training plans, and directing all aspects of joint training, including the conduct and evaluation of joint exercises. The services are responsible for training their forces in basic service skills, such as infantry, armor, and aviation, so that they can be integrated with forces from the other services, when needed, in joint exercises and operations.

Joint training exercises are measured by CINC defined standards. CINC training standards state the degree of proficiency to which a joint organization or force must perform a JMET under a specified set of conditions. "A standard consists of two parameters: a measure and a criterion. A measure provides a common basis for describing varying levels of task performance. The criterion is set by the commander and defines acceptable levels of performance."[26] The U.S. Joint Chiefs of Staff, *Joint Training Manual for the Armed Forces of the United States*, CJCSM 3500.03, lists five tenets of joint training that must be considered when developing a J-SEAD training program:

1. Warfighting Mission Focus. The central theme of the JTS is the focus on the combatant commands' primary warfighting missions. By focusing on assigned warfighting missions, training is intentionally linked to the most dangerous as well as most likely missions assigned to the combatant commands via the Joint Strategic Capabilities Plan (JSCP).
2. Train the Way You Intend to Fight. Joint training events should be designed to reflect actual operational requirements. Conditions should represent worst-case constraints and assumptions from operation plans. Standards should reflect actual combat performance requirements.
3. Commanders Are the Primary Trainers. Commanders at all echelons are responsible for preparing their commands to accomplish assigned missions. The JTS is ultimately a tool for the commander. Commanders are also responsible for the accuracy, integrity, and proper distribution of joint training assessments.
4. Apply Joint Doctrine. Effective training must be based on the concepts likely to be employed in actual operations. Joint doctrine establishes the fundamentals of joint

operations and provides guidance on how to best employ forces to achieve assigned objectives. Joint Pub 1, "Joint Warfare for the Armed Forces of the United States," Joint Pub 0-2, "Unified Action Armed Forces (UNAAF)," and supporting doctrinal publications describe common procedures and uniform operational methods that permit commanders and organizations to plan and adjust to rapidly changing situations.

5. Centralize Planning, Decentralize Execution. In actual operations, centralized planning and decentralized execution is intended to provide organizational flexibility. Decisions are made where and when necessary by subordinate commanders consistent with available resources and the superior commander's intentions, priorities, and mission objectives. Training methods should mirror operational techniques without constraining the on-scene commander.[27]

Joint staff guidance requires that training should emphasize warfighting missions and focus on major regional contingencies before other less critical training is accomplished. From fiscal year 1995 to 2002, 1,405 exercises are planned as part of the CJCS exercise program at the five regional commands. Only 60 percent of these missions can be linked to joint training. The objectives of these exercises are to ensure that U.S. forces are trained to conduct their highest priority missions contained in regional command contingency plans and provide joint training for forces.[28] The majority of the exercises focus on battle staff training.

The services have historically emphasized the need to train the various components together to ensure synchronized tactics. The complexity of current joint operations, which often involve the integration of diverse land, sea, and air assets from all military services, makes joint training even more essential to the effective execution of joint military operations. Future operations will increasingly be joint. Stateside-based SEAD forces need to train together to provide the needed J-SEAD capability to the CINCs. J-SEAD training is essential if joint forces are to succeed in combat.

Training readiness is the component of overall readiness that reflects the ability of a unit to perform an assigned task to a given standard. "We define joint training readiness as that of military units and enablers from different services working together to accomplish a mission that requires the coordination of their forces. It includes the training readiness of the joint headquarters and of the assigned and supporting service forces working together."[29]

ACOM's joint training and exercise process must focus on the requirements of supported CINCs. Tier-one SEAD training focuses on service-specific training for the development of core SEAD employment competencies on the USAF mission essential task list. Tier-two training and joint interoperability training is achieved through field-training exercises based on a list of critical interoperability tasks from supported CINCs. These tasks should include J-SEAD.

ACOM

ACOM is responsible for training stateside-based forces in joint doctrine and JTTPs for deployment anywhere in the world. ACOM also sponsors theater exercises that focus on unique missions. The five-year defense program planning for 1995-1999 provides detailed training guidance to CINCs. The five year defense program places greater emphasis on joint exercises and training to stress interoperability and joint warfighting doctrine in order to prepare JFCs and staffs for crisis and contingency operations. "Current JCS and JV 2010 guidance stresses using technology (including simulations) to improve training at a reduced cost."[30] Financial hardship brought about by years of reduced defense funding has significantly impacted ACOMs implementation of joint training through the JTS. ACOM is proposing to replace the majority of the field-training exercises (FTXs) with simulation-based training exercises. This change will place more training emphasis on battle staffs at the expense of the warfighter.

Civilian contractors promote warfighting models and simulators as low-cost replacements for expensive tier-two FTXs. Simulators are good procedural trainers for warfighters. Simulator-based training may enhance flying training, but does not replace it. "Simulation-supported joint staff training has replaced joint field exercise staff training at ACOM because it provides JTF headquarters training at less cost."[31] The utility of simulator training beyond procedural staff training is limited based upon the inaccuracies of the assumptions used in the warfighting models, simulation model incompatibilities and a lack of realistic training for warfighters. Doctrine

should not be rewritten based upon the results of simulated exercises. All simulation results should be verified during realistic FTXs before they are considered valid.

Warfighting forces require live training events to exercise all aspects of the employment of their weapon systems. The weapons load crews need to practice reloading jets, the crew chiefs need to practice surge operations, and the mechanics need constant training to maintain proficiency. The pilots must experience the unique stress-filled environment of manned flight in their employment training. Simulations do not cause the same level of combat-like stress that is associated with a live-training event. Simulation cannot accurately replicate the human element in all processes or the fog of war. The limitations to simulator-training systems are numerous. Their primary utility is as a low-cost, procedural-training device, despite what the contractors may claim. Warfighting commanders have not yet demanded that ACOM keep the FTX funding at current levels. If ACOM continues to be enamoured by contractor-promoted simulator training technologies, warfighters will continue to lose their warfighting skills and possibly their lives in combat. If ACOM replaces FTX training with simulator training for warfighting forces, the U.S. warfighting readiness will be reduced to dangerous levels.

The JTS is designed to identify the funding levels required to fully resource CINC plans for joint training. All joint training is planned to exercise joint and service doctrine. ACOM has a responsibility to request enough funds to ensure tier II FTXs and other live-training events are funded at current levels as a minimum. The CINCs must formally articulate joint training event requirements for warfighters. Their success in combat will depend on the effectiveness of the tier-two training events conducted under the JTS.

Joint Training System

The JTS is designed to focus on warfighting. The specific objective of the JTS is to develop a joint training program that bolsters the ability of combatant commanders to execute the

National Military Strategy while simultaneously maintaining high readiness of U.S. forces. The results of an effective joint training process should be improved readiness of joint forces, a training and exercise strategy better aligned with the National Military Strategy, improved interoperability, and a more stable process for optimizing the application of scarce resources (dollars, forces, and time).

> The JTS defines a multi-step approach to identify requirements, plan, execute, and assess joint training events. The first step is to develop joint training requirements documented in the command Joint Mission Essential Task List (JMETL). Next, the combatant commands' develop Joint Training Plans (JTPs) based on their JMETL. Required training events identified in the JTPs are scheduled. Schedule extracts are consolidated and published within a single document--the CJCS Joint Training Master Schedule (JTMS). Combatant commands then execute training events, evaluate training proficiency, and assess the results. Finally, strengths and shortcomings are documented and recommendations developed to enhance future training programs or provide training input to other programs.[32]

Joint Training Program

Training occurs in one of six categories: service, component interoperability, joint, multinational interoperability, joint, multinational, and interagency. Training enhances individual and unit abilities to perform specified tasks. Joint individual training and joint collective training are conducted to enhance joint readiness.

J-SEAD training requirements for each of the six categories should be incorporated into the JTP. J-SEAD needs to be specified as a JMET to receive JTP planning emphasis. J-SEAD is not listed as a JMET and therefore will not be addressed in the JTP. The JTP process analyzes JMETs for warfighting capability requirements. These broad requirements are refined to address a specific training audience. In a future J-SEAD exercise, the audience should consist of J-SEAD assets likely to be utilized in a similar wartime scenario. The refined and assessed J-SEAD training audience should be considered as the commander formulates training guidance. J-SEAD training objectives should be developed to support applicable JMETs, the J-SEAD training audience, and the commander's guidance. Specific J-SEAD training methods should be developed to ensure all

aspects of the J-SEAD JMETs are satisfied. The training methods should then be integrated into the design of an FTX. The J-SEAD developed FTX is then published in the JTP. ACOM is responsible for submitting a resource request through the JCS for FTX funding. Once funding is approved, the FTX is scheduled. The process is straightforward and could easily emphasize J-SEAD training. The JTP will not address J-SEAD until the CINCs specify J-SEAD as a JMET.

An FTX is an exercise performed in the field under simulated operational conditions. Joint field training focuses on performing tasks at the tactical level of war and typically exercises joint tactics, techniques, and procedures. The training audience includes all echelons below the JFC. Emphasis is placed on CINC-sponsored interoperability requirements derived from operational mission analysis.

J-SEAD training is essential from the JFC down to the individual USAF F-16 SEAD pilot. J-SEAD training can be enhanced with wartime simulations. The process training commanders and their staffs receive during simulation training allows them to operate more efficiently during the more-expensive FTXs. The C2 and battle staff tier III simulator-training events are more cost effective than FTXs. Tier-III training is only one aspect of the required training ACOM should focus on. ACOM must realize the cost savings and effectiveness of simulation training at the tier III levels does not satisfy the tier I and tier II training requirements for warfighters. "It may be more effective and less expensive to have commanders and staffs participate in computer-driven distributed simulations at their home stations. . . . On the other hand, such training cannot replace individual or unit FTX training."[33]

Joint Mission Essential Tasks List

The JMETL is a subset of joint tasks that each combatant commander determines essential to accomplishing the command's missions. An essential task is defined as one where the mission has a high probability of failure if it is not accomplished successfully. The tasks

essential to mission accomplishment are selected as JMETs. Therefore, the JMETs should receive sufficient training resources to ensure that a high degree of proficiency is achieved and maintained. Planners and trainers should work closely to ensure JMET selection is fully aligned with operational planning. J-SEAD fits the JMET selection criteria exactly. If J-SEAD missions are not successful, then all aerospace operations are at risk of failure.

A JMET defines a joint mission capability requirement. The CJCS, defense agencies, and service component commanders develop JMETLs, agency METLs (AMETLs), and service component METLs. Just as JMETL tasks are used to derive training objectives for the combatant commands in the planning phase of the JTS, the AMETLs and service component METLs are used to derive training objectives for their organizations.[34] J-SEAD is not listed as an AMETL or a USAF METL. J-SEAD does fit the criteria to be listed as a METL and therefore should be listed as a mission essential task. JMET-developed exercises benefit warfighting commanders in two important ways. They provide valuable training opportunities for their forces, and they allow the commanders to assess the proficiency level of their forces in specific mission essential tasks.

Joint Simulation System

The JSIMS is an element of ACOM's JTS. JSIMS supports joint and service training, operational mission rehearsal, education, and the assessment of joint and service strengths and shortcomings in doctrine, organization, training, material, education, and personnel. Approved military doctrine provides the foundation for JSIMS to support the challenge of assessing and preparing for future operations.[35] The primary utility of JSIMS is as a training aid for CINCs, JTF commanders, and battle staffs. It has little operational utility for warfighters.

Combatant Commanders

According to chapter 6, Title 10, of the U.S. Code, a CINC has a responsibility for the readiness of his forces and has the authority to give directions to subordinate commands and forces necessary to carry out missions assigned to the command. Each combatant command develops an annual training plan. The commander in chief's joint training plan (CINC JTP) is developed and updated annually by each CINC. The CINC JTP defines the methods used to train assigned forces in joint doctrine and TTPs to accomplish the JMTL requirements over the selected training period. "The plan identifies the training audience, the joint training objectives, the training events, and required training resources."[36]

CINCs will not be able to determine J-SEAD training readiness until they identify J-SEAD as a JMET item. "CINCs get a generic view of training readiness from SORTs, but they do not know a units' capability to perform joint missions, specific service tasks, or missions. . . . Neither CINCs nor services have a way to estimate future training readiness."[37]

USAF

The Joint Integration Directorate (JID) within the Air Force's Doctrine Center (AFDC) interfaces with other services' doctrine development activities and the Joint Warfighting Center at ACOM. "The JID participates in the planning and execution of joint war games and exercises to ensure scenarios provide a realistic depiction of the uses and impacts of air and space power."[38] JID's current exercise planning and execution does not consider J-SEAD METs because they do not exist. The JCS, ACOM, and CINCs need to develop joint training requirements for units participating in service component exercises. Existing service component exercises need continued funding to provide opportunities to train jointly. These are the future instruments of an effective J-SEAD training program.

The USAF has not been required to establish unit-level joint training event requirements for USAF F-16 SEAD pilots. A lack of joint training requirements results in a lack of J-SEAD flying training. "Air Force commanders specify the tasks units are to train and manage in the Air Force training readiness system."[39] The tier I and II training requirements will not address J-SEAD until USAF commanders are directed to do so by the JCS, ACOM, or the CINCs.

Air Combat Command Director of Operations

Service component commanders' responsibilities are derived from their roles in fulfilling the services support function. Service component commanders are responsible to the JFC for conducting joint training. This includes training of other service components in joint operations for which the component commander has or may be assigned primary responsibility. Headquarters ACC/DO will develop ACC exercise AF Mission Essential Tasks for the JTP.[40]

The Air Force has not identified J-SEAD as a TA task on the UJTL or as an AFMET. Before the EF-111 was retired from active service, the USAF was capable of performing single-service SEAD. The USAF is no longer capable of single-service SEAD and therefore must add J-SEAD to the UJTL to reflect this new mission essential task. The USAF uses its mission area plan (MAP) to define various functional missions for the USAF. The MAP must be updated to list J-SEAD as a primary functional area when the Air Force updates the UJTL to reflect J-SEAD as a TA. This is important because the MAP is used to define future USAF requirements.

ACC Joint Exercise Coordination Team

The Air Combat Command joint exercise coordination team (AJECT) is responsible for consolidating the warfighter's essential joint training requirements.

> The ACC Joint Exercise Coordination Team (AJECT) serves as ACC's central focal point for deconflicting, prioritizing, developing, coordinating, executing and assessing the efficient and doctrinally correct use of air power in CJCS and CINC-sponsored joint

> exercises to ensure realistic and robust readiness training for Air Force war fighters focused on the operational level of war.[41]

AJECT analyzes appropriate lessons learned relative to the training environment and builds a comprehensive requirements-based training plan across the upcoming annual exercise schedule. As part of the annual ACC schedule's conference cycle, AJECT reviews the scheduling year JTP. AJECT specifically, identifies those JMETs related to USAF tasks and the associated AFMETs. AJECT rates the training value of each exercise based on associated JMETs and AFMETs. The scheduling prioritization is based upon the assessed training value.

AFMETs

AFMETs are the tasks the USAF has determined are essential to its warfighting capability. "SEAD is listed in the AFMETL and JMETL, but J-SEAD is not. Every pilot knows their annual USAF training requirements (squares) because they are well defined by the rated aircrew program (RAP). Ask those pilots to tell you what their joint training squares are and where they are defined and you will get a confused look."[42] Joint training requirements for unit-level pilots must be established in order to assess readiness for joint operations. USAF training is a requirements-based process just like the JTS. USAF pilot training requirements are based upon identified AFMETs. Joint training events will not be tasked, accomplished, or assessed until they are identified as a requirement by either the JCS or as an AFMET. The lack of joint training requirements at the unit level should be of great concern to all warfighting CINCs.

Unit

USAF fighter units are scheduled to attend major exercises at least once each eighteen months. Units are allowed to develop unit-specific training objectives for these exercises. The units understand the need for J-SEAD training but do not have the capability to alter the exercise scenario to ensure J-SEAD training objectives can be achieved. The majority of unit training is

conducted at home station. The training requirements for units are based upon AFMETs. Unless J-SEAD is an AFMET and JMET, it will not be considered for training.

The CJCS saw the need to link JMETLs to service-unit training. In his 1997 annual defense report to Congress, the CJCS discussed his plan for nesting JMETLs into unit training. "By the end of FY 1998, the services will link the Component Command Mission Essential Task List (METLs) with the Joint Training System-approved JMETLs, and incorporate the JMETLs as the source for guiding service unit training. Integrating JMETLs into the readiness assessment process will give decision-makers standards of performance against which individual unit capability can be measured."[43] The METLs are nested; however, USAF F-16 SEAD units are not required to accomplish joint training events as part of their annual unit-level training program.

The CINCs need to establish JSEAD as a JMET. The Air Force needs to establish J-SEAD as an AFMET. The two METs should be nested and support tier II training requirements for USAF F-16 J-SEAD pilots. The USAF F-16 SEAD units need these MET-based J-SEAD training requirements in order to develop an effective tier I training program for J-SEAD. USAF F-16 SEAD pilots will be required to employ in J-SEAD packages in future operations. They must be afforded the opportunity to train jointly if they are to develop effective TTPs that allow them to employ efficiently. J-SEAD training in peacetime exercises has a direct correlation to successful J-SEAD operations in combat. Realistic J-SEAD flying training is expensive, but it is worth the cost of the aircraft and crews that will be saved in combat because of it.

Training Ranges and Exercises

The analysis focuses on training ranges and exercises that offer J-SEAD training opportunities to USAF F-16 SEAD pilots. A common dilemma faced by many commanders is that too many requirements are placed upon too few resources. Hard trade-offs are often required to ensure a balance between programs that most often compete for the same resources. "Choices

must be made to ensure that the tasks essential to accomplishing the most important warfighting missions are trained before other less critical training requirements in joint as well as service training programs."[44] USAF leaders and CINCs should consider J-SEAD one of the most critical training requirements for USAF F-16 SEAD units. Air superiority cannot be achieved without an effective J-SEAD campaign. "To ensure the most effective allocation of limited training resources, commands should identify their requirements based on mission priorities. Training for war remains the highest training priority."[45] USAF F-16 SEAD pilots must be trained in J-SEAD employment to be effective in combat. All joint forces will rely on the effectiveness of J-SEAD forces in combat. J-SEAD training should receive the highest training priority based upon its importance. The USAF must develop a J-SEAD training program consistent with its importance.

The USAF J-SEAD training program should include three distinct J-SEAD training elements. Effective training should use a building-block approach. J-SEAD training should start at the unit level by building on USAF SEAD continuation training. J-SEAD employment training allows USAF F-16 SEAD pilots to participate in local, small-scale, J-SEAD interoperability, training events. This training is achieved by conducting home station out and back flying training events. USAF F-16 SEAD pilots should routinely train with Army, Navy, and Marine units at nearby training ranges to develop an understanding of basic employment considerations, and interoperability limitations and to build teamwork. The local ranges support small-scale joint flying training but will not support major exercises due to airspace or range restrictions or limitations. The integration training learned through J-SEAD employment training at the unit level should then be expanded in service command sponsored exercises at larger range complexes. These exercises can provide training for USAF F-16 SEAD pilots in J-SEAD JTTPs and focus on each mission area that will require SEAD support in combat. J-SEAD training culminates when J-SEAD experience gained through all previous training is exercised in support of an offensive campaign scenario at one of the JTS developed joint exercises.

USAF F-16 J-SEAD pilot training objectives are nested throughout this envisioned J-SEAD training program. The training program focuses on the USAF F-16 SEAD pilot first and then builds experience and proficiency in the required J-SEAD tasks until the final mission of campaign support in combat. The building-block approach allows pilots to gain experience and proficiency in increasingly demanding elements of the overall J-SEAD mission.

J-SEAD is an extremely demanding mission for USAF F-16 SEAD pilots. They must achieve proficiency and experience at each step of the training process. A systematic building-block approach is necessary. A high school junior varsity football player must develop playing skills through years of practice in high school and collegiate football before playing in the National Football League. An Air Force F-16 SEAD pilot must follow the same type of training regiment to be ready for professional-level J-SEAD employment in combat.

J-SEAD training must be realistic. Training exercises based upon simulation, scripted scenarios, notional threats, or notional J-SEAD assets promote negative training. Pilots are not exposed to the limitations of JTTPs unless all J-SEAD elements are provided an opportunity to train together in peacetime. Training scenarios must replicate threat IADS that can be expected in combat. "Training exercises must reflect operational reality and include problem solving."[46] Scripted and computer-based simulation training is dangerous because it does not allow pilots to understand what is required for effective coordination, planning, or employment in combat.

Military training exercises and operations provide an unparalleled opportunity for the services to assess the performance and capabilities of their forces under realistic conditions. Moreover, these experiences often result in lessons learned, which can identify and publicize recurring problems. These lessons learned can then be used to develop corrective actions to prevent others from repeating past mistakes. Major training exercises enable combat units to train in an environment that closely parallels actual warfare. The military services rely upon major training exercises to assess their units' strengths and weaknesses. J-SEAD training for

service and joint exercises can be supported at several range complexes worldwide. This analysis considers a range complex conducive to J-SEAD training if it incorporates, or is capable of incorporating radar-emitting threats in training exercises. The ranges at major exercises should incorporate an aircraft-tracking system to enhance pilot debriefs and weapons employment evaluations. The ranges should finally authorize electronic-jamming systems for all forces.

The following range complexes provide unique J-SEAD training opportunities in various climates and terrain for continental U.S. (CONUS) training exercises. CONUS training ranges that support large-scale exercises include: the Nellis range complex, Utah Test and Tactics Range (UTTR), Fallon Range Complex, Cherry Point Range Complex, Twenty-Nine Palms Range complex at China Lake, National Training Center (NTC), and the Joint Readiness Training Center (JRTC). The Nellis, Fallon, UTTR, NTC, and China Lake range complexes provide mountainous and desert training environments. JRTC provides a wooded, rolling terrain and high-humidity training environment. Cherry Point provides a wooded and high-humidity training environment in close proximity to the Atlantic Ocean.

Each of the following outside the continental U.S. (OCONUS) range complexes provide unique J-SEAD training opportunities in various climates and terrain. OCONUS training ranges that support large-scale exercises include: the Cope Thunder range complex in Alaska, the Maple Flag range complex in Canada, and the Combat Maneuver Training Center (CMTC) at Hohenfels Germany. The Maple Flag and Cope Thunder training ranges provide hilly, wooded, and mountainous cold-weather training environments. The CMTC provides a unique European training environment year-round.

The following recurring joint exercises offer valuable J-SEAD training opportunities at locations other than the above listed training ranges. The all-service combat identification evaluation and test (ASCIET) activates range space specifically for exercise purposes. The range space provides a high-humidity, wooded, and over-water training environment. Roving Sands

exercises are conducted in exercise activated range space north of Fort Bliss. The Roving Sands exercise range space provides both desert and mountainous training environments. Harpoonex and Giant Warrior Range space is near the island of Guam. These exercises activate over-water training ranges that support HARM live-fire events. Cope North training activates a training range in the vicinity of Misawa, Iwakuni and Okinawa Japan. These ranges provide both over-water and humid-land training environments. Commander seventh fleet (COMSEVENTHFLT) units conduct wars at Sea Exercises (WASEXs) on a regular basis. WASEXs offer J-SEAD training opportunities in an open-ocean environment. Joint task force exercise (JTFEX) incorporates some limited J-SEAD training, but focuses mainly on battle staff training. JTFEX ranges offer both over-water and humid-land training environments. Bright Star exercises offer coalition and J-SEAD training opportunities for USAF F-16 SEAD pilots in the desert environment of Egypt. Foal Eagle and Ulchi-Focus Lens exercises provide unique J-SEAD training opportunities in Korea.

These CONUS and OCONUS exercises and training ranges can provide realistic J-SEAD training opportunities for USAF F-16 pilots. The JCS, CINCs, ACOM, and the USAF need to identify J-SEAD as a high-priority mission essential task to ensure J-SEAD training for pilots is emphasized. J-SEAD training for USAF F-16 SEAD pilots must be an exercise objective of every major live fly exercise. The previously listed exercise locations offer terrain and weather conditions that directly replicate any possible theater of war. The ranges are large enough to permit effective J-SEAD tactical employment by all J-SEAD forces.

Service SEAD Operations

United States Army

J-SEAD success is crucial to the employment of Army aviation, light infantry, and light artillery at depth. J-SEAD operations with Army assets require close coordination to prevent

fratricide, double targeting, or impediments to operational tempo. Integration and planning must occur at the operational level to ensure all assets are mutually supporting. This requires training to develop effective JTTPs and doctrine. Many of the interoperability issues associated with joint employment can only be addressed in a realistic combat training environment. Coordination is required to ensure air assets are deconflicted with the Army tactical missile system (ATACMS) firings. Opportune suppression and reactive J-SEAD employment is highly likely in Army close and deep employment scenarios. J-SEAD forces must coordinate and deconflict fires to ensure all threats are effectively targeted or avoided. "Fire support and J-SEAD operations must be fully integrated in deep attack operations. Land Component Commanders employ field artillery and aviation simultaneously throughout the battlespace with precision fires at depth to bewilder and overwhelm the enemy. Fire support for J-SEAD becomes increasingly important to support attack aviation as they conduct raids and ambushes in depth."[47] Army aviation and other joint air assets require localized air superiority to conduct these operations effectively. Air superiority can only be achieved through an effective J-SEAD campaign.

The request process for J-SEAD support from army forces is discussed in TACP 50-23. The battlefield coordination detachment (BCD) is charged with Army and Air Force integration for J-SEAD operations. Ground forces are responsible for J-SEAD up to the limits of observed fire. USAF SEAD is employed only in a support role and only when requested by the Army. Army SEAD may not be capable of effective localized suppression in many cases. The Army's single-service limitation against mobile or undetected SAMs and AAA may require USAF F-16 SEAD. Beyond the limits of observed fire, the Air Force has primary SEAD responsibilities. Army landing zones for air assault operations are normally 125 to150 kilometers in front of friendly forces. Special operations force (SOF) operations may employ at greater ranges. Air superiority must be achieved prior to conducting these operations. Deep operations will rely upon USAF and USN or Marine Corps J-SEAD support and Army Apache Hellfire J-SEAD

integration. Air assault operations are always joint and combined arms operations. J-SEAD training is required based on two of the five Army basic tenants. Specifically, their ability to ensure that operational fires and maneuver operate in depth. Without effective J-SEAD, this is not attainable. Synchronization is a critical component for Army deep operations. J-SEAD must be synchronized to ensure the Army can mass combat power at the decisive point. This can only be accomplished by arranging combat activities in time and space. Synchronization demands J-SEAD forces are not only afforded the opportunity to plan and coordinate in training, they must be afforded the opportunity to employ together to build trust in each others capabilities. This can only be achieved through J-SEAD training.

The Army's operations staff (G3) is responsible for SEAD operations. The G3 delegates lethal and nonlethal fires to the fire support element (FSE). The enemy electronic order of battle (EOB) and electronic warfare (EW) support development is managed by the intelligence staff (G2). This makes effective J-SEAD difficult. USAF, USN, or Marine Corps planners must coordinate with four organizations to ensure synergy in their J-SEAD plans. USAF warfighters at the tactical level do not have direct contact with any of these elements. They must coordinate plans, procedures, and tactics through the AOC to the BCD to the G3, G2, and FSE. This process is not exercised in training. Effective training should allow the development of efficient JTTPs that simplify the coordination and J-SEAD request process. Army aviation and FSE must have a streamlined process to request and coordinate J-SEAD support operations with other J-SEAD assets.

United States Navy

The Navy does not have a dedicated SEAD platform. All of its weapon systems are designed, by necessity, as multifunction platforms due to limited deck space on aircraft carriers. Naval SEAD operations are normally conducted in support of fleet operations. The surface

warfare commander (SWC) has complete tasking authority over all naval SEAD assets. This is unique when compared to the organizational structure of the other three services. "The Navy, by virtue of its role as a self-contained force, plans for very little joint support for its fleet operations. There are coordination procedures with the USAF for joint maritime operations, predominantly for joint strikes against an enemy fleet."[48] Additionally, while not planning for significant joint support, the Navy also does not overly commit itself to J-SEAD. "For example, it is not a signatory to the multi-service J-SEAD procedures manual, though the preface notes that the Navy information included in the publication was coordinated."[49] The majority of naval SEAD missions are in support of Marine Corps landing force operations. The Navy like the Marine Corps is not overly anxious to parcel out its SEAD capable assets to a JFACC. Unless they participate in joint exercises with USAF pilots, they will not understand how best to employ USAF F-16 HTS aircraft during the times that they have the preponderance of aircraft in a theater and are designated as the JFACC. When the Navy is the JFACC, they are in charge as the J-SEAD coordinator.

United States Marine Corps

The Marine Corps SEAD program functionally combines the Air Force, Navy, and Army SEAD programs. Their artillery support for SEAD is managed through a fire support coordination center (FSCC). Their air operations are managed through an air coordination element. Support and planning responsibilities transcend two staff structures during a landing operation. "The commander, amphibious task force (CATF), has overall control of the landing force and all its naval air and artillery support. After establishing command and control facilities ashore, the commander, landing force (CLF) assumes responsibility for these operations."[50] The Marine air-ground task force (MAGTAF) commander is the CLF. Once ashore, SEAD operations are conducted in support of both Marine close and deep operations. Operators do not

control the EW assets of the MAGTAF. Marine and Army EW assets are both controlled by their respective intelligence division's J2. The MAGTAF EW assets suffer the same association troubles as the Army. They are not always considered part of the SEAD offensive component. Instead, they are often viewed as just another intelligence asset. Separation of MAGTAF SEAD assets for J-SEAD operations is not addressed or practiced outside of naval operations in the majority of MAGTAF exercises and operations. This is a significant J-SEAD training challenge for USAF F-16 SEAD pilots.

United States Air Force

The Air Force SEAD program is orchestrated from the air operations center (AOC). The AOC coordinates with the Army through the BCD for close operations and deep operations involving Army assets. The AOC allocates forces, matches targets to missions, and deconflicts air operations through the air tasking order (ATO). USAF EC package and mission commanders conduct employment planning and coordination at the tactical level. USAF EW forces play a significant role in the planning, execution, and postmission analysis phases of SEAD operations.

J-SEAD

This section explores J-SEAD concepts of employment for USAF F-16 SEAD pilots. Single-service SEAD requirements are assessed to determine USAF J-SEAD employment applicability. The measure of effectiveness for J-SEAD operations is safe passage, unopposed weapons employment, and safe return of offensive air forces. An effective J-SEAD campaign targets the eyes, ears, and teeth of a threats IADS. Effective J-SEAD training allows U.S. forces to determine the most efficient targeting schemes and employment tactics required to attack different IADS in peacetime rather than during the course of a battle.

Synchronization is a critical aspect of J-SEAD mission employment. J-SEAD activities must be arranged in time, space, and purpose to produce maximum effects when they are required. Electronic jamming must be coordinated to not only mask supported aircraft, but to stimulate threats or force them into long on-air or autonomous operations during J-SEAD ARM employment. Electronic jamming and ARM employment must be synchronized with precision or conventional employment to enhance the success of destructive lethal SEAD missions. This is referred to as destruction of enemy air defenses (DEAD) in USAF TTPs. Tactical J-SEAD operations must be synchronized with tactical and national collection efforts to enhance J-SEAD battle damage assessments and campaign effectiveness assessments. J-SEAD forces require extensive live training in order to develop effective JTTPs that effectively synchronize activities.

Joint doctrine is primarily based upon single-service SEAD employment instead of J-SEAD employment. Joint doctrine treats SEAD as though it is synonymous with J-SEAD. The only distinction being the number of services participating in the SEAD campaign. Most joint doctrine delineates SEAD and J-SEAD responsibilities between land, sea, and air forces based on the limits of observed fire. The definition of observed fires can be interpreted differently by each component commander resulting in boundary gaps or overlaps in J-SEAD support. J-SEAD employment is not limited to component operational boundaries. Component boundaries are a by-product of a single-service SEAD employment doctrine and TTPs. An effective J-SEAD training program would provide valuable insight into the differences between single-service and joint SEAD. A telling example of this lack of understanding can be found in Field Manual (FM) 90-20, *Joint Air Attack Team (JAAT) Operations JTTPs*. "In the engagement area, J-SEAD is an inherent part of JAAT Operations. . . . A separate J-SEAD operation may be conducted along flight routes outside of the JAAT engagement area to assist aircraft ingress and egress."[51] Localized and opportune suppression employment does not delineate the JAAT support from package ingress or egress J-SEAD requirements. Army doctrine also lists very specific

procedures for requesting CAS when it is required. SEAD and J-SEAD request procedures are mentioned but not described. This oversight could have severe implications in combat.

Future SEAD missions must be joint by necessity. There are not enough single-service SEAD weapons or systems to effectively target all IADS on every battlefield. JFCs and CINCs need the synergistic effects of joint application of J-SEAD forces to achieve strategic, operational, and tactical objectives. J-SEAD should be a JMETL with applicability across the complete spectrum of land, sea, air, and space warfare. J-SEAD training must be emphasized in peacetime to realize the benefits of a synchronized J-SEAD campaign in combat.

Joint Publication 3-01.4

JP 3-01.4, *Joint Tactics, Techniques, and Procedures for Joint Suppression of Enemy Air Defenses (J-SEAD,* focuses primarily on J-SEAD planning, coordination, and command and control responsibilities. It is not a tactical employment document. "The practical link between tactical level SEAD and operational level J-SEAD is not present. The development of this critical link requires a basic knowledge of service approaches to SEAD."[52]

JP 3-01.4 is very misleading in its description of the J-SEAD planning and execution process. Any reader unfamiliar with operational J-SEAD mission employment would be led to believe that the JFC, J-3, JFACC, and other component commanders conduct all J-SEAD mission planning and execution. Battle managers do not have the experience, competency, or manning to accomplish everything that JP 3-01.4 states they do. JP 3-01.4 promotes centralized control and centralized execution. Battle micromanagement is not effective in peacetime or combat. Mission planning and execution responsibilities must be delegated down to the warfighter who is actually conducting the mission. JP 3-01.4 does not address the operational information requirements for pilots. JP 3-01.4 states that component commanders conduct detailed mission planning for J-SEAD operations. This responsibility is normally delegated to the EC package commander

through the ATO. The EC package commander and the forces participating in the missions conduct detailed mission planning. JP 3-01.4 does not require the J-2 to ensure warfighters have access to threat data collected by national and theater assets. The “real” warfighters have been left out of the information age. They do not have the same connectivity as the battle managers. They have very little exposure to the J-SEAD planning data that is readily available to JFC staffs. Very few USAF F-16 SEAD pilots have either the security clearance or facilities to access data classified above secret. This limitation directly impacts USAF F-16 SEAD pilot requests for intelligence support for their missions.

J-SEAD TTPs found in JP 3-01.4 attempt to separate the warfighters from the planning process. AOR/JOA air defense system suppression, localized suppression, and opportune suppression all require close coordination between operators and battle managers. Battle managers rely upon the unique expertise of each operational element of the J-SEAD force structure to provide realistic employment tasking. Operators rely upon battle management guidance for force allocation, ROE, and targeting priorities. Battle managers should be responsible for high-level coordination necessary to task J-SEAD forces. Battle managers, by design, should focus on strategic and campaign planning and express their objectives through effective and efficient tasking of combat ready J-SEAD warfighting forces. The function of the battle staff' is not to coordinate within the J-SEAD mission but between the J-SEAD mission and the other combat functions occurring in the same time and space. The battle managers are responsible for the overall synergy between concurrent missions. JP 3-01.4 TTP shortfalls would be readily apparent to JFC and combatant commanders if J-SEAD training was exercised in conjunction with other JMETL tasks.

USAF

The USAF F-16 HTS possesses a unique (range-known) reactive and preplanned targeting capability that allows this weapon system to support opportune and localized SEAD missions. The F-16 HTS is the only DOD aircraft that is capable of autonomous precision location, emitter identification, and targeting of all fixed and mobile SAM and AAA radars. The F-16 HTS aircraft have the capability to data link SEAD targeting information to other IDM-equipped platforms or relay threat location information using voice communications to any compatible radio system. The USAF F-16 SEAD pilots are capable of communicating with all J-SEAD forces but do not have established JTTPs to execute this capability.

Army

The Army's SEAD campaign is primarily preplanned for air assets that may be threatened by tactical air defense systems. The principal Army suppression weapons are the MLRS and 155-millimeter Howitzer. SEAD targets are reactively targeted when the forward support element (FSE) receives a SEAD fire request. The surface-launched reactive and preplanned suppression fires have limited destructive capabilities due to the FSE's inability to locate, target, and refine fires in real-time against mobile SAMs and AAA. The Army's most effective reactive SEAD weapon system is the Apache Longbow helicopter armed with hellfire missiles. If the FSE is unable to suppress the enemy's air defense capability, the G3 may task Army aviation with a reactive SEAD mission. The tasking process is not responsive enough to support real-time SEAD requirements. Army Apache helicopters primarily conduct opportune suppression. Unlike the USAF, the Army places all EC assets under the control of their intelligence support division (G2). The Army EW capabilities are not well understood by Army combat units and even less so by USAF F-16 SEAD pilots. USAF F-16 SEAD pilots must coordinate with the Army G3, G2, FSE, and BCD components to adequately coordinate, plan,

and deconflict J-SEAD missions. There are no established J-SEAD TTPs that allow an AOC to retask an USAF F-16 SEAD pilot to provide J-SEAD support to Army SEAD forces after takeoff. The risk of fratricide on both sides would be extremely high without established and practiced J-SEAD TTPs. There are no J-SEAD communication procedures for joint missions inside of the FSCL or beyond the FSCL. There are no J-SEAD JTTPs for Army SEAD employment beyond the FSCL. The Army will operate beyond the FSCL during both deep attack and special force (SF) operations. An effective J-SEAD training program will identify all of these shortfalls and provide the warfighters with the experience they need to develop and practice effective TTPs.

USAF F-16 SEAD pilots should train to conduct J-SEAD support of Army close and deep operations. J-SEAD missions should be nested into any CAS, deep attack, or SF operations mission if an air defense threat is expected. USAF F-16 SEAD pilots must practice J-SEAD coordination, planning and execution with Army ground and air units to be effective in combat. Airspace control, J-SEAD targeting priority, jamming deconfliction, and fratricide prevention are all coordination and execution problems that require extensive J-SEAD training for effective employment in combat. The USAF and Army have not developed or practiced J-SEAD TTPs at the unit level. J-SEAD training is required to help Army doctrine writers update their service doctrine. Current Army doctrine does not support integrated J-SEAD operations.

FM 2-20-40, Tactics, Techniques, and Procedures for Fire Support for Brigade operations (HEAVY), does not address SEAD or J-SEAD. FM 6-20-30, Tactics, Techniques, and Procedures for Fire Support for Corps and Division Operations, specifically addresses J-SEAD in appendix B, section V. The J-SEAD concept in this manual is outdated based upon current joint force structures for SEAD systems. The manual fails to recognize the benefits of integrated joint operations. Instead, Army concepts of J-SEAD focus on separate single-service SEAD operations deconflicted by boundaries instead of integrated joint operations that exploit the advantages of each services systems. The Army and Marine Corps Integration (AMCI) in Joint

Operations manual, dated May 1996, describes multiservice TTPs for joint operations. It does not address either the TTPs or the requirement for J-SEAD in support of these operations.

Army, Marine and Air Force J-SEAD training must provide J-SEAD training opportunities in support of close and deep operations, landing operations, CAS, offensive ground maneuvers, assault operations, SOF insertion and extraction operations, and Apache helicopter attack maneuvers.

Navy

The Navy does not possess an integrated sensor system with the same capabilities as the F-16 HTS. Naval SEAD employment TTPs are designed to exploit the capabilities of Naval weapon systems. Navy aircraft require a detailed electronic order of battle in order to achieve targeting effectiveness. Their SEAD weapon systems are not able to detect, identify, and locate undetected mobile air defense systems. This capability limitation significantly reduces their ability to reactively target mobile IADS. Naval aircraft normally employ the HARM in a preplanned range-known mode of operation. Naval reactive HARM employment is predominantly for self-protection. Naval SEAD tactics are optimized for localized suppression missions against known threat systems. J-SEAD is required for effective opportune suppression.

There are no J-SEAD JTTPs for USAF-Navy J-SEAD operations. The F-16 wing at Misawa submitted a request through ACC in July of 1997 to develop J-SEAD tactics. These tactics have not yet been published. The only USAF-Navy J-SEAD training has occurred between EA-6B aircraft and F-16 SEAD units at ACC-managed Green Flag exercises. Integrated J-SEAD missions present synergistic benefits for both USAF and Naval SEAD assets. The USAF F-16 HTS aircraft are very effective at reactive SEAD and have a better lethal SEAD capability against mobile SAMs and AAA due to an extremely accurate autonomous ranging

capability. Integrated J-SEAD training opportunities would allow the pilots to develop JTTPs to effectively suppress then kill most surface-based air defense systems.

An effective J-SEAD training program would expose USAF F-16 SEAD pilots to all carrier battle group (CVBG) operations that require SEAD support. The EA-6B is the Navy and Air Force's primary radar-jamming platform. The EA-6B will be an essential member of any future USAF F-16 SEAD mission. The EA-6B is also the Navy's primary HARM employment platform. EA-6B HARM carriage results in the loss of an external jamming station. Combatant commanders will need to balance HARM carriage with electronic jamming requirements when tasking these limited assets. EA-6B aircraft are extremely limited in range when compared to the endurance capability of the EF-111 Raven. Efficient force management of these high-value assets will probably force combatant commanders to opt for J-SEAD employment over single-service SEAD. USAF F-16 SEAD pilots must train as a mixed flight with EA-6B aircraft because they will be required to provide air support if Navy F/A-18s are not available. The EA-6B requires dedicated air support due to its slow speed and large radar cross section. Navy and USAF SEAD employment tactics are different but effective for their respective weapon systems. J-SEAD training would allow these forces to develop joint tactics that maximize the capabilities of each weapon system. J-SEAD training provides the USAF F-16 SEAD pilots with the opportunity to practice directive targeting of Navy F/A-18s conducting destructive SEAD missions. J-SEAD training with Naval SEAD assets is a natural step because both services currently employ SEAD in support of similar missions. The USAF can no longer afford to think of J-SEAD with the Navy as two separate services conducting SEAD missions in separate areas at the same time. USAF J-SEAD operations must be integrated to protect the same area of responsibility. Naval and USAF J-SEAD training must provide J-SEAD training opportunities in support of CVBG, landing, strike, AI, OCA, and search and rescue operations.

Marine Corps

The Marine Corps SEAD assets are the same as the Navy's, except their assets are primarily dedicated to ground forces. The Marine Corps list J-SEAD as a TA in the UJTL. The Marine Corps believes that their pilots are prepared for J-SEAD employment based on the single-service SEAD training they receive. Marine Corps and USAF J-SEAD training must provide J-SEAD training opportunities in support of deep, landing, strike, AI, OCA, and search and rescue operations. USAF F-16 SEAD pilots are not trained to conduct J-SEAD operations with the Marine Corps. They have not been afforded J-SEAD training opportunities and do not have established JTTPs.

Future Trends

The fiscal year 1998-2003 programs and budgets from the 1997 Annual Defense Report gave the following principal guidance:

> -Readiness and sustainability remain the highest resource priority.
> -Service Chiefs are permitted to reallocate funds to ensure readiness.
> -Readiness programming should reflect the first-to-fight principle. This requires components to maintain appropriate levels of manning, training, equipment procurement, distribution, and maintenance for the most demanding deployment schedules.
> -Increased use of simulations, simulators, and advanced training devices and technologies will be aggressively pursued to increase operational training effectiveness and efficiency for both active and Reserve components, reduce requirements for field training, and aid in planning and programming.[53]

ACOM adhered to this guidance by promoting simulation as a replacement for FTX training for battle staffs and warfighters. There are no studies in the open press that compares simulation training effectiveness to FTX training effectiveness. There are also no comparisons for educational effectiveness. The only comparisons published are cost and efficiency studies. ACOM's simulation-based training program appears to be driven primarily by these factors alone. ACOM's simulation and modeling training program uses current service-developed force-on-force models.

> Aggregate Level Simulation Protocol (ALSP) is a simulator confederation that uses service models to train in a Joint environment. ALSP allows disparate simulations to interact through a common, message-based protocol interface. ALSP connections provide a common environment that supports major ACOM training exercises. An Army model, representing army ground operations, a Navy model, representing naval force operations and an Air Force model, representing air operations, provide an integrated simulation of joint warfare in a theater.[54]

The networked simulators communicating using the ALSP protocol are known as the ALSP confederation. ACOM exercise simulation training is based upon the ALSP confederation. ALSP models do not accurately simulate SEAD, J-SEAD, or EW force employment or effectiveness. The ALSP integrated Army model is flawed. It is a two-dimensional model and does not account for aircraft maneuvers, countermeasures, altitude, speed, aspect, visibility, electromagnetic clutter, or HARM employment. The service models do not interact effectively enough to replicate the effectiveness or ineffectiveness of a given SEAD or J-SEAD campaign. The models do not effectively model J-SEAD and should not be used a JSEAD training replacement for battle staffs or USAF F-16 J-SEAD pilots. CINCs and warfighters should not base future warfighting proficiency on faulty models.

The old adage--garbage in, garbage out--applies to simulator-based training. Simulator models are only as good as the technicians who write the code. The models are not written by warfighters. The service models are designed to support service TTPs and weapon systems. They do not interact in a realistic manner. Simulators can contribute to effective learning. "They should be employed in the area of knowledge levelers that ensure all students are at a baseline level of knowledge and proficiency before beginning expensive live training exercises."[55] ACOM's push for simulator-based joint training has negatively impacted joint readiness training. Simulations conducted during exercises should support procedural training not hamper it. "When over half of the Unified Endeavor '95 participants find the simulation intrusive, the visibility of the models needs to be reduced."[56]

The DOD has not openly addressed the problem and cost of updating aircraft simulations to keep them current with aircraft and weapons systems upgrades. Aircraft, weapons, and sensors are constantly updated by software and hardware upgrades. Traditional unit simulators have lagged behind the capability improvement process by one to two years at USAF wings. This means that by the time the unit received an update to their simulator software, the unit was within a year of changing the aircraft operational flight program. Simulator procedural training utility is negligible if the system does not accurately replicate the aircraft or its current weapons. The delayed simulator software upgrades were often unable to replicate the actual system operation or performance in the aircraft. The differences between the aircraft and its simulator often produced negative training results that had to be untaught in the air. The task of updating all simulators for all services may produce less than optimum results for simulator confederations and simulation based exercises.

Models and simulations do not accurately replicate the aspects of human interaction. Simulations are scripted by design and usually require role playing by a console operator. The role-playing may satisfy a procedural requirement, but does not deal with the significant variations in interaction a pilot will experience during a mission. The console operator needs training in each career field role-played to replicate reality. The console operator should have the same display information as the simulated support agencies. An AWACS or GCI radar operator does not normally have perfect communications with the pilot. The pilot does not fly single-ship operations. A J-SEAD package in support of an OCA, AI or CAS mission could involve as many as forty other participants. One simulator console operator cannot accurately replicate each of those individuals or their communications. The variables present in a live-fly mission require persistent and demanding training to overcome. Simulation-based training does not allow pilots to train for all aspects of the “human element” that will be present in a live fly exercise.

"As DOD reduces its force structure in response to budgetary constraints, SEAD programs have been given low priority relative to other missions or functions."[57] The USAF has retired the EF-111 and F-4G, reduced HTS upgrade and procurement funding, delayed HARM Block V upgrades and delayed the F-16 upgrade program for LINK 16 data-links. USAF budget priorities have focused on the procurement of the F-22 for the near and long term. The USAF's only significant investment in SEAD-related expenditures was for two additional RC-135 Rivet Joints and increased UAV funding. The USAF has sold the farm to save the tractor when it comes to SEAD funding priorities.

Tier I, II, and III Training

Tier I and II training is being reduced. The reductions are caused by budget shortfalls, increased operations tempo (OPSTEMPO) and force reductions. Warfighting forces are experiencing significant increases in deployments to support contingency operations worldwide. Increased OPSTEMPO and reduced training opportunities continue to negatively affect combat readiness. J-SEAD training is not emphasized in the remaining tier I or II training. Combatant and service Commanders have not emphasized J-SEAD Tier-one or -two training for pilots. The UJTL does not address J-SEAD. Until CINCs and the USAF lists J-SEAD as OP and TA tasks in the UJTL, it will not receive training funding or priority. Combat readiness will continue to decline.

J-SEAD testing accomplished at Nellis in conjunction with Green Flag flying exercises has limited training value. The focus of the OSD-sponsored J-SEAD tests is to determine how to integrate near-term off-board sensor information with Joint Force Commander's resources to improve the JFCs management of localized suppression capabilities for deep attack operations. The testing involves a combination of modeling and simulation, minitest, and leveraging off of

other service and joint test. USAF F-16 SEAD pilots are participating as scripted training aids in these tests. The J-SEAD program is scheduled to end in fiscal year 99.

Tier III training has become predominately a simulator-based training program. Tier III simulation and modeling emphasizes C4ISR training for battle staffs. Simulators are efficient and effective tier III procedural training tools. Simulators are less expensive and offer more scripted battle staff procedural training opportunities over a given exercise period. The replacement value of simulator-based training should not be over sold. Warfighting commanders must understand the limitations of simulator-based training. Simulators do not always provide accurate or valid warfighting lessons learned for battle staffs. Simulation results do not accurately evaluate weapons or tactics employment. The modeling assumptions do not accurately capture the impact of human interaction, environmental variances, and equipment performance differences for warfighters. Simulators do a poor job of replicating the "fog of war" and the combat related stresses a pilot experiences in both live training events and combat. Computer operator priorities and computer model randomness often cause poor results. Skewed outcomes resulting from flawed simulation-based training events often impact the commanders' future decision-making process. Commander's experiences during flawed simulations may have negative connotations on that same commander's decision-making process in combat.

Simulation

The emergence of technologically advanced threats, combined with the aging of key U.S. systems and the need to execute missions with minimal casualties, demands renewed emphasis on unit, service, and joint field training exercises instead of simulations. The simulator cannot accurately model the physiological stresses placed on a fighter pilots body. The simulator cannot accurately model the effects that clouds, glare, smoke, dust, haze, or night illumination has on the pilots or the sensors they employ. Simulators do not accurately model the electromagnetic

characteristics of threat emissions or how they will be processed and displayed by actual aircraft systems. The differences are significant because they illustrate why simulators cannot effectively replace the experience and proficiency that a pilot gains from actual flying training. Technology has advanced, but the basic fact is that simulations are based upon models. The old adage--garbage in, garbage out--applies.

Flight simulators should be used to enhance current flight training, not to replace it. Simulators do not provide realistic training when compared to flying training. Simulators do not replicate the stress and demands placed upon a pilot during an actual sortie. The rationale behind supporting the simulator initiative is primarily cost related. Operating a simulator is considered less expensive than operating an aircraft for the same amount of time. It is extremely easy to be enamoured by simulation technology. Simulators have advanced significantly since their introduction. They are excellent procedural training devices. They allow pilots to practice basic airmanship and avionics tasks in a controlled and repetitive environment. They do not accurately replicate combat environments. Flying combat is a fluid and dynamic event. No mission is standard. Aircraft and their associated weapon systems perform differently between aircraft. The aircraft radio and data link communications do not always work. The radar does not always lock-on or display targets at maximum range. Ground and air targets are not as easy to see as they are in a simulator. Every canopy is different. Some are scratched, some are fogged, and most are dirty. All of these variables have an impact on the pilot. None of these variables can be accurately modeled in a simulator.

The amount of internal and external variables involved in an hour of flight cannot be captured through modeling. Simulator designers make assumptions when they develop warfighting models. The assumptions limit realism in training. Modeling assumptions and scripted scenarios make simulations predictable. Once a pilot learns the assumptions and determines how to “win,” the simulation has lost its tactical utility. This point is exemplified in

any computer-based game. A popular computer game is called “DOOM”. Once a player learns the tricks at each level of the game, it is easy to advance through those levels every time the game is played. The simulation is no longer challenging. Realistic flying training does not suffer from this limitation. Every mission is different in some aspect. Every mission is an active learning event. Every mission entails a high degree of risk that adds to the scenario-induced stress.

Operational Commanders must fight for flying training. USAF F-16 SEAD pilots must practice the art of J-SEAD and service specific SEAD if they are expected to be effective in combat. Simulator training is an important training aid. Simulators enhance procedural and emergency training. They do not replace tactical flying training. There are no studies published that prove simulator training is as effective as flight training for F-16 SEAD pilots. Pilots must be afforded an opportunity to train as they will fight, so that in combat they will fight as they have trained. There are many historical examples that show the direct correlation between realistic training and success on the battlefield. Commanders have an obligation to their pilots and to the American people to ensure their forces go into battle with the best chance of success and survival. This is an obligation that only consistent and realistic training conducted to the most exacting standards can fulfill. The cost of live flying training is fully recovered in combat. The goal of any effective joint training program should be to ensure forces are prepared to execute joint operations when committed, without additional training or lengthy adjustment periods.

Readiness

Commanders periodically assess the command’s overall training proficiency based on the aggregated results of joint exercise, training events, and actual operations conducted during the assessment period. The training proficiency assessment of exercised JMETs form a reflection of the command’s ability to accomplish its wartime mission. America’s leadership in world affairs relies on ready military forces. A decline in material resources or adequately trained people will

lengthen the amount of time it takes to rebuild readiness.[58] The JTS is the cornerstone of joint readiness training.

> The purpose of the JTS is to improve joint readiness through quality joint training. The JMETLs and supporting tasks provide a clear and common framework for assessing joint training results back to the requirements phase of the JTS. Furthermore, the requirements-based JTS establishes a uniform system for joint training proficiency assessments that directly supports joint readiness assessments.[59]

Readiness must account for the strategic, operational and tactical levels of war. Readiness at the strategic level is the synthesis of readiness at the operational and tactical levels. Readiness at the operational level must consider the joint perspective. Joint readiness is the combatant commands' ability to integrate and synchronize ready combat and combat support forces to execute assigned missions based upon their theater concept of operations. Readiness at the tactical level is primarily measured through the units of the services. "Readiness assessments are, by nature, subjective--the measures and metrics do not define readiness by themselves. They are tools used by those responsible for readiness."[60]

Warfighting commanders cannot assess J-SEAD readiness. J-SEAD training must occur at the strategic, operational, and tactical levels to accurately make such an assessment. The JTS has supported J-SEAD battle staff training using primarily simulator-based training events. Battle staffs may have the capability to develop a comprehensive J-SEAD plan, but the warfighters are not trained to execute it.

> A detailed, comprehensive J-SEAD plan is of little value if it is poorly executed. The planning step is but half the requirement. On tomorrow's battlefield, combat plans will require aggressive, synchronized execution if we are to accomplish the mission and inflict our will upon the enemy. An operation's execution must be rapid, unpredictable, violent, and disorienting.[61]

The USAF F-16 SEAD pilots are not trained to conduct effective J-SEAD operations. Reduced flying hour programs, increased contingency operations, and the mass exodus of experienced F-16 SEAD pilots have severely reduced the USAF's readiness. The CJCS highlighted these facts in the 1997 *Annual Defense Report to Congress*.

> Air Force tactical aircrews participating in Operation Southern Watch in Iraq are flying primarily surveillance missions, and cannot train for air-to-air combat tasks, air-to-ground gunnery or delivery of precision-guided munitions. . . . The Air Force changes in size and mix of aviation squadrons has forced active flying-hour standards to be reduced somewhat relative to Cold War levels. The Air Force is again re-evaluating its fighter flying-hour program to consider further reductions to save money.[62]

The CJCS later noted that "training and exercise programs are key to maintaining unit readiness and combat effectiveness."[63] The J-SEAD mission demands an effective joint training program to ensure readiness. The importance of J-SEAD to every mission involving the use of aircraft cannot be overstated. J-SEAD readiness is low and demands priority and training emphasis.

The U.S. Government Accounting Office (GAO) conducted two separate investigations in 1996 and again in 1997 that concluded SEAD training, equipment and personnel should receive increased priority from the DOD. The known contributions of current SEAD assets to mission effectiveness and survivability and the identified need to improve SEAD capabilities appear at odds with DOD's SEAD investment plans.

> DOD's decision on the SEAD force structure have been made based on budget constraints and with the assumed risk of not being able to adequately counter enemy threats addressed in various SEAD improvement programs. DOD has not assessed the cumulative impact on war-fighting capability resulting from the individual program decisions canceling improvements or replacement systems. The preliminary results of DOD's recent study on electronic warfare requirements not only reaffirm the continuing need to improve SEAD capabilities but question the funding priorities given to address air-to-air versus surface-to-air threats.[64]

The JCS indicated in the response section of the 1997 GAO report that it is "sensitive to the SEAD mission but, with declining budgets, it must weigh the SEAD war-fighting contribution with other war-fighting assets."[65] The GAO reports conclude that the military's capability to achieve the objectives of "air superiority missions were marginal through 2001."[66] The GAO reports are conducted in response to Congress inquiries. They are politically motivated with underlying themes that are often predetermined prior to the start of the investigation. The reports do contain some relevant and supporting objective data. The reports identify the importance of

effective SEAD to warfighting capabilities and specifically to air superiority. They identify the lack of funding priority SEAD systems and training have received. The GAO analysis supports the need for increased J-SEAD funding and training priority.

Operational J-SEAD Examples

The USAF does not have an effective J-SEAD training program to measure its J-SEAD employment readiness. It must rely upon operational employment to develop J-SEAD readiness assessments. The USAF F-16 SEAD pilots conducted J-SEAD operations during three separate combat operations in recent history. The readiness analysis for this thesis assesses those missions. USAF F-16 SEAD pilots conducted J-SEAD operations during the air war portion of Operation Desert Storm in Iraq, during Operation Deliberate Force in Bosnia-Herzegovina and recently during Operation Desert Fox in Iraq. The information in this analysis was obtained through various open sources.

Desert Storm

Operation Desert Storm provided the first prolonged combat test of U.S. SEAD forces since the Vietnam War. USAF and Navy SEAD weapon systems performed the majority of SEAD support missions during the war. The Navy and USAF pilots employed over 2,000 HARMs during the air campaign portion of the war. The majority of HARMs were employed during the first week of the air war. The Iraqi SAM operators were quick to learn not to radiate when HARM-carrying aircraft were in the area. As the air war progressed, pilots found they could force the SAMs to turn off their radars simply by simulating a HARM shooter's radio call. An analysis suggests that the single-service SEAD campaigns conducted by the USAF and Navy SEAD aircraft were effective at suppressing the SAM portion of the Iraqi IADS. The Navy and

USAF SEAD assets were not as effective at destructive SEAD. A large portion of the Iraqi air defense system still exists today.

> Contrary to widespread prewar and postwar claims, the Iraqi IADS was not "robust" or "state of the art." Rather, its computers were limited in their capacity to monitor incoming threats; the system was vulnerable to disruption by attacks on a relatively few key nodes; and its design was [DELETED]. IADS had been designed to counter limited threats from the east (Iran) and west (Israel), not an attack from a coalition that included nearly 1,600 U.S. combat aircraft primarily from the south, hundreds of cruise missiles, and the most advanced technologies in the world.[67]

The USAF did not employ as part of an integrated J-SEAD force primarily because it did not require joint employment to conduct effective suppression operations. USAF EF-111s and F-4Gs were still in operational service during Operation Desert Storm. EF-111 support jamming played a critical role to the USAF's SEAD campaign. EF-111s provided close and standoff jamming support to most USAF missions that penetrated Iraqi airspace. They were responsible for degrading or denying Iraqi acquisition radars. This included standoff jamming support to penetrating F-117A Stealth Fighters. Future stealth aircraft will continue to require jamming and J-SEAD support.

> The commonly held belief that stealth aircraft are invisible to radar is wrong. They are merely less detectable. Similarly, the belief that stealth aircraft cannot benefit from jamming is equally wrong. What a jammer offers is such a reduction in a defending radar sensitivity to render an otherwise detectable inbound stealth aircraft effectively invisible, by burying its return in noise. This was successfully accomplished on a number of raids when support jammers radiated as the F-117As closed on the target, concealing them totally.[68]

USAF and Navy SEAD employment during the Gulf War was accomplished primarily as a single service localized SEAD effort under the name of J-SEAD. USAF SEAD platforms were tasked with specific areas of responsibility, while Navy assets protected separate areas. The Navy and USAF SEAD missions were called J-SEAD missions only because they flew at the same time. They did not conduct integrated J-SEAD localized or opportune suppression missions.

The IADS USAF SEAD forces fought during Operation Desert Storm did not understand how to counter the Navy and USAF SEAD campaign.

> The Iraqis violated a fundamental principle of electronic combat by lighting up radars outside of actual engagements, and then not moving or reshuffling their assets to invalidate Allied reconnaissance. Were they to have done the proper thing, they would have moved batteries of dummy SAM sites, lit up in the presence of Allied ELINT aircraft, and then shifted the batteries to implement a scheme of tactical or strategic deception. If this is implemented properly, and appropriates emission control discipline enforced, it becomes very difficult for the attacking party to map out what the real structure of the target IADS is. This in turn makes the planning of a pre-emptive strike very difficult, as with the increasing complexity of the deception the risk of not taking out all key assets in the initial hit increases vastly.[69]

U.S. SEAD forces had a unique opportunity to succeed during Operation Desert Storm. The Iraqi's allowed U.S. forces to build-up, train and plan for almost six months prior to the start of the air campaign. At the start of the air war, U.S. SEAD forces were well equipped and trained for their respective single-service SEAD missions. The six-month buildup allowed U.S. forces to achieve high combat readiness levels. The U.S. had over eight years of intelligence collection data on Iraqi weapon system employment from the Iran-Iraq War. The Iraqi SAM and radar operators did not take long to appreciate the danger of an effective SEAD campaign. They learned their lessons through defeat in combat. Other nations around the world learned as well from the Iraqi lessons. Four years after the war in the Gulf, an enemy air defense system would again test the readiness of U.S. J-SEAD forces over the skies of Bosnia-Herzegovina.

Bosnia-Herzegovina

The JCS and the JFC in charge of the no-fly operations over Bosnia-Herzegovina did not understand the requirement for J-SEAD prior the loss of an American and a French fighter. These fighters were lost because the Bosnians understood how to employ their 1970's-era SAMs effectively against modern fighters. The Bosnian SAM operators learned from the Iraqi mistakes during the Gulf War. The JFC did not require SEAD or J-SEAD support for coalition flights into the No-Fly airspace prior to the shoot downs. Anytime U.S. forces are tasked to operate in an air or space environment that employs an air defense system, J-SEAD operations are applicable.

The Pentagon, Congress, and the American public were all shocked when an American and a French fighter were shot down over Bosnia-Herzegovina in 1995. These incidents forced several knee-jerk reactions to Bosnian no-fly operations. "The Pentagon reaction was to order that all missions over the Balkans must include escort jammer aircraft."[70] In theater, the JFC placed no-fly rings around all suspected SAM locations. These no-fly rings significantly impact employment and flight route options for joint aircraft. If commanders had properly employed J-SEAD assets in theater prior to the shoot downs, restriction would not have been necessary.

The JFC planned and employed a J-SEAD campaign against the Bosnia air defenses during Operation Deliberate Force in August and September 1995. USAF and Navy J-SEAD pilots were not trained or operationally ready to employ as an integrated J-SEAD team. USAF F-16 SEAD pilots were controlled by a Navy SEAD package commander who did not understand the tactical employment requirements or capabilities of the F-16 Block 50/52 or the HTS. The Navy employment plan forced USAF F-16 SEAD pilots to operate from a nondoctrinal orbit. Their HARM shots were not successful because they were forced to use a less capable employment mode. The JFC imposed HARM employment ROE did not consider the capabilities of the HTS. The JFC developed ROE severely hampered F-16 HARM employment.

The AGM-88 HARM cost $316,856 per weapon. J-SEAD aircraft launched fifty-six HARMs during Operation Deliberate Force at a total cost of approximately $17.7 million. Coalition aircraft flew 785 J-SEAD sorties in support of Operation Deliberate Force. A flight hour conservatively cost at least $8,000 per hour. Most J-SEAD sorties last at least two hours. The cost of the J-SEAD sorties was at least $12.6 million. The total cost for the J-SEAD portion of Operation Deliberate Force is conservatively over $30 million for the assets utilized.[71] The investment in equipment, weapons, and personnel was significant when compared to the destructive results of the J-SEAD effort. There are no open-source reports to confirm the destruction of any Bosnian SAMs. The ineffectiveness and cost of this eleven day J-SEAD

operation should justify spending more money to train U.S. J-SEAD forces to enable them to operate effectively in combat. An effective J-SEAD training program would have identified the flaws in the joint employment tactics, highlighted the problems with the JFC's ROE and resulted in a higher overall destructive mission success. The objective of effective J-SEAD employment is not to force one service to adapt to the others employment TTPs. Effective J-SEAD operations exploit the advantages of each service. Effective J-SEAD operations integrate and coordinate J-SEAD attacks. Effective J-SEAD tactics exploit the capabilities of each weapon system, instead of limiting them. These lessons learned should have been realized earlier through an effective J-SEAD exercise and training program. J-SEAD forces were not trained or ready to conduct effective J-SEAD operations during Operation Deliberate Force. The Bosnian SAM threat still exists today. The cost of the French, and U.S. fighter aircraft lost to SAMs in Bosnia-Herzegovina (over $50 million) prior to the J-SEAD campaign and the total cost of the J-SEAD campaign should be considered when evaluating the value and cost of realistic J-SEAD training.

Operation Desert Fox

Operation Desert Fox was conducted during the month of December 1998 in Iraq. The operation specifically targeted Iraqi air defense systems through an AOR/JOA Air Defense Systems Suppression campaign. This campaign primarily used cruise missiles and laser-guided weapons to target known IADS. The USAF F-16 SEAD pilots provided reactive SEAD support in a Localized and Opportune Suppression role. Pilots have informally reported that the Iraqi SAMs did not radiate much during the operation. The CJCS reported over 80 percent effectiveness against planned targets for this operation during a Senate Armed Services Committee hearing two weeks after the operation ended. The "effectively targeted" Iraqi air defense system has since threatened several Navy and USAF aircraft in southern and northern Iraq. These SAMs were not effectively targeted during Operation Desert Fox. Based upon the

current Iraqi IADS activity, it is safe to say that the Iraqi SAM operators have modified their employment doctrine to effectively counter U.S. suppression efforts. The USAF F-16 SEAD pilots operating from Saudi Arabia and Kuwait are not trained to conduct effective J-SEAD operations with the Navy. The JCS, ACOM, warfighting CINCs, and the USAF have not provided them with the J-SEAD training opportunities that they require to effectively employ.

Results and Analysis Summary

It is ultimately the operational commanders' responsibility to ensure all supporting commanders place the proper emphasis and priority on J-SEAD mission training. Service SEAD capabilities are not employed jointly, they are deconflicted rather than integrated. The future of SEAD in the USAF is J-SEAD. The USAF can no longer afford the inefficiencies of a system that brings redundant forces together for the first time on the battlefield. USAF F-16 SEAD pilots must be trained in J-SEAD operations if warfighting commanders expect successful J-SEAD campaigns results in future combat operations. The JFACC will find it very difficult to achieve air superiority without effective J-SEAD. J-SEAD training has not received the emphasis or priority it demands. The DOD should seriously question the military's warfighting readiness based upon this training shortfall. The cost of live J-SEAD training for J-SEAD aircrews is a readiness cost that the DOD and Congress must be willing to pay.

The secondary research questions for this thesis focus on specific elements of USAF J-SEAD training to assess the overall effectiveness of that training. The current J-SEAD training accomplished by USAF F-16 SEAD pilots does not satisfy the elements required for an effective J-SEAD training program. An effective J-SEAD training program should provide realistic training opportunities for every USAF J-SEAD mission area. The USAF's only semirealistic J-SEAD training occurs at the annual USAF Green Flag exercise. Green Flag exercises traditionally have emphasized air-to-air engagements more than air-to-surface SEAD or J-SEAD

operations. Green Flag scenarios task F-16 SEAD pilots and EA-6B aircrew with SEAD support missions for AI operations. The USAF F-16 SEAD pilots will often deconflict single-service SEAD missions instead of integrate the EA-6Bs for J-SEAD employment. Pilots are able to conduct deconflicted operations instead of integrated J-SEAD operations because the training range space supports it. Integrated joint employment is not emphasized. The USAF does not conduct J-SEAD training that supports Army close or deep operations, CAS missions or SOF operations. J-SEAD training is not conducted in support of Marine Corps landing or CAS operations. The USAF does not participate in J-SEAD operations that support CVBG operations.

USAF F-16 SEAD pilots participate in other joint exercises that list J-SEAD as an exercise element. JFX and Roving Sand exercises contain J-SEAD participants. Scenario development for these exercises does not support realistic J-SEAD employment or training. The scenarios task USAF F-16 SEAD pilots to conduct scripted single-service SEAD operations. In effect, the USAF F-16 SEAD pilots are training aids for battle staffs participating in these exercises. Single-service SEAD deconfliction rather than J-SEAD integration occurs. The training does not promote J-SEAD flying training experience or proficiency for SEAD pilots.

The JTS does not provide USAF F-16 SEAD pilots with effective J-SEAD training opportunities. An effective J-SEAD training program should provide USAF F-16 SEAD pilots with an opportunity to develop tactics that maximize the strengths of each services' SEAD employment TTPs. Joint training exercises must provide opportunities to highlight each service's capabilities, limitations, and vulnerabilities to other J-SEAD planners and operators. EC package commanders require a thorough understanding of these capabilities and limitations in order to develop successful engagement plans. Effective J-SEAD training fosters teamwork and confidence in each other's abilities. Effective J-SEAD training allows USAF F-16 SEAD pilots to develop employment plans that integrate mutually supporting portions of service TTPs to enhance overall effectiveness. The analysis has shown that USAF F-16 SEAD pilots are not

afforded J-SEAD training opportunities. The lack of effective operational joint training is not new. The GAO identified the military's lack of joint training emphasis in three reports to Congress between 1984 and 1995. Joint forces must train today as they will fight tomorrow, jointly. The JCS, warfighting CINCs, JFCs, and USAF must recognize the importance that J-SEAD operations will play in future conflicts. J-SEAD must be listed as a mission essential task at both the service and joint levels to receive future training emphasis. J-SEAD must be included in the UJTL in order to receive the training priority it demands. Future J-SEAD capability and readiness rely on the effectiveness of peacetime training.

Units need to practice combat operations as a team that is part of a larger team. Exposure to joint service combat units enables individuals to understand and accept operations that are both similar and different from their own. Military training should place J-SEAD participants under stressful situations that resemble combat conditions, where cooperation and teamwork are the keys to success. Uncertainties and doubts are answered, as joint units become successful at working together as an integrated and cohesive force. Exercises highlight the differences in equipment, procedures, and capabilities. The differences must be addressed in peacetime training to ensure wartime interoperability. Working and training together breeds acceptance and understanding. The military leaders cannot overemphasize to the nation, Congress and to the rest of the military community, that victory does not come cheap. Training of our forces produces the only tangible measure of investment, success. Victory in combat requires significant peacetime expenditures in time, money, and equipment.

J-SEAD planners should not expect a favorable and target-rich environment like the U.S. experienced during Operation Desert Storm. The United State's adversaries learned a lot through the open press about the effectiveness of U.S. J-SEAD equipment and the vulnerabilities of their IADS. They have changed their employment doctrine and are developing systems that counter U.S. capabilities. The USAF must train for this evolving threat. The United State's next

adversary will not allow our forces to build-up and train for six months prior to attacking. They will target our C4ISR elements. They will employ anti-ARM tactics and use decoy emitters to limit United States collection and targeting effectiveness. The USAF has seen the lessons from Desert Storm employed by SA-6 batteries in Bosnia-Herzegovina when they successfully targeted and shot down an American and a French fighter in 1995. The Iraqi's are no longer making the same mistakes with their remaining IADS as evidenced by Iraqi IADS activity after Operation Desert Fox. American forces can no longer rely upon the experience of pilots who had the benefit of Reagan-era defense spending and training. Those pilots have left and are continuing to leave the USAF in droves. Their replacements are inexperienced, ill trained and not prepared or equipped to conduct single-service SEAD or J-SEAD operations to the same level of effectiveness. This trend must be reversed immediately.

The JCS, warfighting CINCs, JFCs, and the services must consider the costs of replacing their aircrews, aircraft, weapons, and the cost, or risk of reattack in combat when they weigh the cost of live J-SEAD training in peacetime. The U.S. employed over 2,000 HARMs during the air war portion of Desert Storm. U.S. forces during Operation Deliberate Force employed fifty-six HARMs. The weapons and equipment employed during these two operations cost of over $650 million. Military aircraft range in cost from $25 million for a basic F-16 to approximately $2 billion for a B-2 bomber. Effective J-SEAD missions protect these valuable assets. The cost and time invested to train aircrew to operate these aircraft cannot be measured in dollars alone. Success and survival in combat easily justify the cost of providing effective J-SEAD training. The cost of not providing J-SEAD training is phenomenal.

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CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Analysis Conclusions

The primary research question for this thesis was developed to determine how the USAF should modify F-16 SEAD training to ensure its pilots have the operational flying experience and proficiency required to conduct effective J-SEAD operations in combat. In order to answer the primary research question, the thesis first established a conclusive requirement for USAF J-SEAD operations in combat. The USAF has lost the capability to conduct single-service SEAD operations since it retired the EF-111. Future USAF SEAD operations must be joint.

Based upon the USAF's J-SEAD requirement, the analysis assessed the JTS to determine if J-SEAD employment has been established as a JMET, AMET, or service MET by the USAF. The JTS is the cornerstone for all joint training. The JTS is a requirements-based program. J-SEAD must be an established MET to receive joint training priority and funding for high-cost tier-one and -two training. The thesis confirmed that J-SEAD has not been established as a MET by the JCS, warfighting CINCs, or the USAF. Warfighting commanders have failed to demand unit-level joint training proficiency and experience requirements throughout the JTS process for J-SEAD tier-one and -two training. The USAF has included some basic J-SEAD training elements into exercise scenarios. J-SEAD training objectives in USAF service exercises and joint exercises are the exception and not the norm. The limited nature of J-SEAD training events does not satisfy the requirement for a comprehensive J-SEAD training program.

The future of J-SEAD training for USAF F-16 SEAD pilots depends on the JCS, warfighting CINCs, and the USAF. They must establish J-SEAD as a MET. Effective J-SEAD training also requires joint training proficiency requirements. The current management of the JTS has failed to satisfy the J-SEAD training responsibility for USAF F-16 SEAD pilots. ACOM has

placed the majority of J-SEAD training emphasis on tier III simulator-based J-SEAD planning exercises for battle staffs. "A detailed, comprehensive J-SEAD plan is of little value if it is poorly executed. The planning step is but half the requirement. On tomorrow's battlefield, combat plans will require aggressive, synchronized execution if we are to accomplish the mission and inflict our will upon the enemy."[1]

USAF baseline SEAD training should be nested in any future USAF J-SEAD training program. J-SEAD training for USAF F-16 SEAD pilots must follow a building-block approach for effective learning. J-SEAD exercises should build upon basic USAF F-16 SEAD pilot skills to support and fully achieve the synergistic effects of integrated J-SEAD operations. The secondary questions evaluate established USAF J-SEAD training events for realistic training value. The exercise scenarios should define realism in training. The JTS developed J-SEAD training program should include J-SEAD support training for all mission areas (CAS, AI, combat search and rescue [CSAR], Army deep operations, Special Forces operations, Marine Corps landing operations, nuclear strike operations, and naval fleet support). These are all mission areas that may require the application of J-SEAD combat power in future conflicts. J-SEAD training for USAF F-16 SEAD pilots should not be limited to daytime training as it currently is. USAF F-16 SEAD pilots must be trained to conduct effective J-SEAD operations at night and in all-weather conditions. J-SEAD support at night and in adverse weather is an absolute requirement. The enemy IADS must rely on their radars to effectively target U.S. aircraft at night and in adverse weather. Effective J-SEAD operations prevent the enemy from seeing U.S. forces. Night and adverse weather J-SEAD employment truly stresses the JTTPs. The J-SEAD TTPs must satisfy all coordination, planning, execution, and communication requirements for effective nighttime and adverse weather J-SEAD operations. Current J-SEAD training only focuses on support for daytime, clear weather AI missions. This is a significant training shortfall.

The J-SEAD training assets should conduct mission planning and coordination from separate operating locations and use the same communications and planning equipment they expect to use in combat. They must train using deployable systems in peacetime training in order to develop TTPs to overcome any identified planning or coordination limitations in combat. J-SEAD training scenarios should provide USAF F-16 SEAD pilots with real-time access to national and tactical ISR data for mission planning. Pilots cannot be expected to use this data or the associated intelligence systems effectively in combat unless they have trained with them in peacetime. J-SEAD forces require access to this information at the same time as battle managers to allow parallel mission planning. J-SEAD forces cannot afford to wait for a battle manager to decide if they have a need for the information. The battle managers are not the J-SEAD weapon systems experts and cannot be expected to understand every weapon system specific information planning or coordination requirement. J-SEAD weapon systems will be rendered ineffective without access to real-time ISR data for planning and coordination. Current J-SEAD training fails to provide realistic J-SEAD planning and coordination opportunities for J-SEAD pilots.

The exercise training ranges for J-SEAD training events should be able to replicate the various threats IADS that can be expected in combat. The training ranges should provide feedback to J-SEAD forces on the effectiveness of their ECM, tactics, maneuvers, and weapons employment. The training ranges must provide realistic feedback that allows the pilots to assess the impact of their actions on the employment of the IADS. The IADS must be scalable to reflect the probable IADS that would affect forces for each mission supported in the exercise scenarios. Service training ranges provide IADS replication capabilities that can satisfy this effective J-SEAD training requirement. The training ranges do not currently have the capability to kill or remove IADS threats in real time. This often impacts the perceived effectiveness of J-SEAD forces until the debrief. The threat IADS replicated on U.S. ranges must begin to integrate

opposing force space capabilities. Future J-SEAD training must account for enemy space capabilities. The U.S. cannot expect to maintain exclusive use of this medium.

The final element of an effective J-SEAD training program is the debrief. JTS planners should allocate the resources and time to allow thorough J-SEAD mission debriefs by all warfighting participants. The majority of the learning occurs during a mission debrief. A thorough debrief analyzes every aspect of the J-SEAD training event from mission planning through mission termination. USAF F-16 SEAD pilots must be afforded an opportunity to conduct a thorough debrief. Debriefs allow the pilots to determine lessons learned that aid in the development of effective TTPs, future system requirements, and doctrine. Current training exercises do not allocate adequate time or resources for effective debriefs. Noncollocated J-SEAD forces require either a secure video teleconference system or a similar capability at the unit level to conduct collaborative classified package briefs and debrief. Noncollocated forces do not have the communication equipment to conduct effective J-SEAD package briefs or debriefs.

The underlying restriction to effective J-SEAD training for USAF F-16 SEAD pilots is a lack of an established J-SEAD training requirement. J-SEAD training is not emphasized in JTS-developed training and exercise programs. "Training and exercise programs are key to maintaining unit readiness and combat effectiveness."[2] SEAD is a recognized mission essential task. SEAD by definition is not joint; it is a single-service activity. The USAF F-16 SEAD units train for single-service SEAD at the unit level and component levels. Their SEAD planning and execution at joint exercises often stress single-service TTPs. J-SEAD forces are deconflicted instead of integrated. The USAF F-16 SEAD units are employing the way they have trained, as a single-service SEAD force. Their employment is a product of their training. The single-service SEAD employment mentality will continue until J-SEAD is identified as a mission-essential task that requires training priority and appropriate funding. Warfighting commanders need to understand that the USAF is unable to conduct effective single-service SEAD operations against

an aware IADS. USAF F-16 SEAD pilots must employ as part of a J-SEAD package. Warfighting CINCs are relying on USAF F-16 SEAD pilots who are not trained for effective J-SEAD employment. It is the responsibility of the JCS, CINCs, and USAF to correct this problem.

J-SEAD Interrelationships

Warfighting CINCs often misunderstand the impact that effective J-SEAD operations have on all other offensive operations. Warfighting CINCs must be aware that an effective J-SEAD operation places a focused and purposeful "fog" into the enemy's command and control decision cycle. J-SEAD operations naturally dovetail and support other offensive operations. An effective J-SEAD campaign is designed to go for the brain shot before the body shot. AOR/JOA air defense system suppression and localized J-SEAD operations sever the enemy's central nervous system. The goals of an effective J-SEAD campaign are directly aligned with those of information operations (IO). The two campaigns are not mutually exclusive; instead, they are directly nested. Operational J-SEAD planners and warfighters must have access and direct influence on the IO planning process to prevent double targeting of systems at the operational level. Operational warfighters must understand the IO targeting process, relative effectiveness expected at each phase of the targeting process, and how their operations will be impacted by the actions of the IO campaign. Warfighting CINCs should appreciate the link between IO and J-SEAD operations as they develop targeting and force allocation strategies.

Advanced IADS are being designed to take advantage of digital systems and information transfer technologies. "Information technology's aim is building devices that tie other systems together to exchange data efficiently and redundantly. This makes the entire IADS process even more fluid and dynamic, presenting SEAD with its biggest targeting challenge since Vietnam."[3] J-SEAD campaigns should emphasize centralized policy, strategy, and planning. The campaigns

should also emphasize decentralized force planning and execution. This process allows J-SEAD and IO operators to take full advantage of local initiative and flexibility. The current trend of rigid centralized command and control is detrimental to overall effectiveness. IO and J-SEAD Campaign operations must kill sensors, not people first. This process opens the way to the enemy's army by blinding all his defenses and limiting his offensive capacity. IO and J-SEAD operations must be planned, coordinated, and integrated at the operational level to accomplish this task effectively.

J-SEAD operations are directly linked to friendly and enemy space operations. Space will play an increasingly important role in future air defense systems. Space sensors will be used by threat nations to cue air defenses, to track U.S. force movement, and to pass targeting data. The U.S. can no longer expect to have exclusive use of the space medium.

Future wars require both air and space superiority. USAF J-SEAD forces play a vital role in the Air Force's aerospace concept. The operational distinction between air and space forces is rapidly disappearing. Space operators, J-SEAD planners, and J-SEAD operators must train together to develop effective future employment TTPs and doctrine. Sensor data from J-SEAD forces can be used to seed national signals intelligence (SIGINT) databases to improve the accuracy of overhead collection. Conversely, national SIGINT data should be integrated with shooter data to enhance operational situational awareness, to provide sensor cueing, and to resolve target identification problems. Overhead assets must be integrated with traditional J-SEAD operations to achieve future air and space superiority in a CINC's AOR. AOR/JOA air defense systems suppression operations must account for enemy space capabilities during campaign and employment planning and training. Future threats demand cross-discipline J-SEAD training.

Synchronization is a critical aspect of J-SEAD mission employment. J-SEAD activities must be arranged in time, space, and purpose to produce maximum effects when they are

required. Electronic jamming must be coordinated to not only mask supported aircraft but to stimulate threats or force them into long on-air autonomous operation during J-SEAD ARM employment. Electronic jamming and ARM employment must be synchronized with precision or conventional employment to enhance the success of destruction of enemy air defense (DEAD) missions (lethal SEAD). USAF F-16 SEAD pilots demonstrated the effectiveness of well-rehearsed and planned DEAD operations when they effectively suppressed Iraqi air defense systems while F-15E aircraft guided multiple GBU-12 laser-guided bombs on SAMs in northern Iraqi in January of 1999. A more complex threat will require the use of EA-6B jamming assets, which will require J-SEAD employment by definition. The forces require adequate training for this to succeed.

Tactical J-SEAD operations must be synchronized with collection and IO efforts to enhance J-SEAD battle damage assessments and campaign effectiveness assessments. J-SEAD forces will require extensive live training to ensure they have developed effective JTTPs that will allow them to synchronize their activities. The scope of J-SEAD activities crosses traditional warfighting boundaries. Effective J-SEAD employment requires visionary leadership at command and operational levels in order to fully exploit the advantages of an integrated joint warfighting effort. J-SEAD will continue to be a USAF requirement for any mission that requires air superiority.

J-SEAD Simulator-Based Training

The JCS, ACOM, and USAF have decided to rely on simulator-based training as a viable substitute for J-SEAD flight training. This myopic decision will significantly reduce pilot experience, proficiency, and overall warfighting capability. Flight simulators should be used to enhance and reinforce current flight training, not replace it. Simulation does not replicate or replace the experience or proficiency attained through actual flying training and therefore should

not be considered a replacement. They cannot replicate the stress and demands placed upon a pilot during an actual mission. The rationale behind supporting the simulator initiative is based on cost savings instead of enhanced training. Operating a simulator is promoted as less expensive than operating an aircraft for the same amount of time. This is debatable when the costs of simulator support facilities, contractors, support personnel, support equipment, and software upgrades is considered. The software for each system must keep pace with aircraft and weapon system upgrades to ensure operational compatibility. Each simulator software upgrade must be thoroughly tested to ensure it accurately replicates threat and aircraft avionics and weapon systems. The testing must be conducted at the same time as the aircraft avionics and weapons upgrades occur. The simulation software upgrades must also be responsive to the avionics development cycle throughout the testing period. Aircraft avionics and weapons often go through several revisions before ultimately being fielded. This process will be very expensive for simulation software designers because they will also need to rewrite simulation code and accomplish testing to match each development change prior to fielding. The lack of training for inexperienced aircraft support personnel should be considered as well. Aircraft mechanics, weapons loaders, avionics specialist, and other support personnel depend on daily flying events for their training. Employing an aircraft in combat requires the effective coordination and readiness of the complete team, not just the pilot. It is extremely easy to be enamoured by technology. Simulators have advanced significantly since their introduction. They are excellent mission task-training devices that can be used to enhance procedural awareness. They allow pilots to practice basic avionics tasks in a controlled and repetitive environment. They do not replace the training pilots or their supporting crews receive through live-flying training.

Simulator Limitations

Simulators do not accurately model the physiological and psychological stresses fighter pilots experience during flying training. The only way to accurately simulate the effects of gravitational forces on a pilot's body is in a centrifuge. Simulators that employ gravitational (G)-suits to simulate the effects of Gs on a pilot's body, fail to accurately replicate the physical stress of actually pulling Gs. Full-motion simulators provide some motion cues, but are cost prohibitive at the unit level. Simulators do not accurately model the effects of clouds, glare, smoke, dust, haze, canopy glare at night, or night vision goggle variations for the pilots or the sensors they employ. Simulators do not accurately model threat electromagnetic emission characteristics or how the actual aircraft systems process and display them. The lack of realism in sensor interaction significantly detracts from J-SEAD training effectiveness.

Every sensor display and control the pilot employs in the aircraft should be simulated and be able to accurately replicate actual systems. The receivers and processors must be stimulated or precisely simulated to ensure that the threat's proper sequence and priority are displayed for detection systems, such as the HTS, HARM, radar, and radar-warning receivers (RWRs). Simulators can model sensor processors to represent actual, emulated, or simulated sensor stimulation. Actual processor stimulation uses authentic threat processors to provide signal inputs. Processor emulation uses commercial processors to run threat processor software in order to provide stimulated signal inputs. Processor simulation models the functions of actual processors through software to receive, process, and output data. Simulation modeling cannot adapt to all variations of input data and variances of output processed data. Processor simulation does not satisfy realistic J-SEAD simulation requirements. Current unit-level simulators use simulation modeling.

The J-SEAD simulation models should emulate the multispectral effects of the threat environment. Realistic radar frequency, electrooptical, and infrared energy modeling in a dense

environment requires significantly more computing power than current unit-level simulators possess. High-fidelity simulation models should use three-dimensional antenna patterns versus two-dimensional patterns, multipath effects versus direct-path effects and multiple threat IADS instead of limited IADS. Complex calculations are required to model the radio frequency energy changes associated with actual J-SEAD threats. A credible simulation model must provide enough realism to allow the aircraft's signal processors to accurately identify and react to the threats. Simulations should use real-time fly-out models for surface-to-air, air-to-air, and air-to-ground weapons. The simulation models should accomplish six degrees of motion calculations for each engagement sequence while factoring in the effects of maneuver and countermeasures. Realistic high-fidelity simulation is very costly. Current unit-level simulators have traded off realism for cost. They do not provide realistic simulation.

The final simulation area that demands high fidelity is the simulator's visual display. Flying training provides pilots with a full 360-degree view of their environment. Simulators need either a domed facility or an integrated visor display system to emulate a realistic visual environment. Current simulators do not provide pilots with the same visual stimulus as the real world. Visual stimulation in training is an absolute requirement for effective F-16 J-SEAD training. Pilots rely heavily upon visual stimuli during mission employment.

The J-SEAD mission is extremely demanding. Single-seat fighter pilots must have their heads on a swivel at all times. Pilots must monitor all aircraft systems, fly the aircraft, monitor four different weapons displays, cross-check RWR indications, operate the radar and other weapons, monitor the information in the heads up display (HUD), navigate, communicate on two radios, and conduct visual searches for enemy aircraft, surface-to-air threats, and other friendly aircraft. Cockpit pacing is essential to their survival. Pilots rapidly lose their visual crosscheck during simulator training because of a lack of realistic visual stimuli. They become fixated inside of the cockpit on their weapon system displays. They learn dangerous habits that are often fatal

in the air during actual missions. Simulators promote target fixation and task misprioritization because they do not effectively replicate the demands of live flying. In combat, these simulator-induced habits can become lethal to the entire J-SEAD package.

High-fidelity simulation is technically challenging and very costly. Unfortunately, cost drove military leaders to adopt simulator training as a viable alternative to flying training. These leaders cannot justify the cost to procure and sustain high fidelity simulators although they are an absolute requirement to effectively model aircraft systems. High-fidelity simulator programs cost as much as the flight training those military leaders are pushing so hard to replace.

Recommendations

The USAF should rely upon embedded simulation capabilities in the aircraft and flying training for effective J-SEAD training for USAF F-16 SEAD pilots. Embedded simulation allows the user to train in simulation with the same equipment that will be used in combat. All sensor and avionics functionality is utilized in the training, the pilot just does not release a weapon. When a pilot depresses the weapon release consent in the "simulate" mode, the avionics continue replicate employment through weapon timeout. This is very positive training because it involves actual systems that will be used in combat, operating in a realistic flight environment. Pilots are able to train using the same equipment they will use in combat. Simulator training should be maintained as an enhancement to established flying training events. The simulator can be an effective procedural training aid. Its utility beyond that application is limited for pilots.

The importance of J-SEAD must be established at all warfighting levels. J-SEAD operations are a necessary first step for any operation that requires U.S. forces or equipment to conduct operations in or around hostile airspace. The strategic, operational, and tactical goals of air superiority rely upon the success of J-SEAD operations. USAF F-16 SEAD pilots must be provided J-SEAD training opportunities in support of all mission areas that may require J-SEAD

support to achieve these goals. J-SEAD training must be conducted in both day and night all-weather environments. Night and adverse weather J-SEAD employment training does not exist in the USAF. Night and adverse weather J-SEAD employment is more demanding than daytime clear-weather J-SEAD employment for a pilot in a single-seat fighter. The pilot cannot rely on most of the visual cues that are available during clear-weather daylight operations. Effective coordination, planning, and execution at night and in adverse weather demands extensive flight training. J-SEAD training is an absolute requirement. The cost of J-SEAD training is more than justified by its impact on all other missions. J-SEAD is a mission essential task. The JCS, warfighting CINCs, and the USAF must identify J-SEAD on their respective METLs. J-SEAD must be listed as a MET in the UJTL.

J-SEAD training should be incorporated into all USAF service exercises. USAF F-16 SEAD pilots should be provided with J-SEAD training opportunities that support every Air Force, Army, Navy, and Marine Corps mission area that could require SEAD support. New service exercises are not required to satisfy the addition of J-SEAD training requirements or J-SEAD exercise objectives. USAF J-SEAD forces should be tasked to support existing exercises. Current exercise training can be modified to improve the USAF F-16 SEAD pilot training for the J-SEAD mission. The USAF must maximize current training to train more efficiently. The following example uses the Air Warrior exercises to illustrate the point.

Stateside-based USAF F-16 SEAD units should be tasked to support Air Warrior exercises. These exercises can provide J-SEAD training opportunities in support of Army CAS and close operation training. USAF F-16 SEAD units do not need to participate during every exercise day. The units can employ from home station with tanker support, fly the J-SEAD mission, land at an airfield near the exercise, and debrief. This type of exercise support scenario would allow USAF F-16 SEAD pilots to practice J-SEAD coordination and planning from geographically separate locations. The mission duration would replicate a real-world scenario.

The entry and hand-off coordination procedures would be applied at the exercise location. Finally, the pilots would have an opportunity to debrief in person with the forces they are supporting. This type of training scenario enhances cooperation and teamwork between joint forces. The training is effective because it builds trust and it provides the forces with an opportunity to improve their JTTPs. The next exercise day, the same USAF F-16 SEAD pilots could fly a J-SEAD mission on the way back to home station. The return flight would utilize airborne tanker support if it were available. If tanker aircraft were not available, the flight would hop home by stopping to refuel along the way. This type of training supports effective J-SEAD planning, coordination, and employment training by integrating USAF F-16 SEAD into existing exercises. Support personnel are not required to deploy when pilots fly out and back exercise missions. Training costs are minimized by limiting exercise play and by employing out and back from home stations. The training is realistic and supports the concept of joint integration.

The concept of out and back J-SEAD training for USAF F-16 SEAD pilots can be applied to all existing service and joint exercises and unit level tier-one training worldwide. USAF F-16 SEAD pilots must have the opportunity and established requirement to conduct J-SEAD training with Navy, Army and Marine Corpse SEAD forces. USAF F-16 SEAD pilot participation does not have to occur on every exercise day. The J-SEAD training should occur on the days when the maximum numbers of J-SEAD forces are available to participate. This type of approach to effective J-SEAD training reduces cost while providing enhanced and realistic J-SEAD training opportunities to USAF F-16 SEAD pilots. This approach to J-SEAD training can and should be implemented immediately.

The joint and service exercises that require USAF F-16 SEAD pilot participation should develop exercise scenarios that encourage joint integration. The use of notional forces should be kept to an absolute minimum to ensure realism. The first time that a USAF F-16 SEAD pilot employs with another J-SEAD asset should not be in combat. Exercise participants should use

only the planning and communication equipment they plan to take to war. Planning and coordination processes should replicate what these forces expect to use in a combat theater. If they will not plan and brief in person during combat, they should not plan and brief together in training. The exercise developers should ensure J-SEAD forces have complete access to real-time theater and national collection data for planning purposes. J-SEAD participation should be planned to allow adequate time for thorough mission debriefs prior to the planning cycle for the next exercise event. J-SEAD training conducted under realistic combat conditions promotes effective and active learning. Realistic training allows USAF F-16 SEAD pilots to ascertain accurate tactical and operational lessons learned from each mission. These lessons learned will be applied to all future training and combat J-SEAD missions. The lessons learned from realistic training events have far-reaching effects. They impact future unit and joint training. They are used to refine and develop new TTPs. They are critical to the development of useable service and joint doctrine. Warfighting commanders rely upon training lessons learned for insight into force capabilities and limitations. The lessons learned provide commanders with the tools they need to effectively manage the war and their forces.

Warfighting CINCs do not have an effective measure of joint warfighting readiness. Subjective assessments of warfighting readiness are not based on training proficiency. Warfighting CINCs are not assured actual readiness ratings based on the current system. The warfighting CINCs should establish annual joint training proficiency requirements for USAF F-16 SEAD units for all three J-SEAD mission areas. AOR/JOA air defense systems suppression, localized suppression, and opportune suppression training requirements should include J-SEAD objectives for all service mission areas that will require J-SEAD support. The requirements should include day and night all-weather training events. These requirements can be applied to all JMETs. Annual joint training requirements for warfighting units would assure CINCs their planned forces have some joint employment proficiency.

J-SEAD planning and coordination should be integrated with planning and coordination for IO and space operations. The three mission areas are interrelated and nested in functionality. The effective integration of these three mission areas will be required for effective offensive operations in the future. The JCS should initiate the development of joint doctrine that integrates IO, space, and J-SEAD operations into a comprehensive warfighting mission area.

Future J-SEAD training can be enhanced by ensuring each USAF F-16 SEAD unit has a secure video teleconference (VTC) or similar capability for joint mission planning, coordination, briefing, and debriefing. All future mission-planning systems should be designed as collaborative joint mission planning systems that utilize common data formats. The mission planning systems should receive and integrate national and theater collection data to ensure all J-SEAD forces have a common operational picture of their AOR/JOA. The effectiveness of joint forces in combat will rely on trust, teamwork, and a common picture for battlefield situational awareness. Providing J-SEAD forces with interoperable systems enhances teamwork. Trust is built by working together as a team in training. Providing the same information to all levels of warfighters at the same time ensures a common picture and allows these forces to parallel plan. J-SEAD training must receive priority and funding. J-SEAD combat effectiveness is directly related to J-SEAD training. USAF F-16 SEAD pilots must be afforded the opportunity to train for all possible applications of J-SEAD during peacetime training if they are expected to function effectively and efficiently as a J-SEAD team member during combat. Joint employment is the future of USAF F-16 SEAD. The USAF F-16 SEAD pilots must be trained to conduct effective day and night all-weather J-SEAD operations. The JCS, warfighting CINCs, and the USAF must recognize the absolute requirement for J-SEAD training. The warfighting readiness of the USAF depends on the readiness of USAF F-16 J-SEAD pilots.

Relationships to Previous Studies

This thesis is the first study of its kind.

Suggestions for Further Research

Future research should explore the effectiveness of Navy, Marine, and Army J-SEAD training programs. Service and joint TTPs training should be evaluated to assess J-SEAD employment training readiness. Research should be conducted to determine the effectiveness of the joint and service specific readiness rating system. The research should determine if the readiness reporting systems accurately gauge operational readiness. The final area that demands future research is simulation-based training. This topic can be refined into many categories. The military needs to know if current simulations are providing effective training for warfighters. Research should also be accomplished to determine if simulation-based training is an effective replacement for live-training exercises. J-SEAD planning and coordination should be integrated with planning and coordination for IO and space operations. Research should be conducted to determine how these missions can be combined for future conflict. The research should explore how IO, space operations, and J-SEAD are related. It should further refine how to combine the different operations to achieve greater synergy for targeting in combat.

Summary

J-SEAD is a critical mission essential task for USAF F-16 SEAD pilots. J-SEAD operations will support all Army, Navy, and Marine Corpse offensive operations in future military operations. USAF F-16 SEAD pilots must be given the opportunity to train jointly in support of each of these mission areas if warfighting commanders expect success in combat. The J-SEAD training must be accomplished both during the day and at night in all weather. Daytime and nighttime all-weather J-SEAD operations present unique operational employment obstacles

that must receive training emphasis to overcome. J-SEAD training should provide USAF F-16 SEAD pilots with an opportunity to employ with all J-SEAD forces that can be expected in combat. The training should be demanding and realistic. The training IADS should replicate expected threat IADS. J-SEAD planning and coordination should be conducted from separate locations, as it will be in combat. The equipment used for J-SEAD planning and coordination should be identical to the equipment that will be available to J-SEAD forces in combat. J-SEAD training execution should focus on joint integration and not joint deconfliction. Joint integration of J-SEAD forces maximizes the capabilities of each weapon system while minimizing the limitations. J-SEAD operations should capitalize on the synergistic effects of the integrated J-SEAD force.

J-SEAD training for USAF F-16 SEAD pilots does not require the creation of new service and joint exercises. USAF F-16 SEAD pilot J-SEAD training can and should be integrated into current exercises. USAF F-16 SEAD units should be tasked to participate in current exercises on a limited play basis from home station. The F-16 SEAD pilots will plan, coordinate, and initiate the mission from their home base and then fly to the exercise area with airborne tanker support. The pilots will conduct J-SEAD support, land at an airfield near the exercise area, and then thoroughly debrief the operation with the other J-SEAD forces. They can then plan and coordinate their next J-SEAD mission together, execute the mission, and then return to home station. This approach to J-SEAD training minimizes the cost of adding J-SEAD training to current exercises. USAF F-16 SEAD units are not required to deploy support personnel and equipment to exercise locations. Training opportunities are increased with a limited increase to OPSTEMPO. J-SEAD exercise integration should occur when the maximum number of J-SEAD forces can be made available for training. Eventually, J-SEAD training should be incorporated into all exercise scenarios. J-SEAD must be listed as a JMETL, AMETL and a service METL and be included in the UJTL before this can occur. The cost of adding J-

SEAD training is far less than the cost of ineffective J-SEAD operations in combat. Congress must understand that readiness requires realistic training. Realistic training costs directly equate to success in battle. If the U.S. expects to win in combat, the USAF must train realistically in peacetime.

The JCS, warfighting CINCs, and the USAF must recognize the importance of J-SEAD to all other airborne operations. They must place J-SEAD on their respective METLs and include J-SEAD in the UJTL to establish J-SEAD training as a prioritized requirement. Warfighting CINCs should require ACOM to establish annual joint training requirements for all J-SEAD forces to ensure they have the training proficiency they will need to be considered combat ready. The JTS has emphasized battle staff training at the expense of warfighter training. Warfighter training includes J-SEAD. Warfighting CINCs cannot afford to efficiently manage forces that are not prepared to fight. The warfighting readiness of the military depends on the training proficiency of the warfighting forces and the battle managers. J-SEAD operations are linked to most offensive combat operations. J-SEAD forces must receive training priority and funding to assure effectiveness in support of these operations in combat. The effectiveness of all USAF airborne operations depends on the effectiveness of USAF J-SEAD operations.

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13. ABSTRACT ***(Maximum 200 Words)***

This thesis investigates the question: How should the U.S. Air Force (USAF) modify F-16 Suppression of Enemy Air Defense (SEAD) training to ensure pilots have the operational flying experience and proficiency required to conduct effective Joint Suppression of Enemy Air Defenses (J-SEAD) operations in combat? USAF F-16 SEAD pilots are not receiving the quantity and quality of training required to conduct effective J-SEAD operations in combat. USAF F-16 SEAD pilots must be trained for J-SEAD to prevent operational failure in combat.

The thesis analyzes and evaluates joint training requirements, programs, and combat employment cases to identify USAF J-SEAD training shortfalls. The current and planned trend for joint training is to replace high-cost, live training exercises with simulation-based exercises to reduce cost. This trend has significantly impacted operational readiness and has prevented effective J-SEAD training for USAF F-16 SEAD pilots.

J-SEAD must be identified as a mission essential task for the USAF. Pilots cannot afford to wait until combat to develop effective J-SEAD joint tactics, techniques, and procedures. Simulation training should be used to enhance flying training not replace it. The addition of J-SEAD objectives and forces to exercises can be accomplished by simply training smarter.

14. SUBJECT TERMS
Readiness, military capability, joint suppression of enemy air defenses, F-16, HARM, HARM targeting system, training, Army, Navy, Air Force, Marines, AOR/JOA air defense systems suppression, UJTL, ACOM, ACC, opportune suppression

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