Putting the "J" in J-SEAD

A Monograph
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The monograph looks first at the history of J-SEAD from World War II through Desert Storm. Next, it examines the joint doctrine, noting service requirements and discussing several deficiencies. Then, the doctrines of each service are examined by focusing on the organization, planning, and execution of J-SEAD. Deficiencies in the service doctrines are also highlighted and needed changes are discussed. Two historical vignettes are provided; both cases display the potential of effective J-SEAD.

The monograph concludes that the present organization for J-SEAD is effective, but several changes are needed to make it more efficient. Particular changes include the placement of electronic warfare jamming resources under the direct control of the fire support coordinator, a dedicated J-SEAD coordinator in the fire support element, and a greater emphasis in all doctrines on the ability of each service to contribute to J-SEAD.

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Introduction

> Because we operate and fight jointly, we must all learn and practice joint doctrine, tactics, techniques, and procedures; feed back to the doctrine process the lessons learned in training, exercises, and operations; and ensure Service doctrine and procedures are consistent.[1]

These words from Joint Pub 1, Joint Warfare of the US Armed Forces, indicate the importance placed on being prepared for joint operations. One of the most critical areas requiring integration is for the joint suppression of enemy air defenses (J-SEAD). J-SEAD is the use of joint forces to accomplish SEAD, which is defined as, "That activity which neutralizes, destroys, or temporarily degrades enemy air defenses in a specific area by physical attack and/or electronic warfare."[2] Some of the most compelling television images from Desert Storm were the intense anti-aircraft artillery (AAA) and surface-to-air missile (SAM) firings from Baghdad during the initial moments of the war. However, few people are aware of the intense J-SEAD effort that helped minimize coalition casualties during both the air and ground wars. While the results of Desert Storm seem to indicate that J-SEAD doctrine operates well, it is still important to ensure that it is evolving and efficient. Furthermore, as force levels decrease and more countries obtain access to increasingly sophisticated air defenses, the need for unambiguous and consistent J-SEAD doctrine is clear.

Another reason to ensure J-SEAD integration is the increasing ability of each service to influence the battle outside of its "traditional" sector. The various types of field artillery systems, missiles, helicopters, and unmanned aerial vehicles (UAVs) are capable of ranges which put them in areas normally the exclusive venue of the Air Force or the Navy. Additionally, electronic warfare (EW), and jamming in

particular, is able to affect radars and communications well beyond the area of its user—electronic "fratricide" is a growing concern. Special operations forces also have the capability to attack enemy air defense assets. This melding of capabilities and affected areas requires a doctrine to ensure synchronization.

Yet, while the joint doctrine addresses the importance of J-SEAD, and the individual services each address it in various forms, in reality the integration is often lacking. While history points to some excellent examples of effective J-SEAD, in many cases these were the result of extensive rehearsals or were only for a short duration operation. More often, the emphasis on SEAD/J-SEAD came only after aircraft losses began to mount. The ability to orchestrate effective J-SEAD on short notice or to continue the process for an extended period has rarely been tested. This leads to the question of whether J-SEAD doctrine is supported by the doctrines of the individual services.

To understand how to answer this question, it is important to briefly look at why J-SEAD execution is seldom an integrated effort. The first, and probably most important, reason is because effective J-SEAD requires a concerted effort to synchronize forces. Combining electronics, air assets, field artillery and other means is difficult to achieve on a continual basis. Secondly, J-SEAD is only a means to an end. In other words, successful J-SEAD simply allows airpower to directly influence the battle; it has little effect in and of itself. A few destroyed air defense assets is not likely to affect the enemy in the same way that destroyed maneuver assets would. This leads to the third reason, which is the lack of quantifiable measures of success, especially when employing electronic warfare (EW). Seeing something destroyed

is normally a good sign of target destruction, but with EW it is difficult to determine just how well it is working. Many times, one does not know if the air defense system is suppressed until flying within range of it without being engaged.

This ties in with a further problem in measuring effective J-SEAD, which is that one is essentially working with a negative aim—no air assets shot down or engaged. With this negative aim, how much effort is enough? The definition of "suppression" is ambiguous enough. "Neutralize," "destroy" and "degrade" all define different results and thus different efforts. This is especially important because every asset used against air defenses is an asset not employed against other enemy forces. All of these factors tend to limit J-SEAD integration.

Given this, to answer the question of whether the services support the J-SEAD doctrine, one must establish some measurements. This monograph will focus on two: are the service doctrines consistent with the joint doctrine and are they integrated? To answer these questions, one must analyze several factors: the organization, the command and control for planning and execution, and the ability to integrate with other forces. With this logic, one can identify weaknesses in either the joint or the service doctrine.

One other measurement that will not be addressed is whether or not each service has the ability to execute the doctrine. It is one thing to have the doctrine, but quite another to be able to implement it. This ability is primarily a matter of equipment. The amount of equipment available for J-SEAD and its capabilities is beyond the scope, and in many cases the unclassified nature, of this research.

With the increasing sophistication and capabilities of various air assets and air defenses, a comprehensive, synchronized, and efficient doctrine is indispensable. Each service is becoming more capable of employing drones, missiles, and aircraft into areas traditionally controlled by other services. By reviewing the historical foundations of J-SEAD and then examining the joint and service doctrines, a better picture of current joint capabilities and areas for improvement will emerge.

Historical Foundations

In briefly reviewing the history of modern J-SEAD, one can note several trends. While there are a number of great successes, in many cases SEAD or J-SEAD was not adequately addressed until losses began to mount. Another trend is that effective SEAD operations required detailed planning, the latest technology, and synchronized execution. When done well, J-SEAD can have dramatic results, as evidenced by the 1982 Israeli operation in the Bekaa Valley and Operation Desert Storm. Yet, even here one can see cautions and needed doctrinal improvements.

Modern day SEAD can trace its lineage to World War II and the advent of radar. Both the British and the Germans employed this new technology to warn and defend against incoming bombers. In fact, the Germans arguably conducted one the first SEAD campaigns by attacking radar sites along the English coast. However, unable to see any direct results from these strikes, Reich Marshal Hermann Goering discontinued his campaign, not realizing the critical role radar played in the British defense.[3]

As the Allies began bombing missions over enemy territory, the growing lethality of air defenses became apparent. Early attempts at suppressing these defenses involved a mixture of directly attacking them with other aircraft, and employing various types of electronic countermeasures (ECM). The direct attacks proved quite costly.[4] This led to attempts at J-SEAD, with Allied artillery suppressing for fighters and bombers.[5] One of the most impressive took place in March 1945. To support an Allied Rhine river crossing by aircraft and gliders, bombers flew more than 4000 sorties, dropping nearly 9000 tons of bombs over a 3-day period prior to the mission.[6] On the day of the crossing, British artillery fired 24,000 rounds in just 18 minutes against 100 German air defense sites. With over 2000 inbound aircraft and gliders, an observer on a hilltop controlled the timing of the operation.[7] Despite this impressive assault, the aircraft still took heavy losses, with damage to nearly 50% of the force.[8] The reason is that despite this large effort, the air defense sites remained difficult to accurately locate and destroy. Furthermore, with the number of sorties, bombs and artillery rounds, the element of surprise was lost and the defenses were prepared.

There is little evidence of any effort to increase the effectiveness of J-SEAD between Word War II through the first part of the Korean War. North Korea and China employed a smaller number of air defenses, few of which were radar controlled.[9] However, as the threat grew and losses mounted, American forces finally initiated some coordination; however, this effort began two years after the war began. Even then, the Army and Air Force worked independently of the Marines, with both sides achieving various levels of success.[10] No substantial synchronization between the services took place. In fact,

out of the many "lessons learned" from the air war in Korea, SEAD was not even listed.[11] Again, one can see a belated application of J-SEAD and insufficient joint integration.

It was not until the Vietnam War that the growing importance of SEAD became obvious. Despite the downing of U-2s by Soviet surface-to-air missiles (SAMs) in 1960 and 1962, it required the first downing of an Air Force fighter over North Vietnam in 1965 to initiate a serious response.[12] While both the Navy and Air Force built various types of electronic jamming aircraft, each took a different approach to actually finding and neutralizing the SAM sites. The Air Force developed the "Wild Weasel," a specialized aircraft modified to locate the SAMs. These aircraft normally flew separated from the bombers, attempting to draw the SAMs away. The Navy, on the other hand, added equipment to existing aircraft and made them an integral part of the strike package. This trend continues today.

Due to the location of the enemy SAMs, the separation of North Vietnam into service-specific sectors, and the lack of a joint air commander, little J-SEAD occurred. When it did, it required extensive planning and briefing to convince those involved of capabilities and responsibilities.[13]

Additional lessons concerning J-SEAD emerged during Linebacker II, the 11-day intensive bombing campaign in December 1972. During this campaign, the Air Force/Navy J-SEAD effort was quite extensive; however, the early emphasis was on suppressing the defenses and not destroying them.[14] Some assets attacked the sites directly, but it was not until after the SAMs began inflicting significant losses that planners made a concerted effort. After concentrating

against the SAM sites and storage facilities, losses to the enemy diminished.[15] The lesson learned from Linebacker II is that while suppressing enemy defenses may work for a single mission or a short campaign, repeated strikes require a dedicated destruction effort as an early priority.[16]. Unfortunately, this same lesson had been learned during the Linebacker I campaign seven months earlier.[17] Even though Linebacker II constituted a great success for airpower and most considered the losses "acceptable," it also displayed the reluctance to weight the destructive J-SEAD effort until losses began to mount.[18]

The Israeli Air Force (IAF) closely watched the American effort in Vietnam, particularly since they were becoming intimately aware of the growing lethality of air defenses. Following the IAF's dramatic success in the 1967 war, Egypt, with Soviet help, constructed a formidable integrated air defense system (IADS), eventually reaching from Cairo to the banks of the Suez canal. As the defenses became more sophisticated, Israeli losses began to mount. The IAF attempted various equipment and tactical changes to handle this threat, but did not achieve a comprehensive plan.[19] This hurt them in the 1973 Yom Kippur War, as the Egyptian and Syrian IADS accounted for 20-30 planes a piece on just the first day, and nearly 100 airplanes during the war.[20] Stunned by the early losses, the IAF quickly focused their efforts on neutralizing the SAMs. While new tactics and ECM pods helped reduce the losses, what made the difference on the Egyptian front were the ground forces. After forcing the Egyptians back across the Suez, the Israeli army attacked and overran 40 SAM sites, thus helping the IAF to regain air superiority.[21] Once again, neglecting J-SEAD until incurring significant losses helped put Israel in a precarious position.

However, this experience also showed the role ground forces can play in suppressing enemy defenses.

The Israelis emerged from the near disaster of 1973 determined to make fundamental technological and doctrinal changes for the air defense threat. One of the most important changes involved the use of non-IAF forces to achieve air superiority. This realization helped set the stage for the 1982 Bekaa Valley Operation.[22] In fact, to some people, this operation was simply delayed revenge for the 1973 war and, as such, represents a nine year planning process for an exceptional mission.[23] This operation, displaying what effective J-SEAD can accomplish, is covered in-depth in Appendix I.

Desert Storm also represents the impressive capability of synchronized J-SEAD forces. In fact, the spectacular results almost beg the question of the need to investigate J-SEAD doctrine when it apparently worked so well. However, upon close examination of Desert Storm, one can still find deficiencies in regards to J-SEAD. For example, several "non-standard" organizations, which will be detailed later, were required to effectively integrate J-SEAD. Additionally, many of the critical missions were rehearsed for months—an ability which might not be available in future conflicts. Furthermore, the two distinct operations—the air campaign and the ground campaign—facilitated the concentration of effort on destroying Iraq's air defense assets early. Finally, Iraq's air defense system, while impressive, was not employed smartly. Doctrine must be founded on the belief that the enemy will use his equipment the way it is supposed to be.

This brief background on J-SEAD shows that for the most part, J-SEAD was neglected until aircraft losses begin to mount above

"acceptable" levels. Additionally, effective operations versus enemy air defenses required a concerted effort by several forces to achieve results. Though Desert Storm marks a significant change to the tendency to neglect J-SEAD, the distinct and intense air campaign made J-SEAD one of the few operations available to all forces. Recent commanders have not had to conduct extended J-SEAD operations, with the requisite detailed planning. However, with the US's transition to a smaller power projection force and the increasing sophistication of air defenses, doctrine must allow for tactical operations to achieve and sustain results beginning with the first mission.

Joint SEAD

With this background on J-SEAD, one can begin to examine the various current doctrines with an understanding of the historical foundations. To comprehend the joint doctrine, it is necessary to review some basic definitions, and then the organization and roles of the major participants. The planning and execution processes will then outline the various responsibilities in J-SEAD. Additionally, weaknesses in the joint doctrine that might carry over into the service doctrines will be highlighted.

The primary sources for J-SEAD doctrine are Joint Pub 3-01.4 Joint Tactics, Techniques, and Procedures (JTTP) for Joint Suppression of Enemy Air Defenses (J-SEAD), and FM 90-15/FMFMRP 5-43/TACP 50-23/ J-SEAD, Multi-Service Procedures for the Joint Suppression of Enemy Air Defenses (hereafter referred to as TACP 50-23). Additional sources with references to J-SEAD include several joint fire support and electronic warfare publications.

While J-SEAD encompasses all efforts against enemy air defenses, it is broken down into three separate categories: campaign, localized and complementary. Campaign J-SEAD directly reflects the joint force commander's (JFC's) operational plan and is normally targeted against an entire system, or significant parts of it, to facilitate current and future air operations. An example is the targeting of Iraq's integrated air defense system (IADS) command and control centers in Desert Storm. Particularly important in a campaign J-SEAD plan are those defenses affecting critical "force multipliers," such as AWACS and JSTARS. Localized J-SEAD, on the other hand, usually involves a specific geographical area and time. This reflects the tactical employment of J-SEAD assets. An example is the employment of J-SEAD assets in support of a particular close air support (CAS) flight. Complementary suppression involves engaging targets of opportunity, which may be located by various sources.[24] Though these delineations provide a focus, they are certainly not distinct. Localized and complementary suppression invariably support campaign suppression objectives.

Additionally, J-SEAD means are defined as either "destructive" or "disruptive." Destructive means ensure the long term degradation of enemy air defenses, but entail a much greater effort. They also provide better proof of a neutralized system. Disruptive means seek to temporarily suppress the enemy air defenses, primarily by denying accurate targeting information. Furthermore, disruptive means may be either active (jamming, decoys, tactics, etc.), or passive (camouflage, radar warning receivers, etc.).[25]

To support the JFC's campaign plan, there are a number of staff personnel who plan and execute the J-SEAD part. The joint force

director for operations (J-3) directs and controls the J-SEAD effort as part of the overall campaign. The joint force air component commander (JFACC) is responsible for controlling all air operations and is normally designated as the J-SEAD coordinator. The J-SEAD coordinator, who may also be the J-3 or a component commander, is responsible for integrating joint suppression with the J-3's maneuver plan. Additionally, he will normally delegate specific planning functions to the tasked components. Each component is also responsible for identifying J-SEAD needs, planning actions, and coordinating their execution.[26] It is important to note that JP 3-01.4 states that the component of the J-SEAD coordinator will normally be charged with the J-SEAD planning and execution process.[27] The joint force director of intelligence (J-2) focuses on collecting, analyzing, and prioritizing intelligence on enemy air defenses. Finally, the joint force director for command, control and communications (J-6), is responsible for communications support and frequency deconfliction.

The J-3 has a number of staff agencies to help him plan and execute J-SEAD operations. The first is the joint commander's electronic warfare staff (JCEWS). The JCEWS, headed by the J-3 electronic warfare officer (EWO), is responsible for advising key personnel and also coordinating the entire EW effort. Additionally, the JCEWS integrates EW with another J-3 staff agency, the joint targeting coordination board (JTCB). The JTCB serves as the focal point for refining and prioritizing all requests for targeting, control measures, and service integration.[28] Normally chaired by the J-3, the JTCB includes representatives from major functional areas, plus all pertinent services. One of its key products is the joint target list (JTL), which outlines prioritized targets

and integrates assets. The J-SEAD process benefits by being able to prioritize its resources on the basis of the JTCB's results and also by ensuring that high priority air defense threats are properly targeted by the most efficient means.

These are the major actors in the J-SEAD planning and execution process. However, while they typify the organization, the JFC has wide latitude to establish his staff differently. The JFACC, JCEWS, and JTCB, for example, may or may not be designated. This latitude gives the JFC a great deal of flexibility, but the lack of a firm doctrinal base could cause problems when required to execute missions on short notice.

Planning J-SEAD varies, depending on whether it is campaign or localized J-SEAD. The campaign J-SEAD plan is developed through the J-SEAD coordinator and the JTCB, using inputs from numerous sources. They determine the high payoff air defense targets, prioritize them, match assets, and track the results. The air operations center(AOC), battlefield coordination element (BCE), and other components contribute to the plan with target nominations and by tasking their respective assets to execute the plan. When consolidated and deconflicted, the JFACC approves the plan and forwards it to the JFC for final approval. It is then implemented by either the air tasking order (ATO), operations order (OPORD), or similar means.[29]

While the campaign J-SEAD planning process is primarily a "top down" process, localized J-SEAD is characterized by "bottom up" planning and execution. The localized process begins when an echelon requests air support. This request should include known air defenses and any required suppression assistance.[30] The JFACC coordinates for available air suppression assets while the ground fire support elements

determine what lethal and non lethal means they have to support the plan.[31] The requests from the various forces are consolidated, prioritized and forwarded up through fire support channels and then to the AOC and BCE. This is a continual process as targets and plans are updated.

Once the campaign and localized plans are finalized, the execution of J-SEAD should be straightforward and synchronized. Much of Desert Storm went this way. For J-SEAD requests that are not part of the ATO/OPORD format, then "immediate" procedures are used. These are identical to CAS requests, and are sent via the air request net through the tactical air control party (TACP) or the air and naval gunfire liaison company (ANGLICO). If surface forces cannot respond, then the request goes to the AOC for action.[32]

TACP 50-23 specifically discusses how air assets may request J-SEAD support from surface forces. This applies whether or not the air mission is in direct support of the units from which they need J-SEAD support.[33] For example, an Air Force deep strike package crossing the forward line of troops (FLOT), may request Army support against enemy air defenses in their area. This would allow the Air Force suppression assets to conserve ordnance for their particular target area.

Complementary J-SEAD is, by its nature, not conducive to extensive planning. The JFC will publish rules of engagement (ROE) which will detail specific actions that can be taken against enemy air defenses. In line with these ROE, potential targets will be passed through normal fire support or command and control channels. The targets will either be engaged, or the information will be forwarded to the AOC for possible future targeting.[34]

This covers the doctrinal information in the specific J-SEAD manuals. J-SEAD is also mentioned directly and indirectly in several other publications. One of these is Joint Pub 3-09, Doctrine for Joint Fire Support Operations. Of particular note are the references to electronic warfare and the importance of integrating it into the overall fire support plan.[35] However, even though the discussion of various resources and planning is good, there are several weaknesses. For example, in describing the missions that the individual services are capable of accomplishing, there is no mention of Air Force EW or SEAD.[36] Whoever is coordinating the joint force fire support should know and employ the most efficient fires (lethal and non lethal) available. He should not neglect the capabilities of another service.[37] While he may not directly control some of these assets, he does need to consider them and coordinate for their use when needed. Additionally, expecting one person to be knowledgeable of the myriad lethal and non lethal means available is unrealistic. This expertise should come from the JCEWS, but its exact role in executing joint fires is not detailed in this publication.

EW is a critical element in J-SEAD, and many of the specifics are covered in JCS Pub 3-51, Electronic Warfare in Joint Military Operations. Covering all uses of EW, including J-SEAD, this document expands upon the role of the JCEWS. Reviewing this publication in light of the other documents reveals several further weaknesses in the joint doctrine. One is the request channels for immediate EW support. While the J-SEAD manual showed the similarity between requesting SEAD and CAS, JP 3-51 states that EW requests should flow through the components first, and then to the JCEWS.[38] However, the JCEWS has no tasking authority.

Additionally, it is up to the JCEWS to establish procedures for requesting immediate EW support.[39] For EW to be responsive and fully integrated into the J-SEAD process, its request channels should be parallel with the J-SEAD channels.

This highlights another weakness, which is the relationship between the J-SEAD coordinator and the JCEWS. While the JCEWS is responsible for coordinating all EW support, the J-SEAD coordinator is responsible for supporting the J-SEAD process. Neither person has authority for tasking all J-SEAD resources, though any conflicts should be resolved by the J-3.[40] This is not to imply that the JCEWS or the J-SEAD coordinator should have command authority over all EW sources, but it does exhibit a division in the process of planning and employing J-SEAD, which normally implies a slower response.

The J-SEAD coordinator has other problems in achieving a coherent effort. The statement that the component staff of the J-SEAD coordinator is responsible for planning and executing J-SEAD makes a truly joint effort difficult to attain. The specific components probably do not have sufficient personnel for this task, plus it hampers the capabilities of the joint staff to advise and assist, particularly if the two staffs are not collocated.

A final criticism of the joint regulations concerns the division of responsibility for J-SEAD operations. For example, the joint publication states that ground and naval gunfire units are primarily responsible for J-SEAD up to the limits of observed fire.[41] The air forces have secondary responsibility. These responsibilities are reversed beyond the limits of observed fire. This delineation is not consistently addressed in the other services' publications, and is also inconsistent in

the joint publication. For example, while the range of observed fire would obviously depend on the circumstances, the manuals contain no guidance on how to determine this range. Furthermore, while the JFACC will normally be the J-SEAD coordinator, the joint publication states that in the absence of a JFACC, then the J-SEAD responsibility is divided at the fire support coordination line (FSCL), with the Air Force primarily responsible for J-SEAD beyond it, and the land component primarily responsible short of it.[42] Since the limits of observed fire will often be short of the FSCL, then one must question the wisdom of these two separate divisions. While a discussion of the FSCL is beyond the scope of this monograph, this division of responsibilities can seriously hamper the air component commander's ability to execute coherent J-SEAD missions.[43]

J-SEAD requires careful planning and synchronization. For the services to develop compatible doctrines, the joint doctrine should provide a framework, detailing various procedures and responsibilities. The joint publications do this, for the most part. They provide basic definitions, identify the role of key players, and discuss both planning and execution procedures. However, there are several shortfalls. Specifically the integration of EW forces and the geographic delineation of responsibilities are ambiguous. One would expect this to affect service J-SEAD doctrine, which will now be examined.

Marine Corps SEAD

The Marine Corps should have the best organization and doctrine for J-SEAD based upon their structure. As a true rapid intervention force, they are essentially self-contained—all ground forces, artillery,

air forces and electronic warfare are part of the same service. Additionally, as part of the Department of the Navy and being dependent upon it for much of its support, the framework is there for effective J-SEAD. For the most part, this framework is sufficient; the structure, planning and execution are consistent with joint doctrine. However, there are several areas for improvement both within the Marine Corps structure and more importantly, in its relation to other joint forces.

One of the main hurdles in comprehending the Marine Corps approach to SEAD is understanding its organization and how it operates. This is particularly true during amphibious operations, as the Marines transition from being on ships, to establishing a beachhead, to conducting sustained land operations. 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. Each of these two commanders has a supporting staff to plan and integrate all operations, including SEAD.

The basic Marine Corps combined arms organization is the Marine air ground task force (MAGTF). The command structure includes an overall command element (CE), plus command elements for the ground (GCE), air (ACE), and combat service support (CSSCE).[44] The CLF is the MAGTF commander. The MAGTF CE coordinates the efforts of the other three elements and does much of the coordination with outside agencies. In this role, it focuses on deep operations, while the GCE concentrates on the close fight and the ACE is responsible for deep, close and rear operations.[45] Additionally, the MAGTF and ACE apportion and allocate all air sorties, and publish an air tasking order (ATO).[46]

This process is similar to that used by joint force commander and joint force air component planners.

For fire support planning, the CATF establishes a supporting arms coordination center (SACC). For operations ashore, both the MAGTF and the GCE have fire support coordination centers (FSCCs). The MAGTF FSCC is responsible for integrating all fires, though its focus is on the deep battle. It also helps coordinate the fires of lower echelons and is responsible for coordinating with external agencies.[47] Finally, it is tied into the Marine air command and control system (MACCS) via the tactical air command center (TACC).[48]

The GCE FSCC is linked with the MACCS by being collocated with the direct air support center (DASC). Maneuver units have tactical air control parties (TACPs) for requesting and controlling air support. The DASC translates the TACP's requests into actual aircraft sorties. This organizational structure is similar to the TACP-air support operations center (ASOC) relationship between the Army and the Air Force.[49]

Knowing the Marine Corps organizational structure, the SEAD process can be examined. Planning for SEAD is initially conducted in the SACC prior to the beginning of amphibious operations. Both the ACE and GCE can initiate SEAD/J-SEAD requests, but normally the ACE is charged with formulating the overall plan. As such, it coordinates with other agencies for needed support and establishes procedures.[50] The tactical air commander (TAC) does the actual planning and directing of air assets used in J-SEAD. He coordinates as much as possible with other ACE staff agencies, the GCE and other joint air forces.[51] The GCE is charged with integrating and directing the ground forces' responsibilities for J-SEAD. Requests for EW or joint support are

forwarded to the MAGTF FSCC, where the ACE's SEAD plan is integrated with other fire support plans to ensure compatibility and integration. Liaison officers from the air, artillery, naval gunfire and other supporting units assist in this process. The MAGTF CE will also ensure that EW jamming, deception, and destruction operations are part of the overall fire support plan.[52]

The execution phase of Marine Corps SEAD is similar to the guidance discussed in the joint manuals. For preplanned operations, the TACC and FSCC execute J-SEAD taskings for the air and ground forces. Aircraft are controlled through the TACC, going through the tactical air operations center (TAOC), to the DASC for tasking, and finally to a TACP for execution.[53]

For immediate requests, SEAD targets are passed by forward observers and integrated with other known threats at higher echelons. Both organic and external support is coordinated, including airspace coordination.[54] The FSCC determines what assets to use for SEAD. The fire support manuals outline this process very well, including the employment of EW in place of hard ordnance and the possible synergistic effects of using EW combined with other destructive means.[55] Also included is the use of air assets, either to destroy air defense targets or to suppress them with jammers.[56]

Marine Corps J-SEAD doctrine appears well aligned with the joint doctrine. Many of the agencies are similar to those in the Army/Air Force close air support channels. However, there are some weaknesses in the system, both internally and from a joint perspective. For example, while the joint publications point out specific responsibilities for tasking Marine assets for J-SEAD and coordinating for external

support, there is little mention of how those forces would be controlled. How would Army MLRS, ATACMS, or Air Force EW support be integrated with Marine agencies? Coordination of naval gunfire support is outlined fairly specifically, but little mention is made of other sources.[57] The MAGTF CE is charged with coordination of outside assets, which would work for preplanned operations. However, when an immediate response is needed, there could be confusion.

A second area of concern is with EW. Control of Marine EW is centralized through the SIGINT/EW coordination center (S/EWCC). The S/EWCC is run by the G2 and includes representatives from the intelligence, operations and plans agencies.[58] Other subordinate units do the detailed tasking.[59] This organizational framework is similar to the Army's and shares the same potential weaknesses. By having EW jamming assets controlled through intelligence channels, another echelon must be transited to get support. Since the FSCC is responsible for employing the most efficient lethal or non lethal fires to support the maneuver forces, he does not have immediate tasking authority for the employment of EW jamming. One could argue that this arrangement is no different than having to go through air channels for air support, but there is a difference. Air assets are coordinated through the operations functions. Everything is oriented towards the maneuver forces. By having EW jamming assets function through the intelligence channels, there is a natural proclivity to associate them as just another intelligence asset and not with maneuver unit support.

At one time EW was part of the G3 function. In Desert Storm, airborne jammers were used to mask artillery locations, whereas in the past they were used primarily in support of air operations. However, a

recent article notes that moving EW back to the G2 makes it more difficult to integrate into the maneuver scheme.[60] The author recommends several personnel, fire support and planning considerations to optimize the use of EW.[61]

A further concern involving the Marine Corps and J-SEAD is the command and control of the MAGTF in joint operations. The Marines fill a critical role in a force projection military; however, as the theater matures, at what point is their self-contained force structure integrated with the remainder of the joint force? The Marine Corps answer is to place the MAGTF directly under the JFC, and not parcel out its forces to the land and air component commanders.[62] This desire to retain all forces under MAGTF control can lead to problems when trying to integrate joint forces. Several examples of this occurred during Desert Storm.[63] The role of the MAGTF when operating adjacent to other units has been the subject of much debate and is certainly beyond the scope of this monograph.[64] However, these concerns do affect the planning and execution of J-SEAD and is an issue that needs addressing.

Marine Corps doctrine appears well suited for the J-SEAD mission. It has an organizational framework that parallels the joint structure and is similar to the Army structure for fire support. Its actions are well harmonized with the Navy. The doctrine addresses the use of EW and external support to optimize enemy air defense suppression, while also addressing the use of Marine forces for J-SEAD, though the details are somewhat sparse. However, the Marine Corps is also showing its concern for SEAD by publishing a doctrinal manual specifically on it.[65] Hopefully, it will address the control of EW, since its present placement outside of the operations channel may hinder rapid response and close

integration with maneuver forces. An even more important conflict to resolve is the role of the MAGTF when integrating itself with other joint forces.

Navy SEAD

The Navy faces several unique factors in its role with J-SEAD. First, it has a responsibility to protect the fleet, which varies in size and numbers depending on the mission. There is no "fixed" organizational structure as with Army corps and divisions, or Air Force wings. Secondly, besides fleet protection, much of its land effort is to integrate with Marine Corps amphibious operations. Some of this latter function was discussed in the Marine J-SEAD section. In this role, it is well integrated with the J-SEAD mission; however, there are some areas which need to be enhanced to allow more efficient operations with the other services.

Navy operations are oriented around the aircraft carrier and various supporting vessels. The responsibility for command and control rests with the composite warfare commander (CWC). Specific responsibilities for antiair, antisurface and strike operations are handled by subordinate commanders. The functions most involved with J-SEAD actions are the strike warfare commander (SWC), the air resources element coordinator (AREC) and the electronic warfare coordinator (EWC).[66]

The SWC plans and directs all air operations against land targets, which includes CAS and SEAD. The AREC manages the use of all air assets and publishes a comprehensive tasking list.[67] This appears to be similar to the functions of the Air Force air operations center (AOC) and

the ATO process.[68] The EWC plans and controls the optimal use of fleet EW assets, including airborne platforms.[69]

In planning J-SEAD operations, the SWC is the focus. In fact, his authority for this cannot be delegated.[70] Other elements will do the actual planning and integration, but he has the overall responsibility. When forces outside of the fleet will be used for J-SEAD operations, then liaison personnel will assist in the planning.

The SWC's responsibility extends to the execution of J-SEAD as well. This is unique among the services, to have one person in charge of J-SEAD actions. However, the manuals give little indication of how this responsibility is translated into the integration of air, naval gunfire, and EW forces to optimize suppression.

In closely examining Navy doctrine, one is faced with two challenges. One is the lack of a capstone doctrine—the equivalent of an Air Force Manual 1-1 or an Army Field Manual 100-5. Instead one must go to various Naval Warfare Publications (NWPs) or other sources. The second challenge is classification. For example, almost all electronic warfare procedures and guidance, including basic organizations, are classified.[71] This obviously presents difficulties in analyzing EW and its relation to the J-SEAD process. Despite this, one can still reach a basic understanding of the compatibility and integration of overall Navy doctrine to J-SEAD.

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 Air Force for joint maritime operations, predominantly for joint strikes against an enemy fleet.[72] Any external support would be primarily coordinated by use of liaison officers.

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.[73]

Most of the Navy's SEAD support is focused towards the Marine Corps. Much of this information was included in the Marine Corps SEAD section. With the force embarked, the supporting arms coordination center (SACC) is in charge of integrating all fires, including the J-SEAD effort. As the amphibious operation progresses, some elements of the FSCC go ashore to coordinate naval gunfire support. At this point the commander, landing force (CLF) is controlling the operation with his organic FSCC, and the SACC reverts to a standby status.[74]

Focusing on the SACC, there appears to be a lack of emphasis on J-SEAD operations. For example, SEAD fire is listed as one of the three distinct fires during landing operations; however, while there is further discussion of the first two missions of fires, there is no further discussion of SEAD.[75] Additionally, in discussing the types of fire support delivered by supporting arms, EW is not listed.[76]

The Navy also has some of the same concerns as the Marines do in effecting joint operations. Fleet defense is a primary mission for air operations and subjugating part of this arm to a JFACC is similar to the Marine concern of parceling the MAGTF to the JFACC and the land component commander (LCC). These are valid concerns, but need to be balanced with the requirements of the JFC. Furthermore, if the Navy has the preponderance of air assets in a theater, the JFC would most likely designate a naval officer as the JFACC. If the JFC also delegated

the J-SEAD coordinator duties to the JFACC, then the Navy must be able to orchestrate J-SEAD actions.

Thus the Navy has a compatible framework for J-SEAD. In particular, giving the SWC the task of effecting J-SEAD is an excellent idea. In addition, its role of supporting Marine amphibious operations gives the Navy a solid foundation that can be carried over to working with other services. Weaknesses in J-SEAD appear to be a lack of a comprehensive and codifiable J-SEAD doctrine, and the smooth integration of naval forces, particularly air, into the joint structure.[77]

Air Force SEAD

With so much of its operations influenced by air defenses, one would think that the Air Force would have the greatest interest in J-SEAD. Additionally, the Air Force contains many specialized aircraft capable of disruptive and destructive SEAD. Furthermore, its close relationship with the Army and the close air support (CAS) framework should promote an environment for integrating Army fires with Air Force missions. However, close examination of Air Force doctrine reveals that even though the structure is there, little regard is given to the employment of other service's assets outside of a few specific missions.

Command and control of all Air Force assets, including those employed for J-SEAD, is exercised through the tactical air control system (TACS). The senior level of this organization is the air operations center (AOC). The AOC has a number of staff organizations that plan and direct air operations. It also contains the liaison elements for the other services. The battlefield coordination element (BCE) is the Army

element that works closely with the AOC to ensure air and land forces are integrated. Beneath the AOC are the air support operations centers (ASOCs), which work with the corps fire support cells, normally for the distribution of CAS sorties. As with the Marine Corps, there are tactical air control parties (TACPs) with the maneuver units down to the battalion level.

Air assets are controlled at the wing level, which normally are tasked directly by the AOC. Once airborne, aircraft coordinate through various radar centers before arriving in their designated orbit area in the case of support aircraft, or until they contact the forward air controller, if a CAS aircraft.

Overall planning for SEAD operations is done at the AOC. This includes air support for land forces.[78] The director of the AOC is charged with establishing priorities for J-SEAD, recommending resources, and tasking air assets.[79] The combat plans division of the AOC forms the aircraft packages that strike the various targets. The electronic combat branch of this division is responsible for planning EW support for the package, including coordinating with other services for EW support. The BCE or other liaison elements will assist with J-SEAD requests and coordination. The result of this planning is the air tasking order (ATO), which details all Air Force flying activities for a specific time period. The ATO is sent to the various wings, where the aircrews plan their specific missions. As an example, an F-4G Wild Weasel crew would examine the ATO to find the location of the target area, the time to be there, the numbers and types of strikers, other support assets (air refueling tankers, AWACS, jamming aircraft, etc.), and radio frequencies. One of the attack aircraft would be designated as the

package commander and would orchestrate the particular sequence of events. Any coordination for additional support, such as ground forces for J-SEAD, would go back through the AOC.

During mission execution, aircraft will contact the various agencies discussed earlier. The combat operations division of the AOC is responsible for monitoring the implementation of the ATO and providing updates to targets or resources.[80] Changes to the enemy's air defense status are managed by several staff agencies in the AOC and consolidated at the combat operations division.[81] Any changes by airborne aircraft are normally coordinated through an airborne or ground control element. Immediate needs for J-SEAD support should pass up to the combat operations division for either Air Force EW response or coordination with the BCE or other service liaison element for joint response.

While the framework for Air Force J-SEAD is there, it does not appear to be well supported by doctrine, particularly at the tactical level. Perhaps this is because the Air Force tends to look at warfare more from a theater perspective, especially in regard to executing an air campaign.[82] Besides the capstone doctrine contained in Air Force Manual (AFM) 1-1, there are relatively few other manuals describing basic employment philosophy. Instead, most employment doctrine must be culled from the various tactical manuals that are specific to each airplane. For example, each electronic combat airplane (F-4G, EF-111, and EC-130), has its own manual detailing tactical principles for that aircraft, plus basic integration techniques and procedures. Additionally, each unit normally has its own unique techniques which are adapted to the particular theater.

What information there is in Air Force doctrine tends to reflect an unwillingness to acknowledge the capabilities of other services. For example, in AFM 1-1, when describing electronic combat (EC), it states that while EC is important to both air and surface forces in enhancing their operations, the Air Force should be the coordinating and controlling agency because of its ability to project EC further than surface forces can.[83] Though the Air Force can certainly project assets over a great distance, this statement denies the significant capabilities of other services. Additionally, in many scenarios, the redundant numbers of assets possessed by the other services gives them the preponderance of EW power and thus arguably should be the coordinating agency.

Also, when discussing SEAD, AFM 1-1 states that in attacking enemy air defense assets, commanders should account for the role that surface forces can play. However, it continues by defining that role as directly attacking the various parts of the enemy's IADS, much as the Israeli ground forces did in the 1973 war. Again, no mention is made of the surface forces' capability to attack by non lethal means.[84]

This focus on primarily an Air Force-only approach to J-SEAD is carried through to other manuals and employment guides. For example, there are only several references to the delineations of J-SEAD responsibilities. One is found in AFM 2-8, Aerospace Operational Doctrine, Electronic Combat (EC).[85] The only other references are in the multi-service manuals discussed in the joint section. There is minimal discussion of J-SEAD in any of the tactical manuals. For instance, in the F-4G tactical manual, it describes "localized" and "campaign" SEAD as two submissions, but does not mention

"complementary."[86] Additionally, while there is a chapter on joint maritime operations, it is more a description of how to employ against naval targets than on how to integrate with Navy operations.[87] With the exception of minor references in the A-10 tactical employment manual, there is no mention of integrating with the land forces, the capabilities they have, or even the delineation of service SEAD responsibilities in relation to the limits of observed fire.[88] This trend is carried through with the tactical manuals of the other electronic warfare airplanes. The end result is that if an aircrew simply studies his flight manual, weapons and avionics manuals, and the tactics manual, he would not realize the vast array of SEAD forces that exist.

In addition to these tactical manuals are various non-prescriptive guides detailing other techniques or tactics.[89] An example is the Electronic Combat Integration Guide. Though most of its objectives are focused on providing a framework for the integration of EC forces into the planning and execution process, there is little mention of anything besides Air Force assets.[90] While the guide acknowledges that it contains little consideration for the assets of other services, this is an area that should be addressed.

Given this lack of joint perspective in Air Force doctrine, it should not be surprising to find a lack of it in training and exercises, too. Despite the examples shown in Desert Storm, the use of joint forces, particularly ground forces, to provide J-SEAD is rarely practiced or discussed. For example, two of the Air Force's largest and most technologically sophisticated exercises are Red Flag, and Cope Thunder. While Navy and Marine Corps EW aircraft participate in these exercises, surface forces seldom do, and their capabilities are rarely mentioned.

Additionally, even when specific exercises have been devoted to J-SEAD, there is a lack of jointness.[91] Even though exercise scenarios and operations may not definitively reflect a service's official doctrine or procedures, they are an indication of its emphasis and employment trends.

The Air Force, therefore, has a doctrine that is compatible with J-SEAD, but is not truly integrated. While the joint publications and several of the service manuals refer to the employment of joint assets, there is a lack of emphasis at the tactical level. Part of this problem is organizational. With the ATO system, a tactical aircrew normally performs his mission with reference only to the forces tasked—any coordination is done at the AOC. Once in the air, any requests for J-SEAD support must go through airborne control channels and back to the AOC/BCE for action. While this can and does occur, a more efficient response network should be available.

The other part of the problem is doctrinal. Air Force doctrine, particularly at the tactical level, does not adequately address J-SEAD. When it does, it still purports the primacy of Air Force assets. Due to its inherent requirements for suppressing enemy air defenses, this focus should be changed to adequately address and train for J-SEAD.

Army SEAD

One might not initially think that the Army would have a strong interest in J-SEAD, except perhaps to enhance close air support (CAS) operations. However, upon close examination this interest is quite natural. This is especially so with the increasing roles and capabilities of attack helicopters. Additionally, with its proclivity towards

employing combined arms, the Army has the framework for integrating other forces into its maneuver operations. Both of these factors combine to provide a sound approach to J-SEAD. The few deficiencies seen in the Army system are similar to those found in the other services

The key agencies in Army support to J-SEAD include the operations staff, the BCE, the fire support elements, and the intelligence staff. The operations (G3) staff is the focal point for planning and executing a coherent J-SEAD plan. As such, the G3 function is responsible for integrating J-SEAD into the scheme of maneuver, coordinating with joint forces, tasking the intelligence assets, and monitoring the execution.[92] The BCE is the interface between the Army and Air Force for tactical air requests and J-SEAD. The BCE plans division assists the integration of J-SEAD into the Air Force's ATO, while the operations division monitors the current ATO and coordinates updates to either targets or assets.[93] The fire support element (FSE) is responsible for ensuring that Army fires, both lethal and non lethal, are executed. The FSE tasks various subordinate units as necessary to accomplish this. The intelligence (G2) section is charged with providing both planned and current information on enemy air defense systems. This ensures that air defense locations may be integrated into the target list, and that current information can be used to for immediate targeting. Additionally, the intelligence function tasks the collection and jamming assets, requiring close ties with the fire support function.[94] To effect this, there is normally an EW section working with the fire support element.[95] The divisions also normally assign each maneuver brigade an intelligence and electronic warfare support

element (IEWSE) to coordinate the planning and execution of EW.[96] An air liaison officer (ALO) transmits immediate Army CAS requests, and also ensures SEAD support when these aircraft are approaching their units.

As mentioned before, the corps is the central point for planning Army SEAD operations. All of the necessary planning staffs can be tasked and coordinated at this level, including intelligence, airspace control, air defense, electronic warfare, and joint services. However, much of the detailed planning will take place at lower levels. Regardless of the echelon, this planning involves close integration of the intelligence, fire support and operations teams. When targets are identified for preplanned missions, enemy air defenses in the vicinity will also be identified and passed along with the target data.[97] The ability to suppress these defenses will also be analyzed by the fire support element and intelligence functions, depending on the echelon. Potential targets and air defenses are consolidated at each higher echelon. The final target list is then determined, with Air Force targets published on the ATO, artillery targets listed on a fire support plan, and EW targets sent to several intelligence functional areas. Requests for joint EW support is the responsibility of the corps G3, but the BCE, an echelon above corps (EAC) element, is normally charged with Air Force-Army integration.[98] Finally, coordination with other joint forces is done through either Marine air and naval gunfire liaison companies (ANGLICOs) or Naval liaison officers.

The critical element for Army planners is the choice of attack means. This is the responsibility of the targeting team, which is normally composed of operations, fire support, intelligence, EW and

other pertinent members. The result of this planning will be some form of an attack matrix, detailing targets, assets, times, and other information. This matrix is the key to an effective targeting and J-SEAD plan.

For attack helicopter operations, SEAD operations are normally planned with the supported ground maneuver element.[99] Any external support would be coordinated with higher echelons, as discussed earlier. While this arrangement works for close operations, deep attacks require further assistance since a corps or division aviation brigade does not contain an organic FSE for coordination.[100] Furthermore, many missions will be beyond the range of Army SEAD assets, necessitating J-SEAD help. Additionally, joint air attack team (JAAT) missions represent a unique case where one person, normally an attack helicopter pilot, is in charge of planning and directing all required assets, including J-SEAD assets, to ensure mission success.[101]

During mission execution, J-SEAD operations should go as planned, with allowances for changes in targets or enemy defenses. For example, a CAS mission will contact the ALO for specific targets and times. This information will be integrated at the FSE which, in coordination with the intelligence staff, will fire the SEAD plan. The EW officer will receive target locations from the collection management and dissemination section, and task jamming assets through the technical control analysis element (TCAE).[102] Additionally, in special cases, targets may be passed directly from a collection asset to the fire support cell without going through the normal intelligence channels.

For immediate missions, the planning and execution process is abbreviated. The request process is the same as for CAS. This puts

special emphasis on the FSE to know what assets are available, including EW support. An excellent example of this occurred in Desert Storm, where an ATACMS strike supported an Air Force A-10.[103] Normally, the land forces' artillery and EW support will be more responsive, since Air Force EW requests must pass through the ASOC and AOC. Additionally, the use of direct links between collectors and shooters will enhance timely response. If the Army needs Air Force J-SEAD support, the request will go through the BCE or the ASOC, though it will most likely be handled by the AOC. Air Force requests for Army assistance will pass through an FSE either directly, or via the AOC or ASOC.[104]

Army J-SEAD organization, therefore, is generally compatible with the joint doctrine and able to integrate with other joint forces. For example, the request channel for J-SEAD is the same as for CAS. Likewise, the close coordination between the BCE and the AOC, and the corps FSE and the ASOC, promotes efficient use of suppression assets.

While the doctrine is there, it does not address some of the deficiencies that become apparent on closer examination. An example is the delineation of J-SEAD responsibilities in relation to the limits of observed fire. This division is discussed in several manuals; however, as with the joint manual, there is no guidance on how this is determined or coordinated with various agencies.[105] Even with this delineation, the doctrine does not seem to support it. With ATACMS missiles and MLRS fires capable of ranging out well beyond the limits of observed fire, this coordination is even more critical.

Another deficiency which has been common to all service J-SEAD doctrines, concerns the employment of EW. For example, the doctrine discusses requesting J-SEAD and EW support through the same channels

as CAS.[106] These requests are acknowledged and acted upon by the FSE, in coordination with the ALO. Even though the FSE is responsible for all lethal and non lethal fires, it must go through the intelligence chain to effect jamming. Since it cannot ensure that this support will be available, the natural tendency would be to give priority to those assets he can directly control. Additionally, the time involved in passing information to the fire support cell can be lengthy. However, while lower tactical units might hesitate to request EW support, both Desert Storm and the National Training Center have shown its viability.[107]

Another area requiring increased emphasis is the integration of J-SEAD with aviation. For example, one aviation brigade in Desert Storm formed an ad hoc fire support cell to coordinate J-SEAD with both the Army and Air Force.[108] Another report notes the number of deep operations conducted in Desert Storm and shows the need for a separate corps planning cell dedicated to this one mission, integrating all forces and J-SEAD support.[109] Even an Army publication on tactics, techniques and procedures outlines the need for an organization to facilitate helicopter deep operations.[110] Doctrine should reflect the need by having a permanent organization focused on this task.

Despite these concerns, the Army has a solid foundation and structure for conducting J-SEAD. By having organic artillery, air and EW forces, it is actually quite similar to the Marine Corps. Furthermore, its close relationship with the Air Force gives it an avenue to both readily accept outside support, and also be able to render it when needed. Further emphasis on integrating EW, and providing more emphasis on support for deep operations would enhance Army J-SEAD mission execution.

Conclusion

J-SEAD is undeniably a difficult task. More than just the employment of joint forces, it requires synchronization to increase the survivability of joint air forces and to avoid hindering their operations. This hindrance could be caused by parceling out assets, or actual mutual interference, such as electronic "fratricide." A brief review of J-SEAD history shows that in many cases, air defense suppression is neglected until aircraft losses begin to mount. The joint doctrine for J-SEAD provides a solid foundation for the effective employment of forces to achieve results while also using assets efficiently. The deficiencies noted in the joint doctrine are also carried through in varying degrees to the doctrines of the individual services. These include an unclear delineation of responsibility and the integration of electronic warfare.

The service doctrines generally reflect the guidance of the joint doctrine. Using the measures of compatibility and integration, each service has the organization and control structure to plan and execute J-SEAD operations. Each discusses the employment of joint forces while also outlining the use of its forces to support the other services; however, closer examination reveals differing degrees of success.

One is drawn to the habitual relationships in the joint arena between the Army and Air Force on one hand, and the Marines and Navy on the other. In examining J-SEAD, these parallels still exist. Each "side" has a similar method of organizing fire support, intelligence and EW organizations. Likewise, each has similar methods of integrating forces. Additionally, the two predominantly land forces—Army and Marines—have significant air capabilities in and of themselves.

However, while the compatibility and integration are there, improvements can still be made. These fall under the categories of doctrine, command and control, and training.

The joint doctrine for J-SEAD provides a good foundation for basic employment principles; however, it needs strengthening in the areas of EW employment and delineation of responsibilities. EW is a powerful asset that must be exploited. As such, it needs a clearly defined request channel that provides responsive support and prevents mutual interference.

Furthermore, with the potential ranges of jamming systems, plus the ranges of modern rocket and missile systems, dividing the responsibilities by the vague term "limits of observed fire" serves little purpose. The FSCL might be a better delineation, but even here, the advantages are situationally dependent and may actually hinder operations.[111] The current delineations do not seem well supported by the current doctrinal publications. The J-SEAD coordinator needs to take an active role in determining what distinctions, if any, need to be made.

Besides the joint doctrine, the service doctrines need to reflect the employment of joint forces. By continually emphasizing this, planners and operators can more easily assimilate the unique capabilities each service brings to J-SEAD. This is especially true for rapidly expanding technologies such as air-to-surface and surface-to-surface missiles, electronic warfare, and UAVs.[112]

In addition to doctrinal changes, command and control of J-SEAD needs to be centralized. The J-SEAD coordinator position at the joint level should be initiated in the individual services. It can be argued

that the services already have this in the form of the G3, but for J-SEAD to be efficiently orchestrated, one person needs to be primarily focused on it. The G3 will normally be too busy to devote adequate time. Ideally, the J-SEAD coordinator should be someone unencumbered with other primary tasks who can be knowledgeable of capabilities and limitations of various assets. While he should not have direct tasking authority because of conflicting demands for resources, he can ensure the commander's intent for J-SEAD is met.

As a minimum, Army and Marine EW jamming assets should be placed under the control of the fire support coordinator. Since he is charged with employing the most efficient lethal and non lethal fires, having tasking authority for these assets should facilitate their integration into the fire support plan.[113]

Finally, all the doctrinal manuals and wire diagrams are meaningless unless the joint forces continually and seriously train for J-SEAD. This should extend from computer-assisted exercises such as the Tactical Commanders Development Course (TCDC), Battle Command Training Program (BCTP), and Blue Flag, to large maneuver exercises such as Red Flag and the National Training Center. J-SEAD and EW especially need to be given a more realistic input than they are now.[114] Though already done to some degree, further progress will only help spread the knowledge of its capabilities to others.

As part of this process, two vignettes are presented in Appendix I, showing the synergistic capability of J-SEAD. The first one details the Israeli's 1982 operation in the Bekaa Valley. The second one concerns Operation Desert Storm. The keys in both these cases were extensive training and the use of high technology assets.

As the United States military becomes increasingly oriented towards force projection, it is imperative to have the doctrine and assets to deploy, engage and win in minimal time with minimum friendly casualties. The optimal employment of available forces requires clearly defined roles and the ability to integrate. One recent study postulated that nearly 25% of the initial aircraft sorties flown in a force projection scenario would be devoted to J-SEAD, with many of these flown by USN and USMC air assets, and then USAF sorties as they arrive in theater. These forces would be supported by Naval gunfire, Marine artillery, and then Army assets as the theater expands.[115] The coordinated effort of all services may reduce these numbers, and enhance the sorties that do fly. Additionally, with the increasing trend towards combined warfare, the integration of other countries' will be made easier by clear and consistent joint doctrine.

While many people were enamored by the television pictures of the precision-guided munitions in Desert Storm, few realize that one of the reasons the aircrews could concentrate on tracking the target was because effective J-SEAD operations had negated the "distractions" of enemy air defenses. An effective joint J-SEAD doctrine, supported by the doctrines of the individual services, will help ensure similar results in the future.

APPENDIX I

HISTORICAL VIGNETTES

The Israelis in the Bekaa Valley, 1982

When Israel launched "Operation Peace for Galilee" on June 6, 1982, the Syrians had constructed an impressive defense in the small 10 mile by 25 mile Bekaa Valley. The IADS threat included 16 SA-6s, numerous AAA systems and several SA-2s and SA-3s near the Syrian border.[116] The Israeli's divided their attack plan into four phases: deception, harassment and suppression, destruction, and the air battle. The deception phase involved extensive use of Israeli-made RPVs. These stimulated the Syrian defensive system, allowing the EW collection platforms to confirm exact locations and frequencies, plus causing the Syrians to fire missiles. The electronic data was centrally collected and then distributed to various ground and airborne systems, including an E-2C Hawkeye airborne controller and a specially modified Boeing 707 used for electronic intelligence and jamming.[117] This set the stage for the second phase.

The harassment and suppression phase began with voice and signal jamming by the 707, CH-53 helicopter jammers and various ground-based jammers. These systems effectively nullified Syrian attempts to locate the Israeli forces or even to talk among themselves. Artillery fire then began against the SAM positions. The RPV's television cameras allowed the fire support officers to adjust fires and monitor results. After destroying numerous sites, IAF F-4s with anti-radar missiles launched on the remaining ones, allowing transition to phase three.[118]

The E-2C vectored low flying fighters against the remaining sites, while the jammers continued supporting them. Employing various weapons and attacking from different directions, the IAF overwhelmed the defenses. Desperate, the Syrians launched fighters, which the Israelis again monitored with the RPVs until the Hawkeyes could track them with radar. The jamming and destruction of the Syrian command and control system, combined with several other factors, led to a significant mismatch, which the Israelis capitalized on.[119] In a short time, the Israelis destroyed 17 SAM sites and shot down 29 MiGs, with no losses to themselves. Over the course of campaign, they destroyed approximately 50 air defense sites and shot down about 100 airplanes, while only losing 2 or 3 themselves[120]

While the Bekaa Valley operation clearly displayed what well planned and executed joint operations could accomplish, it is important to keep several caveats in mind. For one, the Israelis had over one year to plan and rehearse this operation.[121] It is doubtful whether they could have sustained this detailed an effort for an extended period. Secondly, the Syrians did not employ their defenses in a sophisticated manner. They kept their mobile SAMs in fixed positions, did not employ decoys, and did not control electronic emissions. This allowed the Israelis to accurately determine locations. A final point is that the size of the Bekaa Valley, while creating a dense environment, also permitted flanking maneuvers and allowed most of the support assets to remain outside of any threat zone. However, the Bekaa Valley operation displays the important role of technology, planning, and effective command and control in executing J-SEAD. The U.S. military would use many of these same concepts in Desert Storm.

Operation Desert Storm, 1991

Like the Egyptians and Syrians in 1982, Saddam Hussein had also constructed an impressive IADS. Combining Soviet, Chinese, French and other western systems with redundant communications, his defenses consisted of 16,000 radar-guided and heat-seeking SAMs and over 7,000 anti-aircraft guns, with some of these also being radar-guided.[122] Arrayed against this threat, the coalition had over 100 dedicated electronic combat aircraft (F-4Gs, EF-111s, EC-130s and EA-6Bs) plus hundreds of cruise missiles, and Army ground and helicopter EC assets.[123] Establishing air superiority was the coalition's most important goal, and the air campaign's top priority was the Iraqi IADS.[124] With months to plan, an extensive J-SEAD effort emerged.

With all the electronic combat aircraft in the theater, interestingly enough the first J-SEAD strikes were conducted by assets not traditionally associated with this mission. "Operation Normandy," consisting of Army AH-64 Apaches, led by Air Force Special Operations MH-53J Pave Low helicopters with sophisticated navigation gear, successfully struck two Iraqi radar sites 40 minutes prior to the official H-hour.[125] Shortly after this, US Navy Tomahawk Land Attack Missiles (TLAMs) and US Air Force F-117s attacked numerous early warning and air defense command and control sites.[126] At approximately the same time, US Army and Marine Corps RPVs and tactical air launched decoys (TALDs), flew in the vicinity of air defense sites.[127] As with the Israelis, the RPVs caused the Iraqis to expose their defenses and expend missiles. EC aircraft collected this data for jamming and employing anti-radiation missiles. With holes now punched into the Iraqi's extensive radar coverage, coalition air forces streamed across the

border. Accompanied by USAF F-4Gs, EF-111s, EC-130s, and USN and USMC EA-6Bs and F/A-18s to jam radars, communications, and shoot anti-radiation missiles, the coalition forces sent hundreds of aircraft to attack key targets.

In addition to the early strike by the Apaches, the Army was an integral J-SEAD player in other areas. The Army Tactical Missile System (ATACMS), a deep strike missile, launched against several air defense sites, including at least once on short-notice to support a USAF A-10 mission.[128] Additionally, an Army combat aviation brigade executed a number of deep missions requiring SEAD support from the USAF. To handle this requirement, the brigade formed a non-doctrinal fire support element to integrate AF fires, EW, and Army artillery fires.[129]

The impressive results of Desert Storm show what a well-planned and integrated J-SEAD effort can accomplish. The initial use of overwhelming destructive and disruptive force resulted in a dramatic decrease in electronic emissions after the first days. The threat of destruction caused many Iraqi operators to either not operate their radars or so limit them as to be ineffective.[130] By neutralizing the Iraqi IADS, coalition forces could attack at will, resulting in "air supremacy" in only ten days.[131] Another fact testifying to the effectiveness of the J-SEAD effort is that while during the first six days of Desert Storm, eight airplanes were lost or damaged by radar SAMs, only five more were struck over the remaining weeks.[132] While there is much more evidence to the effects achieved during Desert Storm, this overview captures how J-SEAD has matured in both effort and technology.[133]

APPENDIX II

DEFINITIONS

Definitions common to J-SEAD are given below. The source is given in parentheses. Additionally, common acronyms are listed in Appendix III.

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. (JCS Pub 1-02)

Air superiority. That degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea and air forces at a given time and place without prohibitive interference by the opposing force. (JCS Pub 1-02)

Air supremacy. That degree of air superiority wherein the opposing air force is incapable of effective interference. (JCS Pub 1-02)

Antiradiation missile. A missile which homes passively on a radiation source. (JCS Pub 1-02)

Campaign Plan SEAD. Preplanned, theater wide efforts conducted concurrently with other air and ground campaigns against air defense systems that are normally located well behind enemy lines. (FM 90-15)

Complementary Suppression. Suppression engagements conducted by aircraft in self-defense and the offensive attack against air-defense-system targets of opportunity by other weapon systems. (Joint Pub 3-01.4)

Destroyed. A condition of a target so damaged that it cannot function as intended nor be restored to a usable condition. (JCS Pub 1-02)

Direct Fire. Gunfire delivered on a target, using the target itself as a point of aim for either the gun or the director. (JCS Pub 1-02)

Electronic Combat. Action taken in support of military operations against the enemy's electromagnetic capabilities. Electronic combat includes electronic warfare (EW), elements of command, control, and communications countermeasures (C3CM), and suppression of enemy air defenses (SEAD). (AFM 1-1).

Electronic Jamming. The deliberate radiation, reradiation, or reflection of electromagnetic energy for the purpose of disrupting enemy use of electronic devices, equipment, or systems. (JCS Pub 1-02)

Electronic Warfare. Military action involving the use of electromagnetic energy to determine, exploit, reduce, or prevent hostile use of the electromagnetic spectrum and action which retains friendly use of the electromagnetic spectrum. (JCS Pub 1-02)

Fire Support. The coordinated use of fires that directly support combat forces, and have an immediate or near-term effect on battles, engagements, major operations, or campaigns. (Joint Pub 3-01.4)

Indirect Fire. Fire delivered on a target that is not itself used as a point of aim for the weapons or the director. (JCS Pub 1-02)

JAAT (Joint Air Attack Team). A combination of attack helicopters and tactical fixed-wing aircraft, normally supported by field artillery or naval gunfire, operating together to attack surface targets.(FM 90-20)

Joint Force Air Component Commander (JFACC). The JFACC derives his authority from the joint force commander who has the authority to exercise operational control, assign missions, direct coordination among his subordinate commanders, redirect and organize his forces to ensure unity of effort in accomplishment of his overall mission. (JCS Pub 1-02)

Joint suppression of enemy air defenses. A broad, all-encompassing term that includes all SEAD activities provided by one service of the joint force to another, and those that are directed by, or directly suppress the joint force commander's campaign. (TACP 50-23)

Localized J-SEAD. J-SEAD operation concluded at the tactical level. Applies to a specific geographic area, time, and tactical targets. (Joint Pub 3-01.4)

Neutralization. As pertains to military operations, to render the target ineffective or unusable. (JCS Pub 1-02)

Remotely Piloted Vehicle. An unmanned vehicle capable of being controlled from a distant location through a communication link. It is normally designed to be recoverable. (JCS Pub 1-02) A UAV differs in that it may not necessarily be controlled by an operator.

Suppression (DOD). Temporary or transient degradation of the performance of a weapons system, below the level needed to fulfill its mission objectives, by an opposing force. (JCS Pub 1-02)

Suppression of enemy air defenses. That activity which neutralizes, destroys, or temporarily degrades enemy air defenses in a specific area by physical attack and/or electronic warfare. (JCS Pub 1-02)

Suppression. Suppression limits the ability of enemy personnel and equipment to acquire and engage a target. In this sense, the effects of suppressive fires are temporary, lasting only as long as the suppression technique continues. Suppression may include obscuration, direct fires, indirect fires, and electronic means. (FM 1-112)

Threat Air Defense Environment. The enemy's air defense capability against airborne friendly aircraft. There are three general levels, defined as:

Low. Permits combat operations and support to proceed without prohibitive interference. Associated tactics and techniques do not normally require extraordinary measures for preplanned or immediate support.

Medium. Specific aircraft performance and weapons systems capability allow acceptable exposure time to enemy air defenses. Restricts flexibility of attack tactics in the immediate target area. Medium-altitude mission and attack deliveries allowed with low probability of engagement by enemy air defenses.

High. Integrated fire control systems, air defense combat power and EW capabilities seriously diminish the ability of friendly forces to provide necessary air support. Some missions, such as immediate CAS, might be precluded. (FM 90-21).

Unmanned Aerial Vehicle. See Remotely Piloted Vehicle.

APPENDIX III

ABBREVIATIONS AND ACRONYMS

AAA	Anti-Aircraft Artillery
ACE	Aviation Combat Element (USMC)
ALO	Air Liaison Officer
ANGLICO	Air and Naval Gunfire Liaison Company
AOC	Air Operations Center
AREC	Air Resources Element Coordinator (Navy)
ASOC	Air Support Operations Center
ASPS	All Source Production Section
ATACMS	Army Tactical Missile System
ATO	Air Tasking Order
BCE	Battlefield Coordination Element
CAS	Close Air Support
CATF	Commander Amphibious Task Force
CLF	Commander Landing Force
CM & D	Collection Management and Dissemination
CTOC	Corps Tactical Operations Center
CWC	Composite Warfare Commander (Navy)
DASC	Direct Air Support Center
DIVARTY	Division Artillery
EAC	Echelons Above Corps
ELINT	Electronic Intelligence
EC	Electronic Combat
ECM	Electronic Countermeasures
EMCON	Emission Control
EOB	Electronic Order of Battle
EW	Electronic Warfare
EWC	Electronic Warfare Coordinator (Navy)
EWO	Electronic Warfare Officer
FEBA	Forward Edge of the Battle Area
FLOT	Forward Line of Own Troops
FSCC	Fire Support Coordination Center
FSCL	Fire Support Coordination Line
FSCOORD	Fire Support Coordinator
FSE	Fire Support Element
FSO	Fire Support Officer
FST	Fire Support Team
GCE	Ground Command Element (Marine)
HARM	High-Speed Anti-Radiation Missile

IAF	Israeli Air Force
IADS	Integrated Air Defense System
IEWSE	Intelligence and EW Support Element
IPB	Intelligence Preparation of the Battlefield
J-2	Joint Force Director of Intelligence
J-3	Joint Force Director of Operations
J-5	Joint Force Director for Plans & Policy
J-6	Director for Command, Control and Communication
JAAT	Joint Air Attack Team
JCEWS	JFC's Electronic Warfare Staff
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
JFFC	Joint Force Fire Coordinator
JFLCC	Joint Force Land Component Commander
JRFL	Joint Restricted Frequency List
J-SEAD	Joint Suppression of Enemy Air Defenses
JTCB	Joint Targeting Coordination Board
JTL	Joint Target List
MAGTF	Marine Air Ground Task Force
MLRS	Multiple Launch Rocket System
OPCON	Operational Control
ROE	Rules of Engagement
RPV	Remotely Piloted Vehicle
S/EWCC	SIGINT/EW Coordination Center (Marines)
SACC	Supporting Arms Coordination Center
SAM	Surface-to-Air Missile
SEAD	Suppression of Enemy Air Defenses
SEMA	Special Electronic Mission Aircraft
SIGINT	Signals Intelligence
SWC	Strike Warfare Commander (Navy)
TACC	Tactical Air Command Center (Marines)
TACS	Tactical Air Control System
TACP	Tactical Air Control Party
TALD	Tactical Air Launched Decoy
TAOC	Tactical Air Operations Center (Marines)
TCAE	Technical Control Analysis Element
TLAM	Tomahawk Land Attack Missile
UAV	Unmanned Aerial Vehicle

ENDNOTES

[1]U.S. Joint Chiefs of Staff. Joint Pub 1 Joint Warfare of the US Armed Forces (Washington, DC: National Defense University Press, 1991), 6.

[2]U.S. Joint Chiefs of Staff, Joint Pub 1-02, Department of Defense Dictionary of Military and Associated Terms (Washington, DC: The Joint Staff, 1989).

[3]Ralph Barker, The RAF at War. The Epic of Flight Series. (Alexandria, Virginia: Time-Life Books, 1981), 59.

[4]Kenneth P. Werrell, Archie, Flak, AAA, and SAM, A Short Operational History of Ground-Based Air Defense (Maxwell AFB, AL: Air University Press, 1988), 43-45. For ECM, the Allies used crude jammers and small pieces of foil, called chaff. As an example of direct attack costs, during Operation Market Garden they achieved fair results on the first day, but on the second, over 35% of the aircraft used against AAA sites were destroyed or damaged.

[5]Ibid., 46.

[6]Ibid.

[7]J.B.A. Bailey, Field Artillery and Firepower (Oxford: The Military Press, 1989), 65.

[8]Werrell, 46.

[9]Ibid., 74.

[10]Ibid., 80. The methods included using artillery until just prior to the aircraft coming into the target area and the use of airborne spotters to mark targets for the artillery. Fratricide also became a growing problem.

[11]Ibid., 78-79.

[12]William W. Momyer, Airpower in Three Wars (Washington, DC, United States Air Force, 1985), 123. The first aircraft shot down was an F-4, followed several days later by a drone.

[13]For an example, see "THOR: A Case Study in Multi-Service Coordination," Field Artillery, February 1993, 11-15. This operation involved all four services against several North Vietnamese coastal sites.

[14]James R. McCarthy and George B. Allison, Linebacker II: A View From the Rock, USAF Southeast Asia Monograph Series, Volume VI, Monograph 8 (Maxwell AFB, AL: Airpower Research Institute, 1979). The authors list the total numbers and types of support aircraft on each mission. These support aircraft, averaging 86 in number, included Air Force and Navy electronic jammers, anti-radiation missile aircraft, and other suppression assets.

[15]Karl J. Eschmann, Linebacker, The Untold Story of the Air Raids Over North Vietnam (New York: Ivy Books, 1989), 207. The first concentrated strikes versus SAM sites occurred on the sixth day of the campaign. After three days of emphasis, losses to air defenses diminished. Some of this was due to the strikes, but some must be attributed to the North Vietnamese running out of missiles.

[16]Ibid.

[17]Ibid., 58.

[18]See McCarthy and Allison, 173. Additionally, many felt that the anti-SAM tactics employing ECM and Wild Weasels were effective against the North Vietnamese radar SAMs. The numbers show that 27 aircraft, including 15 B-52s were lost during Linebacker II. (numbers taken from Eschmann, 205). This equates to a loss rate of approximately 2% for the B-52s and .67% overall. Putting this into "Desert Storm" terms, using just the .67% number and looking at only US combat sorties, this would represent the equivalent of 295 US aircraft losses during Desert Storm versus actual US combat losses of 22, or approximately .05%. Werrell (pg. 122) also notes some flawed tactics that made the North Vietnamese job easier, such as flying the same route, flying at the same time, and remaining on a steady course for several minutes prior to bomb release to ensure greater accuracy and lessen the chances for collateral damage.

[19]Ehud Yonay, No Margin for Error: The Making of the Israeli Air Force (New York: Pantheon, 1993), 297-298. For example, the IAF received electronic countermeasures pods from the US, but abandoned them early when they still lost a few airplanes. The reasons for the losses stem from insufficient training and the fact that the Egyptians deployed a new SAM (SA-3) which was not programmed into the pod.

[20]Stanley M. Ulanoff and David Eshel. The Fighting Israeli Air Force (New York: Arco Publishing, Inc., 1985), 79-84.

[21]Werrell, 144.

[22]For a look at the technological efforts see Paul S. Culter's articles, "ELTA Plays a Decisive Role in the EOB Scenario," and "EW Won the Bekaa Valley Air Battle," in Military Electronics/Countermeasures, February 1983, pages 135-137 and 106, respectively.

[23]Yonay, 365.

[24]US Joint Chiefs of Staff, JCS Pub 3-01.4, Joint Tactics, Techniques, and Procedures (JTTP) for Joint Suppression of Enemy Air Defenses (J-SEAD) Final Draft (Washington, DC: 1991), I-2.

[25]Ibid., I-8.

[26]Ibid., Chapter II.

[27]Ibid., II-6.

[28]Ibid., II-5.

[29]Air Land Forces Application Agency, FM 90-15, FMFRP 5-43, MACP 55-52, TACP 50-23, USAFEP 50-23, PACAFP 50-23, AACP 50-23, J-SEAD, Multi-Service Procedures for the Joint Suppression of Enemy Air Defenses , (Langley AFB, VA: Air Land Forces Application Agency), 12. Hereafter referred to as TACP 50-23.

[30]Ibid., 13.

[31]Ibid.

[32]Ibid.

[33]Ibid., 13-14.

[34]Ibid., 15.

[35]US Joint Chiefs of Staff, Joint Pub 3-09 Doctrine For Joint Fire Support (Final Draft) (Washington DC: The Joint Staff, 1991), I-18.

[36]Ibid. Under Air Force missions, it lists CAS, BAI, and Special Operations.

[37]Ibid., II-5. This publication outlines the duty of a "joint force fires coordinator (JFFC) to coordinate all fires; however, this position is not currently approved.

[38]US Joint Chiefs of Staff, JCS Pub 3-51, Electronic Warfare in Joint Military Operations (Washington, DC: The Joint Staff, 1991), SECRET, III-9.

[39]Ibid., III-12.

[40]Ibid., II-1.

[41]TACP 50-23, 9.

[42]Ibid.

[43]The discussion centers primarily around the employment of anti-radiation missiles. For example, can these air-to-surface missiles be fired at targets inside the FSCL without coordinating with the ground commander? According to the definition of the FSCL, the answer is "no." However, HARM-equipped aircraft routinely plan missions for radars inside the FSCL. This delineation did become a problem during Desert Storm after the ground war started.

[44]US Marine Corps, FMFM 6-18, Techniques and Procedures for Fire Support Coordination (Washington, DC: Department of the Navy, 1992), 1-1.

[45]US Marine Corps, FMFM 2-7-1, Fire Support Coordination by the MAGTF Command Element (Washington, DC: Department of the Navy, 1992), 1-2, 1-3.

[46]Ibid., 2-3.

[47]FMFM 6-18, 1-2.

[48]FMFM 2-7-1, 2-2.

[49]Ibid. The Air Force has TACPs assigned with Army maneuver units. The Air Support Operations Center (ASOC) functions similarly to the DASC, and the TACC parallels the Air Operations Center (AOC).

[50]FMFM 6-18, 1-3.

[51]TACP 50-23, 19.

[52]FMFM 6-18, 2-2.

[53]TACP 50-23, 20.

[54]FMFM 6-18, 6-16.

[55]Ibid., 4-11, 4-12.

[56]FMFM 6-18, 5-8.

[57]See Surface Force TACNOTE, PD3410-1-90, Suppression of Enemy Air Defense (SEAD) and Countermechanized (Countermech) Naval Gunfire Support (NGFS) Fire Missions (SEAD/Countermech NGFS)

(Washington, DC: US Navy, 1990). This publication details specific procedures for employing naval gunfire in support of Marine SEAD operations, including radio calls, marking targets, and aircraft/artillery deconfliction.

[58]JP 3-51, II-30.

[59]For ground assets, the Radio Battalion (RADBN) Operations Control and Analysis Center (OCAC) performs mission management while the air missions are managed by the specific squadrons.

[60]Neri G. Terry, Jr., "It's Time to Integrate Jamming Into Our Ground Operations," Marine Corps Gazette, March 1992, 63-64.

[61]Ibid. Specifically, the author recommends placing an electronic countermeasures (ECM) officer into the FSCC to run EW. Additionally, he proposes a special FSCL for the employment of anti-radiation missiles. This would negate having to go through CAS channels to fire missiles.

[62]Thomas A. Cardwell, III, Airland Combat, An Organization for Joint Warfare (Maxwell AFB, AL: Air University Press, 1992), 73.

[63]See Dwight R. Motz, "JFACC: The Joint Air Control 'Cold War' Continues. . . . " Marine Corps Gazette, January 1993, 64-71. The author notes coordination problems when the Marine Corps wanted to strike deep targets beyond the FSCL.

[64]See Scott R. Moore, "Rethinking the MAGTF," Marine Corps Gazette, June 1992: 20-24.

[65]This publication will be FMFM 5-45, Suppression of Enemy Air Defenses.

[66]TACP 50-23, 21.

[67]Ibid.

[68]AOC is a relatively new term. The old term was tactical air control center (TACC), which is still found in many texts. "AOC" will be used throughout this monograph.

[69]US Navy, NWP 10-1, Composite Warfare Commander's Manual (Washington, DC: Department of the Navy, 1985), CONFIDENTIAL, 4-15-4-16.

[70]TACP 50-23, 21.

[71]For example, Naval Warfare Publication 10-1-40, Electronic Warfare Coordination (U) (Washington, DC: Department of the Navy, 1986), classified SECRET, discusses the various EW systems and their integration into maneuver and fleet operations. For further Navy thoughts on SEAD, see Philip Sprankle, "Defense Suppression Strategy." AIMPOINT Naval Strike Warfare Review, Fall 1985, 16-20, SECRET, and R. L. Thayer, "SEAD Strike Planning Perspective." AIMPOINT Naval Strike Warfare Review, Spring 1990, 34-37, SECRET .

[72]For example, see US Air Force Multi-Command Manual 3-1 Tactical Employment series, Volume X, F-4G, Volume VIII EF-111 (Nellis AFB, NV: 57th Test Group). Each has a chapter devoted to joint maritime operations.

[73]TACP 50-23, v.

[74]US Navy, NWP 22-2 (Rev B)/FMFM 1-7, Supporting Arms in Amphibious Operations (Washington; DC: Department of the Navy, 1990), 7-14.

[75]Ibid., 3-22. The other two missions of fires are "isolation of the battlefield," and "neutralization of specific targets."

[76]Ibid., 7-3. The types listed include field artillery, naval gunfire, and tactical air support.

[77]For more specifics, see Michael D. Lauzen, "Aviation Support to Joint Suppression of Enemy Air Defense Operations," Thesis , US Naval War College, 1991. The author also notes a lack of jointness in Naval J-SEAD training.

[78]US Air Force, AFM 2-8 Aerospace Operational Doctrine, Electronic Combat (EC) Operations (Washington, DC: Department of the Air Force, 1987), 32.

[79]TACP 50-23, 31.

[80]TACP 50-23, 32.

[81]Ibid., 32-33. These agencies include the combat intelligence division (CID), the enemy situation correlation division (ENSCD), and the electronic combat duty officer.

[82]Cardwell, 69.

[83]U.S. Air Force, AFM 1-1, Volume I, Basic Aerospace Doctrine of the United States Air Force (Washington, DC: Department of the Air Force, 1992), 14. Also of note is that electronic combat is a term found only in Air Force vocabulary.

[84]Ibid., 11. Part of this rationale might be that Army EW jamming assets can only jam communications, and not radars.

[85]AFM 2-8, 12.

[86]US Air Force MCM/ACCM/PACAFM/USAFEM 3-1, Vol X, Mission Employment Tactics, Tactical Employment F-4G Wild Weasel, Nellis AFB, NV: 57th Test Group, 1992), 1-2.

[87]Ibid., Chapter 9.

[88]US Air Force MCM/ACCM/PACAFM/USAFEM 3-1, Vol III, Mission Employment Tactics, Tactical Employment A-10 (Nellis AFB, NV: 57th Test Group, 1993), . However, this manual does not discuss anything beyond employing artillery fires on enemy air defense sites.

[89]For example, the Air Warfare Center normally publishes information concerning equipment or testing; the Red Flag exercises publish post-exercise summaries of lessons learned, frequently incorporating some recommendations.

[90]US Air Force, Electronic Combat Integration Guide (U) (Eglin AFB, FL: US Air Force Air War Center, 1992) SECRET, v, vi. This publication lists six objectives, from planning to analyzing effectiveness. While short on joint planning, Appendix F is an excellent classified reference for the capabilities of EW assets for all services.

[91]Michael D. Lauzen, "Aviation Support to Joint Suppression of Enemy Air Defense Operations," Thesis, US Naval War College, 1991, 9. In particular, the author refers to a 1987 Green Flag, which is an electronic warfare version of Red Flag. This exercise was supposed to focus on joint concepts, but in actuality the "joint" staff was manned and planned more as an air component staff.

[92]TACP 50-23, 27.

[93]Ibid., 27.

[94]This is a potentially confusing point. The G3 has overall responsibility for EW. The FSE is charged with employing lethal and non lethal fires. Whereas the FSE can directly task an artillery unit to fire a particular mission, jamming requires the EW officer to channel the mission to the military intelligence battalion, who then tasks the appropriate asset. Thus, there is an extra layer involved in employing EW that is not there for artillery missions.

[95]TACP 50-23, 28-29.

[96]US Army, FM 34-10, Division Intelligence and Electronic Warfare Operations (Washington, DC, 1986), 3-26.

[97]TACP 50-23, 13.

[98]FM 6-20, 2-17. For a detailed description of the EW planning process, see US Army, FM 34-80, Brigade and Battalion Intelligence and Electronic Warfare Operations (Washington, DC: Department of the Army, 1986), 4-36 through 4-39.

[99]US Army FM 1-112, Attack Helicopter Battalion (Washington, DC: Department of the Army, 1986), E-4.

[100]US Army, FM 1-111, Aviation Brigades (Washington, DC: Department of the Army, 1990), 4-1. An FSE may be provided, when necessary. Normally, the FSE for the brigade supported by the aviation unit will handle the coordination. Additionally, a cavalry squadron has an FSE, and each attack helicopter battalion has a two-person fire support team.

[101]Air Land Forces Agency, FM 90-21, FMFRP 5-44, TACP 50-20, USAFEP 50-20, PACAFP 50-20, JAAT, Multi-Service Procedures For Joint Air Attack Team Operations (Ft. Monroe, VA: Air Land Forces Agency, 1991), 3-0. Hereafter referred to as TACP 50-20. A JAAT is the near-simultaneous massing of attack helicopter, fixed-wing aircraft, and artillery against enemy targets, normally armored formations. Additionally, ground or airborne EW assets may also be tasked to support a JAAT. While it is up to the maneuver commander to request a JAAT, once tasked, the air mission commander is responsible for the planning and directing of the mission. Pages 2-6 and 2-7 give an excellent summary of the planning and execution requirements of the key assets.

[102]FM 34-10, 5-2. See also TACP 50-23, 28-29.

[103]US Department of Defense, Conduct of the Persian Gulf War. Final Report to Congress (Washington DC: Department of Defense, 1992), 163. In this particular incident, the MLRS unit with the ATACMS missiles was on the move. After receiving the fire mission, the unit stopped, quickly computed coordinates and fired the mission. The Iraqi SA-2 site was effectively suppressed.

[104]US Army, FM 6-20-30, Tactics, Techniques, and Procedures for Fire Support for Corps and Division Operations (Washington, DC: Department of the Army, 1989), B 38-39.

[105]See FM 6-20-30, B-37, and US Army, FM 71-100, Division Operations (Washington, DC: Department of the Army, 1990), 3-18.

[106]FM 6-20-30, 3-12, 3-13. This FM section also gives a good description of Air Force EW capabilities.

[107]For Desert Storm, see Army Aviation in Operation Desert Storm, (US Army Aviation Center, Ft Rucker, AL, 1992). Page 35 discusses how the attack helicopter units incorporated Air Force EW capabilities into their doctrine while not expecting frequent support. However, recognizing the capabilities, the Army asked, and received F-4G Wild Weasel, EF-11 and EC-130 assistance at various times. For the National Training Center, see David L. Shields and John D. Cecil, "Electronic Close Air Support," Air Land Bulletin no. 90-4, December 1990, 7-9. The authors describe the use of EC-130s to successfully jam the communications links of enemy armor units.

[108]Clark O. Riddle, Jr. and Maxwell G. Carroll, "Air Attack! 12th Aviation Brigade FSE Joint and Combined Operations in ODS." Field Artillery, February 1993, 19-23.

[109]US Army Aviation in Operation Desert Storm, 78. The report specifically details a deep strike mission involving J-STARS, Army collection assets, Air Force jammers, and field artillery, suggesting that it was probably the first "full doctrinal" Air Land battle deep operation conducted in wartime.

[110]US Army, Corps Deep Operations, Tactics, Techniques, and Procedures Handbook (Ft. Leavenworth, KS: US Army Combined Arms Center, 1990), 3-11. Also see Lester C. Jauron "Corps Aviation Brigade Deep Operations: Toward a Sharper Spear," Monograph, School of Advanced Military Studies, 1992.

[111]For example, during Desert Storm, with the rapid advance of coalition forces, a "HARM Phase Line" was delineated. This line was actually beyond the FSCL. As such, suppression forces with anti-radiation missiles could not technically employ them without first coordinating with the land forces. Engagement times for SAM suppression operations does not allow for this coordination time. The end result was that HARMs were not employed during the final stages of the ground campaign, except for missions to Baghdad or western Iraq.

[112]For an interesting examination of the use of UAVs, see Ronald L. McGonigle, "Unmanned Aerial Vehicles (UAVs) On the Future Tactical Battlefield—Are UAVS an Essential Joint Force Multiplier?" Monograph, School of Advanced Military Studies, 1992.

[113]For further examination of integrating EW with fires, see L. M. Porter, "Integrating Electronic Warfare with Targeting and Fires at Division Level: An Electronic Warfare Perspective," Monograph, School of Advanced Military Studies, 1986. Another perspective is given by James E. Elder, "The Tactical IEW System and Intelligence on the AirLand Battlefield," Monograph, School of Advanced Military Studies, 1988.

[114]For example, see Tony Giacobe, "BCTP and Me: Reflections on a Divisional BCTP," The Air Land Sea Bulletin, September 1993), 19-20. The author notes how even with a concerted J-SEAD plan, either the computer operator's priorities or the randomness of the computer can cause poor results.

[115]Christopher Bowie, et. al. The New Calculus. Analyzing Airpower's Changing Role in Joint Theater Campaign (Santa Monica, CA: The RAND Corporation, 1993), 41-42.

[116]David E. Clary, "EW in the Bekaa Valley: A New Look," Journal of Electronic Defense, June 1990, 34.

[117]Ibid., 38.

[118]Ibid.

[119]Benjamin S. Lambeth, Moscow's Lessons From the 1982 Air War (Santa Monica, CA: The RAND Corporation, 1984), 9. Besides the jamming and destruction, the Syrians were equipped with aircraft and armament inferior to the IAF's F-15s and F-16s.

[120]Ulanof and Eshel, 152. Exact numbers are difficult to verify. The Israeli losses include one to an SA-8 and one or two others to AAA.

[121]Lambeth, 5. The original attack was set for April 1981 against the first few SAM sites. In fact, permission was given to conduct it; however, weather delayed the mission, and diplomatic efforts during the delay led to its postponement.

[122]James P. Coyne, Airpower In the Gulf (Arlington, VA: Aerospace Education Foundation, 1992), 20.

[123]Norman Friedman, Desert Victory: The War for Kuwait (Annapolis, MD: U.S. Naval Institute Press, 1991), 301.

[124]Thomas A. Keaney and Eliot A. Cohen, "Gulf War Air Power Survey Summary Report" (Draft copy), Washington, DC, 1993, Chapter 2, 18.

[125]Coyne, 67. The Air Force Special Operations Pave Lows were required because their navigational ability was superior to that of the Apaches.

[126]Ibid., 69.

[127]Final Report to Congress, 723, 784-5. The US Army, Navy and Marine Corps use the Pioneer RPV, a ground launched and controllable

drone. The TALD is an air launched decoy launched from several different types of airplanes. Its capabilities are similar to the Pioneers.

[128]Ibid., 753.

[129]Riddle and Carrol, 22. The fire support element (FSE) is a non doctrinal organization in the aviation brigade. In Desert Storm, the 12th aviation brigade borrowed an FSE from a non-deploying VII Corps artillery unit. The authors go on to recommend the addition of an FSE into an aviation brigade's TO & E.

[130]Final Report to Congress, 689.

[131]See Appendix for definitions of air supremacy and air superiority. While this implies the ability to operate at any altitude, the sanctuary was limited to operations above approximately 10000 feet. Below that, Iraqi AAA and non-radar SAMs still constituted a threat for coalition aircraft.

[132]Keaney and Cohen, Chapter 3, 6. In Chapter 9, the survey also notes that only one of the five airplanes actually lost to radar SAMs had F-4G support. It is also important to emphasize that non-radar guided SAMS and AAA continued to inflict losses throughout the duration of Desert Storm.

[133]For more specific, but classified results from Desert Storm, both the Conduct of the Persian Gulf War and the Gulf War Air Power Survey have classified versions. For J-SEAD-specific results see Thomas P. Christie and others, Desert Shield/Desert Storm Suppression of Enemy Air Defenses (Alexandria, VA: Institute for Defense Analyses, 1992), SECRET.

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