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THE INFLUENCE OF ELECTRONIC WARFARE
ON OPERATIONAL MANEUVER

A Monograph

by

Major David M. Rodriguez

Infantry

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ON OPERATIONAL MANEUVER

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ABSTRACT

THE INFLUENCE OF ELECTRONIC WARFARE ON OPERATIONAL MANEUVER, by Major David M. Rodriguez, USA, 44 pages.

The challenge of adapting to emerging technologies is difficult and important to future success on the battlefield. One area in which recent technological advancements have influenced military operations is electronic warfare. This study examines the influence of electronic warfare on operational maneuver. The purpose is to determine how exploitation of electronic warfare capabilities support operational maneuver by ground forces to attain operational effects.

The monograph begins with an overview of operational maneuver and the link between operational maneuver and electronic warfare. Next, a review of current electronic warfare doctrine illustrates how we are integrating new electronic warfare technology. The '73 and '82 Mideast Wars are recent historical experiences analyzed to show the impact of electronic warfare on operational maneuver. These experiences indicate electronic warfare significantly enhances the ability to execute operational maneuver.

In conclusion, the study offers three important points for consideration during development of future operational concepts. First, the battle for control of the electromagnetic spectrum must be won to effectively conduct operational maneuver. Second, military doctrine must keep pace with improving technologies. Third, near real-time intelligence provided by electronic warfare assets drastically increases the speed of the commander's decision cycle.

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I. INTRODUCTION.

FM 100-5, Operations, is the capstone manual containing our warfighting doctrine for the future. The doctrine claims to be "...rooted in time tested theories and principles, yet forward-looking and adaptable to changing technologies, threats, and missions."¹ Technology is currently the most likely of these to see drastic changes. The challenge presented for adapting to emerging technologies is difficult and important to future success on the battlefield. One area in which recent technological advancements have influenced military operations is electronic warfare.

Electronic warfare is a field where technology improves capabilities rapidly. Warfare in the electromagnetic spectrum began in World War I with rudimentary communications interception. It has progressed with such speed from then to now, that an argument can be made that the effect may be decisive. Chris Bellamy emphasizes that the 1982 Operation Peace for Galilee, "...was not the first war in which electronic warfare featured prominently, but it demonstrated how electronic weaponry has become pivotal on the modern battlefield."² The dramatic increase in technological capability to influence war creates the current dynamic environment of electronic warfare.

The influence of electronic warfare is felt throughout the three levels of war; strategic, operational, and

tactical. This monograph limits the analysis to the operational level of war, specifically, the influence of electronic warfare on operational maneuver. The purpose of the study is to determine how exploitation of electronic warfare capabilities support operational maneuver by ground forces to the operational depth of an opposing force.

The importance of the operational level of war in our doctrine was reintroduced in the 1982 FM 100-5 and reaffirmed in the 1986 version. Operational maneuver is a major part of the operational level of war. Its purpose is to seek a decisive impact on the campaign by gaining advantage of position to exploit tactical success to achieve theater objectives.³

II. METHODOLOGY.

The monograph begins with an overview of operational maneuver and explanation of the link between operational maneuver and electronic warfare. Terms relating to operational maneuver are explained to provide a common understanding of the concepts being analyzed. An overview of current doctrinal manuals, FM 100-5, FM 100-6, and FM 34-1 follows, including the role in our doctrine of electronic warfare. This overview will provide background and illustrate where we are integrating new electronic warfare technology.

The Sinai Campaign in 1973 and the Bekaa Valley Campaign in 1982 are recent historical experiences analyzed to illustrate the impact of electronic warfare technology on operational maneuver. These recent experiences in the Middle East indicate that electronic warfare significantly enhances the ability to execute operational maneuver. However, it is evident that the risk of conducting an operational deep attack with maneuver forces is considered high because of survivability and sustainability issues.

After evaluating these historical examples we will analyze future operational concepts designed to win control of the electromagnetic spectrum. The impact these concepts have on our ability to execute deep maneuver will be examined. The increasing relevance of electronic warfare on future operations is included.

The criterion applied throughout the paper is the influence electronic warfare has on the dynamics of combat power. "Combat power is the ability to fight. It measures the effect created by combining maneuver, firepower, protection, and leadership actions against an enemy in war."⁴ In addition to these four aspects of combat power, we will study combat intelligence because of the large impact of electronic warfare.

Finally, the paper will suggest implications and recommendations about the future direction of electronic

warfare to enhance operational maneuver. The recommendations include changes in equipment, organization, training and tactics.

III. THE THEORY OF OPERATIONAL MANEUVER AND ITS RELATION TO CURRENT DOCTRINE.

The theory and importance of operational maneuver can be traced to the military theorist, Jomini. He defines two types of decisive points, geographical objective points and objective points of maneuver. Both points, if attained, can lead to operational results. Objective points of maneuver are the basis for operational maneuver.⁶

The geographic objective point is defined as: "... may be an important fortress, the line of a river, a front of operations which affords good lines of defense or good points of support for ulterior enterprises."⁶ Jomini further states that during offensive action the geographical objective point is terrain which, if possessed by the attacker, will compel the enemy to make peace.⁷ Compelling the enemy to make peace is one effect that can be attained by operational maneuver.

The other objective point is the objective point of maneuver. "Objective points of maneuver, in contradistinction to geographical points of maneuver, derive their importance from, and their positions depend

upon, the situation of the hostile masses." Jomini goes on to discuss the objective points of maneuver as points which relate to the destruction of the enemy army. Thus, destruction of the enemy army is also an effect attained by operational maneuver.

The operational effects can therefore be defined as those that have a decisive impact on major operations or a campaign. According to Jomini, the two methods of attaining this are seizure of a piece of terrain that compels the enemy to make peace and destruction of the enemy army. The results therefore correspond to a given time and location relative to the enemy in terms of ability to force him to make peace due to positional disadvantage or loss of a major portion of its army.

Tracing Jomini's concepts to FM 100-5 will illustrate his influence on current doctrine. FM 100-5 states: "Operational maneuver seeks a decisive impact on the conduct of a campaign. It attempts to gain advantage of position before battle and to exploit tactical successes to achieve operational results."¹⁹ The decisive impact and operational results equate with Jomini's discussion relating to operational effects.

Another example of the operational effect of maneuver is the actual defeat of an enemy. Effective maneuver "...continually poses new problems for the enemy, renders

his reaction ineffective, and eventually leads to his defeat."¹¹ This technique also illustrates a means of producing an operational effect.

The ability to conduct operational maneuver on the modern battlefield demands tremendous coordination of effort. "Leaders combine maneuver, firepower, and protection capabilities available to them in countless combinations appropriate to the situation."¹² As situations become more complex due to the rapidly changing environment of modern war, the commander's ability to conduct operation maneuver is critical.

The importance of firepower to operational maneuver is clearly stated in FM 100-5.

Firepower supports friendly operational maneuver by damaging key enemy forces or facilities, creating delays in enemy movement, complicating the enemy's command and control, and degrading his artillery, air defense, and air support. At the operational level, firepower can also disrupt the movement, fire support, command and control, and sustainment of enemy forces.¹³

Offensive electronic warfare enhances the firepower effect by disrupting movement, fire support, command and control, and sustainment of enemy forces.¹⁴ Electronic warfare used in conjunction with firepower is a large contributor to the tremendous effects all firepower can have while supporting operational maneuver. Electronic warfare

support to the firepower dynamic is increasing in importance on the modern battlefield and will continue to increase in the future.¹⁵

Protection is another dynamic of combat power that is integral to operational maneuver. FM 100-5 explains:

They (operational commanders) protect the force from operational level maneuver and concentrated air support. Air superiority operations, theater wide air defense systems and protection of air bases are important activities associated with maximizing combat power.¹⁶

Electronic warfare is a major player in each of these areas. The increasing role of ground based missiles in air defense roles is becoming a technological battle for control of the electromagnetic spectrum. The rapidly changing technological capabilities of electronic warfare systems make this battle for protection of the maneuver force a question of who possesses the latest technology and can effectively employ it. The important role electronic warfare has in support of operational maneuver will be the framework for the remainder of the paper.

IV. ELECTRONIC WARFARE DOCTRINE.

FM 100-5 clearly specifies the purpose of electronic warfare:

...electronic warfare uses the electronic spectrum to deceive the

enemy, locate his units and facilities, intercept his communications, and disrupts his command, control, and target acquisition systems at critical moments.¹⁷

FM 100-6 goes somewhat further by establishing the electromagnetic spectrum, "...electronic warfare is military action to determine, exploit, reduce, or prevent hostile use of the electromagnetic spectrum."¹⁸

The staff responsibility for the conduct of electronic warfare is assigned to the operations officer and the communications officer. FM 100-5 declares:

The G-3 or S-3 has the overall responsibility for electronic warfare, but focuses his primary effort on offensive electronic warfare. The G-2 or S-2 develops targets for interception jamming or destruction. The communications electronics officer manages defensive electronic warfare.¹⁹

This methodology divides responsibility between offensive and defensive missions among different staff sections.

Electronic warfare directly supports the commander's concept of the operation. FM 100-5 states electronic warfare assets should be integrated by the commander into his concept of operation. FM 100-5 emphasizes:

...commanders should treat electronic warfare assets much as he treats artillery assets. Electronic warfare is conducted concurrently at both the operational and tactical levels, and

these efforts must be synchronized with each other and with other activities—maneuver, fire, and air support to obtain maximum benefit.²⁰

Thus our doctrine places a heavy emphasis on electronic warfare as one of the elements of combat power.

The defensive application of electronic warfare includes electronic counter-countermeasures (ECCM) and electronic warfare countermeasures (ECM). ECCM are passive measures to protect command, control, and communications (C3) systems against enemy activities. ECM can be used to transmit through enemy jamming or jam enemy signal intelligence systems to screen and prevent enemy intercept.²¹

The offensive components of electronic warfare are electronic support measures (ESM) and active electronic countermeasures (ECM). ESM provides information for jamming, deception, targeting and tactical employment of combat forces. ECM is a nonlethal attack of the enemy's command, control, and communication systems. ²²

Electronic warfare is an important player in deception activities: "Careful integration of electronic deception with visual, sonic, and olfactory actions is critical to the successful projection of a deception story."²³

Electronic deception uses either manipulative electronic deception (MED) or imitative electronic deception. MED is

the passing of false data among friendly forces to deceive enemy signal intelligence capabilities. Imitative electronic deception is the imitation of the enemy's own electromagnetic radiation to deceive or confuse them.²⁴

Electronic warfare possesses the capability to create tremendous uncertainty in the OPFOR's mind. A Soviet theorist, General Kir'yan proposes "blinding" the enemy's electronic reconnaissance, which will result in a "wait and see what happens" mentality. While the enemy waits to see what happens, major forces can be massed and surprise achieved. By the time actual contact occurs, it will be too late to react effectively. The uncertainty that occurs when electronic reconnaissance is blinded is very great indeed. The reliability and trust in electronic systems thus becomes a reliance on technology that can be very costly.²⁵

Due to the distinctive mission, scarce equipment resources and training problems, an integrated concept for electronic warfare employment is difficult to implement. FM 100-5 puts electronic warfare concepts in the current perspective: "...plans should reflect the relative scarcity of electronic warfare weapons, their limitations, and the transient nature of their effects."²⁶ This transient nature of effects may or may not be true when considered in an integrated concept. The transient effects can be turned into permanent effects when combined with maneuver,

firepower, protection, and intelligence. Control of the electromagnetic spectrum is a new mission. The services are like any large organization when it comes to assimilating changes; so the changes come slowly. The scarce equipment resources make it difficult to train and learn the difficult art of coordinating the effects of electronic warfare systems.

The discussion of the theoretical development of operational maneuver and the effects electronic warfare can have on it have been illustrated. Now let us turn to two recent historical examples that provide key lessons for future employment of electronic warfare in support of operational maneuver.

V. LESSONS FROM THE 1973 MIDEAST WAR.

The origins of the 1973 war can be traced to the 1967 war. The defeat of Egypt and subsequent occupation of the Sinai by Israel were unacceptable to the Egyptians. Egypt prepared to regain the lost territory as soon as possible.

During the time between the '67 and '73 wars, Egypt had to find an answer to the superiority of the Israeli air force. Contrastingly, the Israelis believed that:

Having learned the lessons of the 1967 war, the Egyptians would not embark upon a new war until they felt capable of striking at Israeli airfields and neutralizing the Israeli air force."²⁷

However, assistance came from the Soviet Union in the form of modernized equipment. Modernization of Egyptian equipment began in 1970 to offset the Israeli Air Force's air superiority. The new equipment included more air superiority aircraft and, more importantly, surface to air missiles and electronic equipment.

Through February and March (1970), in great secrecy their (Soviet) men and equipment began to arrive: 80 MIG-21 interceptors; 27 battalions of surface to air missiles (SAMS); banks of electronic equipment to counter that carried aboard the enemy intruders (Israeli); four MIG-25 high-altitude reconnaissance aircraft and the crews to man them.²⁸

This is the first time that air superiority was countered by anything but more aircraft.

The Israeli Air Force was to be dealt with by the creation of one of the densest missile "walls" in the world, composed of a mixture of various types of Soviet ground to air missiles SAM-3, and SAM-6, in addition to conventional anti-aircraft weapons, which would provide an effective umbrella over the planned area of operations along the Suez Canal. This would to a very considerable degree neutralize the effects of Israeli air superiority over the immediate field of battle.²⁹

The Egyptian ability to neutralize the Israeli Air Force was the goal for acquiring new equipment from 1970-1973.

Due to the equipment and the primary coverage area of the ADA umbrella, the Egyptian air defense system was defensively oriented.

For static defense they might prove adequate (though we still did not have SAM batteries to protect every target), but they could provide no air cover for an offensive operation especially over the open landscape of the Sinai.³⁰

The Egyptians understood the defensive orientation but were limited in what they could resource. The important thing was to establish an area in which they possessed the freedom to move equipment, arms and men. This enabled them to concentrate forces prior to the battle with little to no interference by the Israelis. This also allowed them to achieve surprise when the attack commenced.

The ability to concentrate undetected enhances the ability of a force to execute operational maneuver. Though the Egyptians did not conduct an operational deep attack, they did establish a relatively safe area to mass.

We had guessed that they (Israelis) would try to knock out our SAM radars, which were set back some ten miles west of the canal by using Shrike air to ground missiles...we had devised electronic means of countering Shrike and were quite keen to test them...the missiles fell hopelessly short. Clearly we were beginning to establish a cordon sanitaire east of the canal too.³¹

This cordon sanitaire became a safe area in which to move, mass, and support major maneuver forces.

Engagements which subsequently occurred between the Egyptian air defense systems and the Israeli Air Force point out the effectiveness of modern electronic warfare. After the initial engagements it was becoming clear "...that victory in any such conflict would go to whoever happened to have the more sophisticated electronic detection, jamming, and counter-jamming devices."³² The level of sophistication and the new employment methods enabled the Egyptians to gain surprise and the early advantage.

The Israelis were basically caught unprepared the first day of the war.

Poor electronic intelligence (ELINT) before the war left the Israeli Air Force unprepared and it sustained heavy losses in the first few days. However, it then quickly managed to develop countermeasures to suppress the radar which controlled most of the air defense systems.³³

It was in the interim between the Israeli's initial surprise and their counterreaction that Egypt was able to tactically maneuver forces successfully.

The Egyptians, through the use of a missile umbrella supported with heavy electronic warfare assets, had established a limited zone of control where they could maneuver. Later, when the Egyptians attempted to maneuver outside of this zone, the Israeli Air Force and armored forces enjoyed success. "That they (Egyptians) had been justified in limiting themselves to the area covered by the missile umbrella was proved to them when the Israeli Air Force twice destroyed their advancing forces pushing southwards along the Gulf of Suez."³⁴ This example illustrates a strong link between air superiority operations and ability to maneuver. The Israeli Air Force was not the only beneficiary of the turning tide in the air and missile war.

On the west bank of the Suez Canal, an unusual example of mutual coordination emerged between the advance of ground forces and the Israeli Air Force. As the armored forces on the west bank of the canal destroyed one surface-to-air missile battery after another, the Israeli Air Force gained a freer hand and became a major factor in supporting the advancing Israeli forces.³⁵

In this example, which came after some initial successes by the Israeli Air Force that weakened the air defense

umbrella, the ground forces directly supported the air superiority fight.

The relationship of air superiority to operational maneuver of heavy conventional forces is one of dependency. This was initially brought to light by Rommel from his experience against the Allies in North Africa.

Rommel stated:

During the day, practically our entire traffic--on roads, tracks, and in open country--is pinned down by powerful fighter-bomber and bomber formations, with the result that the movement of our troops on the battlefield is almost completely paralyzed, while the enemy can manoeuver freely.³⁶

Future developments in equipment and doctrine are continuing to support this premise. With the arrival of the missile age, the battle for air superiority became a totally joint air-ground effort as illustrated in the '73 war. The electronic warfare impact on intelligence, protection, firepower, and leadership were enormous during the '73 Mideast War. The impact was particularly important for Egyptian intelligence, due to the large influx of modern equipment.

The Soviets had reorganized the Egyptian intelligence system and had provided it with modern, sophisticated equipment for all forms of electronic warfare. Radio interception, electronic surveillance and locating equipment were all introduced and attained a satisfactory standard of operation...the Arabs also benefited from Soviet surveillance over Israel by means of electronic intelligence and satellites.³⁷

This new equipment was instrumental in gaining an advantage over the Israelis. As the Egyptians trained and learned with this new equipment, they also improved their own doctrine.

As the capabilities of this equipment became understood, the Egyptians knew they would have to adjust their own doctrine to improve and better protect their force. Examples of this include employment of radar and variety of air defense systems employment techniques.

...to prevent the Israelis acquiring the locations and number of air defense radars by electronic intelligence (ELINT), the radars deployed forward to cover the initial assault over the Suez Canal were kept silent until the assault began.³⁸

Examples of the air defense systems employment techniques included; use of different frequency bands which changed rapidly to minimize the effect of jamming; pulse, continuous wave and infrared homing radar to increase the difficulty of defeating both; and changes in radar positions to minimize the extent of Israeli ELINT.³⁹

"Some of the radar tracking systems also had the ability to track optically so that operations could continue even in a high ECM environment."⁴⁰ The electro-optics option was a simple fix to the technological battle of electronic warfare.

Unfortunately, there are limitations such as visibility and shorter ranges of electro-optics that decrease its effectiveness.

The impact of electronic warfare on the firepower dynamic of combat power during the '73 war was also dramatic. The preponderance of SAMS was the most important. "Each of these weapons (SAMS) possessed different electronic guidance characteristics, which complicated the application of electronic countermeasures."⁴¹ This electronic warfare advancement was specifically used to enhance the Egyptian air defense umbrella while degrading the Israeli air support. This led directly to the Israeli Air Force's inability to support maneuver initially. The Egyptians capitalized on this and supported their initial attack by sound employment of SAMS. The Egyptian intent from the start was to cover their front line:

...in such a way that Israeli air intervention would have little or no effect on the initial stages of the attack, and would allow the Arab preponderance in artillery, troops, and armour to be concentrated fully at the point of attack.⁴²

This is a direct application of electronic enhanced firepower to support maneuver that was successful.

The impact on command and control was a race to integrate new technology. Lt. General Saad El Snazly, Egyptian Chief of Staff declared: "Our major innovations lay in training, technique, and determination; I was nevertheless constantly looking for any device that might help us."⁴³ The increased role of new technology as well as the development of training and techniques to improve combat capabilities is clearly evident from this example.

The major lessons learned with respect to electronic warfare in the '73 war are numerous. These include: the importance of missiles, the synergism between air defense and air superiority, the role electronic warfare plays in concentrating major forces, and the air-ground coordination required to win the air-superiority fight.

Electronic guidance systems and the tremendous number of SAMs the Egyptians were able to employ ushered in the complete arrival of the missile age. The importance of this will have effects on all future conflicts in air, land, and sea operations. This also points out the technological battle between opposing forces as each attempts to counter the effectiveness of their opponent's weapons systems. The ranges of missiles also increased significantly. The standoff capabilities of air, land, or sea based missiles increases the dependence on electronic means to provide early warning and tracking for destruction of these munitions prior to impact.

The link between air superiority and air defense was developed further. Ground based air defense systems are now more capable of directly influencing the air superiority battle than was ever imagined prior to this time. "The bulk of the Israeli losses (aircraft) were caused by missiles and conventional anti-aircraft fire, with honours roughly even between the two, particularly during close support missions."↖↗ This increasing effect of air defense systems requires a relook at the effect of air power in the future. The ability to gain air superiority will be degraded by the air defense systems and the pursuit of local air superiority will become more important.

The role electronic warfare plays in the ability to concentrate forces is extremely vital. The Egyptian plan to provide an electronic and air defense umbrella along its front lines is a perfect example. This umbrella helped them to move and to concentrate major forces while denying the Israelis the ability to observe. This provided the Egyptians with an opportunity to surprise the Israelis. The ability to protect concentrating forces at the point of attack is a key aspect of operational maneuver. The Egyptian success, though not used to launch a deep attack, is directly applicable to operational maneuver.

Air-ground cooperation to win the air superiority fight was also important. The Egyptians enjoyed success in the initial stages of the war because the umbrella was a combined air-ground effort. The Israeli response of aircraft only was unsuccessful. After the Israelis recovered by upgrading their electronic countermeasures and coordinating closer with maneuver forces, the tide turned. The resultant air-ground coordination was effective against the Egyptian forces. Ground forces greatly assisted the fight for air superiority and the air forces assisted the maneuver of the ground forces.

VI. LESSONS FROM THE 1982 MIDEAST WAR.

The Bekaa Valley campaign in 1982 had a profound impact on the future of electronic warfare to support operational maneuver. The influence of air superiority and synchronized maneuver on the battle is important. The analysis will center on one day, 9 June 1982, during which electronic warfare played a prominent role.

A general description of the events of that day follows:

Just an hour after the attack started, the defenders (Syria) knew they were in big trouble. It was June 1982, and Lebanon's Bekaa Valley was a hornets nest of Soviet supplied surface-to-air missiles. They could, their Syrian operators thought, hurl up a lethal wall of firepower against any attacking

aircraft. Instead, they hardly got off a shot. Radar seeking missiles honed in on 29 supposedly secret sites, blowing them away while gleeful Israeli officers sitting in situation rooms across the border watched the action on television. A masterstroke of warfare had left the skies controlled by the attackers, and Israel's friends and enemies alike wondered how they'd done it.⁴⁵

The results provided Israeli ground forces the freedom to maneuver to drive the Syrians out of the Bekaa Valley.

The Israeli preparations for the Bekaa Valley Campaign are key to understanding the results. Armed with the lessons of the '73 war, the Israelis prepared for the next war. Their essential preparations included acquisition of new high technology equipment, extensive intelligence preparation of the battlefield, and the integration of battlefield requirements to win control of the electromagnetic spectrum.

Acquisition of new equipment kept Israel at the forward edge of technological development from 1973-1982. This new equipment included remote piloted vehicles (RPVs) that were used in surveillance, target designation, jamming, and monitoring roles.⁴⁶

Another major acquisition was the EC-707 aircraft which can be configured for communications intelligence, electronic intelligence, and jamming roles.⁴⁷ Anti-radiation and TV guided munitions both air and ground

launched were particularly effective at attacking radar.⁴⁸ Another important equipment upgrade was the state of the art electronic warfare equipment carried on Israeli aircraft. These include jammers, chaff/flare dispensers and threat warning systems.⁴⁹ As shown, the Israelis were not going to be upstaged by not keeping abreast with technological advancements, especially in the realm of electronic warfare.

The Israeli intelligence preparation of the battlefield was a key to the successful operation. "They spent 12 months studying Syrian air defenses in the Bekaa Valley and along the Syrian/Lebanese border."⁵⁰ Information gained included electronic intelligence on SAM guidance radars, frequencies, and accurate locations of the majority of radar.⁵¹ This extensive effort was profitable for two reasons, Israeli technology and Syrian ineptness in employing the SAMs.

The Israeli emphasis on winning control of the electromagnetic spectrum was exceptional. This thorough preparation paid dividends on the afternoon of 9 June. The control and sequence of the operation indicates a tremendously synchronized operation that was executed flawlessly. The scale and coordination of effort for the raid were unparalleled in modern warfare. "The Bekaa missile raid was a textbook example of modern day electronic warfare."⁵²

The Syrian preparation for the Bekaa Valley Campaign was a story of problems. The biggest problem, as with Egyptian use in the '73 war, was the immobile layout of SAMs. "The Syrians used mobile missiles in a fixed configuration; they put the radars in the valley instead of the hills..."⁵³ This enabled the Israelis to pinpoint their locations prior to the attack. The poor operational security of the Syrians made them susceptible to the vast Israeli collection efforts, most of which was electronic intelligence.

The Israeli operational plan to win the electronic warfare battle was an integrated concept from start to finish. First, RFVs were flown over the battlefield to stimulate the SAM radar sites. Following this, both RFVs and the EC-707 gathered information about the radars as they tracked the RFVs. Jamming began to blind the radars as well as the command and control nets. A coordinated attack occurred from air and ground launched anti-radiation missiles along with conventional artillery fires. Target assessment was accomplished by RFVs to conclude the first phase.⁵⁴

The second phase followed as the Syrian Air Force began their defensive counterair operation. The Israelis jammed Syrian ground control radar and communications nets, preventing any coordinated attacks against the Israeli planes. The result was a loss of 24 aircraft on the Syrian

side with no losses to the Israelis. Aerial dogfights continued the next day with similar results.²²

Technology had enabled commanders to centralize control of the battle. As stated earlier, Israeli operations officers watched the Bekaa Valley raid on TV monitors. Though not much is written about the command and control of the operation, it is clear that it was a very high headquarters that provided the detailed plan and very centralized command.

The control and direction of such an operation, and the orchestration required for all elements involved, is highly complex, and thus despite the very sophistication of the equipment, the human element still remains a dominant one.²³

The effect on operational maneuver by the electronic warfare dominated air battle was tremendous. "This new development (victory over the missiles) now enabled the Israeli forces to take advantage of Israel air power and to dominate the battlefield."²⁴ The Israeli Armored Forces were now able to maneuver under protection of the Israeli Air Force. Ben-Gal's corps broke through and was able to advance up the Bekaa Valley. The corps penetrated to the operational depth of the Syrian forces who committed their operational reserve, the Syrian 3rd Armored Division. The 3rd Armored Division was interdicted and became engaged

directly by Ben-Gal's corps on 11 June, when the Syrians agreed to a cease fire.²⁰ The Israelis had maneuvered to a position that had afforded them the opportunity to destroy the Syrian force. In Jomini's terms, they had reached the operational point of maneuver that motivated the Syrians to quit the field in the eastern area of operations.

The importance of the fight for air superiority and its relationship to operational maneuver were lessons learned from the '73 war. The Israelis knew that they could concentrate forces under an air umbrella augmented by electronics. They also realized that the ability to maneuver large armored forces even in difficult terrain was dependent on air superiority. This knowledge was applied in the Bekaa Valley in '82 to effectively conduct operational maneuver.

Electronic warfare had a marked impact on the 1982 war. The Israelis were able to gain real-time intelligence. Smart munitions and anti-radiation munitions contributed to firepower. Control of the air was coordinated by an advanced electronic warfare supported operation. This allowed armored forces to move freely and also protected them from Syrian maneuver. The exploitation of offensive electronic warfare paralyzed the Syrian command structure resulting in a loss of control and unresponsive actions to counter Israeli maneuvers.

The use of drones gave Israeli commanders access to near real-time intelligence.

The field commanders benefited from almost instant intelligence which facilitated their task of reaching immediate decisions. It is clear that the very effective development of reconnaissance drones, produced over recent years by Israeli industry, has played an important part in the success of battlefield intelligence.☛

The use of electronic intelligence was important during both the intelligence preparation of the battlefield and during the Bekaa Valley operation. In both situations the Israelis gained such a relative advantage over the Syrians, that this played a significant role in their success.

The use of smart munitions and anti-radiation munitions enhanced the effect of firepower. "...the batteries were probably attacked with sophisticated air-launched 'smart' weapons. Such weapons are highly accurate and some can be launched from well beyond the reach of SAMS."☛ The anti-radiation missiles, which home in on radar can launch from air, ground, and sea.

These weapons are quite effective, but can be countered in part by turning off the radar. What the Israelis reportedly did was modify the guidance systems of these missiles so that even if the

target radars are turned off, the missile will continue straight to the last source of radar pulses.*1

The exploitation of the electromagnetic spectrum was effective in enhancing firepower as exemplified by the devastating effect of these munitions.

The protection required when moving heavy units around today's lethal battlefield is an important requirement to support operational maneuver. Protection from opposing force maneuver is key and the Israeli Air Force accomplished this during the offensive maneuvers in the Bekaa Valley.

The Israeli Air Force was successful in interdicting and in preventing reinforcements from reaching the battlefield, as when a brigade of the Syrian 3rd Armored Division was caught in a narrow defile and badly mauled.*2

The electronic warfare assets assisted in detecting this force and were the main reason air superiority over the Bekaa Valley could be maintained.

The employment of offensive electronic warfare to disrupt Syrian command and control was highly successful.

Prior to and during the attack, the Syrians claim that their entire radar net was both decoyed and reconnoitered by RPVs and subject to extensive jamming generated by airborne Boeing 707 stand-off platforms, ground stations,

and dedicated A-4 Skyhawk aircraft.⁴³

This paralyzed the Syrian command structure, which could offer no adequate response.

Another related effect on command and control was the result the Bekaa Valley attack had on the Syrian high command.

The destruction of this doctrinal theory, knocked the Syrian command off balance, as it was clear, as they threw air units desperately into battle, thus incurring additional heavy air losses, that they were urgently seeking a reply to a situation for which they had not planned.⁴⁴

The Syrian command lost the initiative midday on 9 June and they were unable to recover it throughout the war. The shock that sent the Syrians reeling was reminiscent of the effect the blitzkrieg had on Germany's World War II opponents.

Lessons learned in the 1982 Bekaa Valley Campaign are applicable to a wide range of electronic warfare, air superiority and operational maneuver issues. The technological impact of electronic warfare is quickly changing employment concepts. The fight for the Bekaa Valley "...was one between the complex technological systems, including the most modern and highly sophisticated air control and electronic communication equipment."⁴⁵

Acquiring new electronic warfare equipment and, more importantly, integrating improved operational concepts throughout the force occupies a critical role in the preparations for the next war.

Electronic warfare, when integrated with other warfighting systems, can be the decisive factor in enabling one to maneuver operationally. The success of the fight to defeat the SAMS and gain air superiority over the valley was the first step. After this, a combined air-ground operation actually carried out the maneuver "...the first move was to strike with heavy air attacks, the only major air action in nine days combined with artillery and armor."** This type of operation forced the Syrians to fight defensively and withdraw before they were destroyed.

The operational commander's concept of operation must integrate electronic warfare. The entire operation on 9 June was dominated by the battle for the electromagnetic spectrum. This will not always be the most important factor in the future, but its potential effect cannot be downplayed. It seems evident from the '82 war that if electronic warfare is not integrated into the concept of operation, the operational commander is inviting trouble.

The potential of unmanned vehicles in the future is limitless. The RPV's capacity to be used as a platform for a wide range of capabilities is inviting. In addition

to communications, intelligence, jamming, and radar decoy, the Israelis also used them as a weapons platform. "At least one SAM-8 was destroyed by a RPV configured with an ammunition payload."⁴⁷ The only limiting factor to employing RPVs seems to be lack of imagination.

The speed and lethality of modern combat was graphically illustrated over the Bekaa Valley. In less than an hour, the SAMs were destroyed. The fight for air superiority lasted less than two days. In 16 days the Israelis moved the Syrians to the northern entrance of the Bekaa Valley and destroyed significant aircraft, air defense systems and Syrian forces. The effect of this operational maneuver compelled the Syrians to make peace.

VII. CONCLUSIONS CONCERNING THE FUTURE DIRECTION OF ELECTRONIC WARFARE TO ENHANCE OPERATIONAL MANEUVER.

Several conclusions that are critical to future warfare can be drawn from experience in the Mideast wars. First, the battle for control of the electromagnetic spectrum must be won to effectively conduct operational maneuver. Second, military doctrine must keep pace with improving technologies. Third, near real-time intelligence increases the speed of the commander's decision-making cycle. Technology is increasing the difficulty of effectively

employing electronic warfare capabilities, and the risk of being caught short in electronic warfare capabilities can be decisive in future operations.

Coordination of the fight for control of the electromagnetic spectrum, air superiority, and operational maneuver are inseparable in the missile age. This has made air-ground cooperation an even more crucial link than in the past. Control of the electromagnetic spectrum which includes denial of the enemy's free use of it, is critical to war now. Without control, our ability to gain air superiority for even limited periods of time is questionable. The side that wins the electronic warfare battle will possess advantages in the air superiority fight that will be nearly impossible to overcome.

Gaining air superiority is critical to maintaining the ability to execute operational maneuver. The ability to concentrate forces, maneuver forces freely, and adequately protect the force must be accomplished for successful operational maneuver to occur. Because air superiority depends on the ability to control the electromagnetic spectrum, these capabilities are interdependent.

The effectiveness of operational firepower depends in many ways on electronic warfare capabilities. Without effective offensive and defensive capabilities, the air force will be hard pressed to deliver operational fires.

The increased dependence on electronically guided missiles also makes forces vulnerable. If these guided missiles are electronically defeated, numerous air, sea and ground launched long range missiles will contribute little to operational fires.

Protection of forces depends heavily on electronic warfare capabilities. The Egyptian umbrella in the '73 war and the destruction of the Syrian umbrella in '82 are perfect examples of the protection dynamic in war. The Egyptian defensive umbrella provided protection for their forces. As the umbrella was degraded, air support became the means of protection. In '82, the Syrian air defense umbrella was quickly destroyed and Israeli air superiority again became the means of protection.

Operational leadership is becoming more and more dependent on intricate communications systems. Destruction of these means even for short periods of time could be critical. The effect one hour had on the Syrian high command on 9 June exemplifies this well. From this day forward, they were in a reactive mode and could not recover. Despite a fairly good showing at the tactical level, the Syrians could not regain the initiative operationally.

Military doctrine and operational concepts must keep pace with improving technologies. The risk of not doing this could be operational surprise. The emphasis in this area by the Soviets can be seen in the following passage:

Hundreds of Russian experts and advisors rushed to Syria within days of the air battles, because once again as in 1969, in Egypt in the war of attrition, the system defending the Soviet empire had been tested by the Israeli Air Force and found wanting. The Soviets will inevitably provide a reply to Israel's technological solutions, but the results of the air battles in the Bekaa Valley have given them much cause for concern.▲■

NATO, and the United States in particular, is as interested as the Soviets. In future conflicts the cost of being upstaged by new technologies will be great. But it is not only the technology that provides input into the equation. Research and development cycles, and more importantly, training and preparation for employing new concepts are time consuming processes.

The impact of near real-time intelligence provided by electronic warfare has decreased the decision cycle in modern combat. This can have a dramatic effect on the

speed of modern combat. Major General Doyle E. Larson in discussing one role of electronic warfare intelligence states:

The sensor information needed for C3CM execution must be available at the lowest level within 15 seconds of collection. This is a tough goal for us to reach, but one which is within our technological capability.♦

The technological impact is increasing the difficulty of effectively using electronic warfare capabilities. The cost of fielding this type of equipment is almost prohibitive. Budgetary constraints complicate the problem. The focus on physical destruction or "hard kill" weapons normally increases while "soft kill" electronic weapons take a back seat.70

The expertise necessary to operate and maintain new electronic warfare weapons is increasing. The impact on operational maneuver is tremendous. We must exploit the increasing capabilities of electronic warfare to successfully execute operational maneuver. The decisive effect of operational maneuver is within our grasp. A synchronized air-ground fight for control of the electromagnetic spectrum will be a major factor in the future.

VIII. IMPLICATIONS.

Education of operational commanders is becoming more difficult due to the increasing complexity of electronic weaponry. Battle for control of the electronic spectrum has no service boundaries. It is truly a joint fight. The capabilities of each service must be understood to develop a coherent concept of operation or campaign plan. The many new electronic warfare capabilities in each service make attaining the required technical knowledge increasingly difficult.

The problem of developing new operational concepts for integrating electronic warfare into future doctrine is twofold. General William E. Depuy, with respect to the US Army, stated they are:

...not yet comfortable with Electronic Warfare. The senior leaders have little firsthand experience and thus little confidence or skill in its use and tend to leave it, unintegrated, in the hands of specialists. The specialists, in turn, are faced with a tradition and structure of secrecy and compartmentalization--a hangover in part from the days of ULTRA.⁷¹

The ability to implement innovative uses of the technology is seen as limited to the "specialists" who are kept abreast of technological improvements. This is a dangerous situation that must be overcome.

Another implication related to electronic warfare is the centralization of command and control. "There are real-time television monitors at division, corps, and territorial headquarters, which may indicate an inclination in the Israeli Army to centralize command at higher levels."⁷⁰ This could be critical to operational leadership in the future. Centralization tends to lead to diminishing initiative at lower levels of command. On the other hand, limited electronic warfare assets and difficulty in employing them on the scale of the Israelis in the Bekaa Valley requires centralization.

The command and control system must be closely analyzed as future technological developments occur. The centralization issue and susceptibility to electronic warfare problem go hand in hand. Continual dependence on technology that increases centralization of command and control without regard to protective countermeasures would be disastrous. The balance is tenuous at best, and the opportunity for miscalculations is high, as history has so effectively demonstrated.

Electronic warfare is changing the environment of modern war. We must be prepared to adapt quickly as new technologies are developed. The electromagnetic spectrum is now as important as the air, land, and sea dimensions of battle. Control of this spectrum is essential to conduct effective operational maneuver.

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