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BATTLEFIELD AIR INTERDICTION IN THE 1973 MIDDLE EAST WAR AND ITS SIGNIFICANCE TO NATO AIR OPERATIONS

A Thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

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1986

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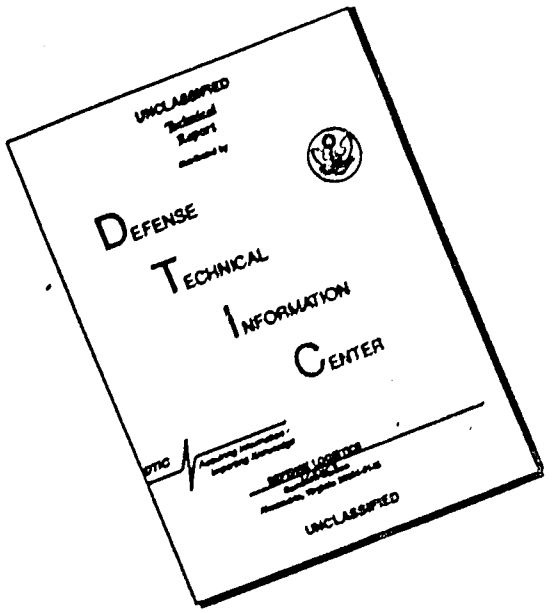

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ABSTRACT

BATTLEFIELD AIR INTERDICTION IN THE 1973 MIDDLE EAST WAR AND ITS SIGNIFICANCE TO NATO AIR OPERATIONS, by Major Bruce A. Brant, USA, 157 pages.

This study is a historical analysis of battlefield air interdiction during the 1973 Middle East War. Its purpose is to draw conclusions, based on the historical findings, about the best way to employ BAI in the airland battle. Although the conclusions come from a Middle East War over ten years ago, they are examined in terms of the NATO environment.

The tactical and technological developments of both Arab and Israeli air forces during the years 1967-1973 are examined in order to explain how both sides arrived at the doctrine they employed in the 1973 War. The Arabs established an intensive air defense network to deny the Israelis their strongest and most flexible weapons system. The Israelis believed that their Air Force would destroy Arab ground forces as it did in 1967. The confrontation of both doctrines had significant implications for the ground forces particularly the relative value assigned close air support and battlefield air interdiction.

The study concludes that close air support is not the best use of air assets in a high density air defense environment. Battlefield air interdiction is more effective to the operational ground commander. Localized control of air defense systems is needed to allow the use of air-to-ground assets. The final conclusion is that suppression of enemy air defense systems is a joint service responsibility.

ACKNOWLEDGEMENT

I owe a great deal of thanks to a number of people without whose help I would have not been able to finish this project.

My committee guided me through the process and kept me on the correct course when I started to go astray. I appriciate the long hours of reading, correcting, coaching, and directing they did. Next, I want to thank the staff of the Combined Arms Research Library of the Command and General Staff College at Fort Leavenworth, Kansas, especially Mr. John Rogers, Ms. Linda Kennedy, and Mrs. Mary Crow. They searched for numerous sourses, many of which were not in the library. Somehow, they were able to get all the documents I needed in time to be used for the paper. They took personal interest in my topic and brought information to my attention when they came across anything new. A special thanks goes to Major Frank George, a classmate and now with the English Department at the United States Military Academy. His hours of proof reading the document helped considerably. Most of all I want to thank my wife Ginger and my children, Heather, Kyle, and Amanda for doing without a husband and father for most of the year. Their support and understanding made this thesis possible.

To all I owe a great debt and express my sincere thanks.

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CHAPTER 1

INTRODUCTION

The proper use of all the capabilities of airpower is essential to victory on the modern battlefield. Without the use of all available assets the commander, fighting a numerically superior enemy, cannot win. Airland battle doctrine calls for the incorporation of air support into the operational scheme of maneuver. The commander now has three air force capabilities available to him to support his scheme of maneuver: close air support (CAS), tactical air reconnaissance (TAR), and battlefield air interdiction (BAI). The air force's ability to maintain air superiority is also directly related to the success of a ground operation.

The newest category, BAI, gives the ground commander limited influence over interdiction assets that he did not have before. However, BAI's importance to the commander, the capability of the Air Force to carry out the mission, and its contribution to the success of the battle have not been tested, in recent history, by U.S. forces.

Certain definitions are required to understand the importance of BAI, its possible use by the ground commander, and to distinguish it from other air-to-ground support tasks.

Army FM 100-5, Operations, defines BAI as, "air action against hostile surface targets nominated by the ground commander and in direct support of ground operations. BAI isolates enemy forces by preventing their reinforcement and resupply and by restricting their freedom of maneuver.[1]

Two other missions, close air support (CAS) and air interdiction (AI) must also be defined to differentiate between those types of air support available to the Army and that kept under Air Force control.

> AIR INTERDICTION--Air operations conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear effectively against friendly forces.[2]

The main differences between BAI and air interdiction are that BAI has near term affect on the enemy and it is used to support the ground commander's scheme of maneuver. AI targets the enemy's war making capabilities and potential. It is conducted deep into the enemy's rear area. BAI usually is coordinated with the corps headquarters. It requires joint planning and coordination during execution. BAI is presently executed as part of the overall air interdiction campaign. AI is carried out by the Air Component Commander in accordance with the priorities of the Joint Force Commander.[3]

> CLOSE AIR SUPPORT--Air action against hostile targets that are in close proximity to friendly forces and that requires detailed integration of each air mission with fire and movement of those forces.[4]

Close air support assists troops in contact with the enemy. It requires some type of active control such as a Forward Air Controller (FAC). It gives immediate support to the ground units.

Research Question

How was battlefield air interdiction used by the Israeli Air Force during the 1973 Middle East War and what lessons can be applied to its use on the modern battlefield?

Purpose

The purpose of this study is to analyze the use of BAI during the 1973 Middle East War and make conclusions, based on the historical findings, on the best way to employ BAI in airland battle. Very little has been written on this subject. No other study has examined BAI during the 1973 War.

The 1973 Middle East War was selected because it provides a clash of philosophies, equipment, and tactics, strikingly similar to that which would result in a conflict between NATO and the Warsaw Pact.

In October, 1973 hostilities were initiated by a coordinated surprise attack by the Arab nations. This type of attack could be expected in NATO. The war broke out before Israel could complete mobilization. Several critical hours passed before forces arrived at the front. NATO may have a similar problem and American reserves are 3,000 miles away. The main Arab objective was not the total destruction

of Israel. It was to regain the land that they had lost in earlier wars.[3] If they had regained their lost territory and could not pursue the war further, they hoped the Soviet Union would come to their aid in the international arena and pressure Israel to accept a cease fire.[4] A similar scenario could occur in Europe. After a surprise invasion, the Warsaw Pact might gain the Ruhr Valley industrial area or all of West Germany and then seek peace before U.S. reinforcements could arrive on the the Continent.

The intensity of the War was also similar to that which is expected in a NATO-Warsaw Pact fight. Both Israel and Syria suffered extremely heavy casualties and high loss rates of equipment during the first days of the War. By the second week, Egypt suffered severe losses as well. Massive assistance by the U.S. and USSR aided in prolonging the War by the resupply of badly needed equipment and by giving new weapons systems to the belligerents to test in combat.

The weapons used by each side are either still in use by the NATO-Warsaw Pact countries, or they have been replaced by technologically advanced weapons that were modified, in a large part, because of the 1973 War. For the most part, Israel used American weapons that were advanced, but not the most modern available. Some of the munitions supplied to Israel during the War were the newest the U.S. had to offer. Most of the Arab countries were supplied by the Soviet Union. Some of their ground support weapon systems were the best the Soviets had at the time, for example the SA6 (surface-to-air)

and SA7 air defense missiles. The T-62 tank was also made available to the Arabs in limited numbers.

The tactics used in the War were similar to those which might be expected in a European conflict. The Egyptians and Syrians used Soviet doctrinal tactics and formations. The Israelis applied most of the tenets of airland battle doctrine: agility, initiative, depth, and synchronization. They struck deep with maneuver as well as air support. They cut off the enemies' first echelons and destroyed the timing of the follow-on reserve forces. They did almost everything the airland battle professes.

An immense amount of literature has been written about the 1973 Middle East War. But, most of what has been written about the air force has been about the air superiority battle over the Sinai. Even those articles are general in nature. The Air University Review published only two articles about the War in the first two years after the cease fire. This is very little considering the intensity of the war and the fact it was fought with American and Soviet weapons systems. There seems to be a lack of effort to try to gain lessons from experience which could provide insight into the execution BAI.

Significance

The issue of the proper use of battlefield air interdiction has started a number of debates within the military community and the aircraft industry. These

arguments include matters of aircraft design, apportionment, command and control, etc. Examples of these debates is found in articles and ads in the Army Times and the Air Force Times describing the best follow on air-to-ground replacement for the A-10. Several planes including the A-7, AV-8B, F-15E, F-16, and the F-20 are under consideration.

An article in Army Times asked why the Air Force needs to replace the A-10 which is used solely for CAS. The author, James C. Kantor, wrote that the Air Force was trying to develop a multi-role fighter that would not be used just for close air support. He argued that with a multi-role aircraft, the support of the Army operations would take a lesser priority to air superiority. "If the Army loses the A-10, we'll all be in big trouble at the FEBA."[7] Although the author discussed the merits of the A-10 only as a close air support weapon, other reports have discussed its suitability for BAI. The execution of BAI for the ground commander as well as CAS, must be taken into consideration in development of a new air-to-ground support aircraft. The debate over the best air-to-ground aircraft is a long way from a decision.

Another problem is how to apportion air interdiction, BAI, and CAS. Which mission will get the highest priority and most sorties? How much should be allocated to Army corps level for use as the ground commander deems necessary?

These are just two problem areas that have an impact on how BAI is executed. Many more aspects of this type of

air support must be studied before it can be used to its fullest capabilities.

The results of this study may change the thinking of airland battle doctrine, or at least the current use of CAS and BAI. Since the U.S. has not been able to test its new BAI concept, the results of this research may affect how the commander uses his air asset and how the U.S. Air Force will carry out its mission. All parties dealing with BAI, pilots, the aircraft industry, and legislators who will ultimately make the decision on which aircraft to use, can make better decisions by examining the practical experience of others.

Background

The airland battle is now a firm part of U.S. Army doctrine. It is seen as the answer to a Soviet style echeloned attack in an environment of electronic warfare, nuclear, biological and chemical operations, day/night and adverse weather attacks, high lethality, rapid resource depletion, and enemy presence both front and rear. To win the airland battle, the Army must gain and retain the initiative by attacking the enemy's vulnerable targets from unexpected directions to disrupt the opposing forces' time table, and to weaken his effective combat power. The initiative can then be taken from the enemy and the friendly forces can dictate the timing and tempo of battle. To accomplish this mission, the Army must stop the first echelons, keep the rear area secured, and attack the follow-on forces so that they are weakened and cannot

reinforce the engaged forces prior to their defeat. Disruption of the enemy time table provides opportunities both for success of the close battle and defeat of follow-on forces. They will lose their initiative, flexibility, strength, and fighting spirit. Attack of the follow-on echelons is an important part of airland battle doctrine. It is vital to the success of the close battle. Without delaying, disrupting and attriting enemy forces, and taking away their window of opportunity, the doctrine will fail. If the threat can select when and where to attack and, remain a sizable force when they reach the front, U.S. forces may be overwhelmed.

The attack of follow-on forces will be accomplished by field artillery, tactical maneuver units, special operations forces and air force assets. Tactical maneuver units will be used but they are limited by their freedom of action, timing, logistics, and firepower. Field artillery has limited assets, range, and acquisition systems. Special operations forces lack the mobility and firepower to do significant damage. The air force gives the best hope for the deep battle attack.

In the last few years, joint planning groups have been formed to try to coordinate the highly complex mission of deep attack. These groups publish procedures and agreements designating responsibilities and actions for each service. Many of the procedures are being tested only now. New problem areas in coordination, target acquisition and

servicing, and the use of real time intelligence are surfacing. The history of the 1973 Middle East War provides usable data on the best way to coordinate air support with maneuver forces and the best way to employ BAI.

Definitions

Additional definitions and terms are provided in appendix 1.

Limitations

1) This study is unclassified so as not to limit its audience or dissemination.

2) Much of the numerical data used is the best estimate than can be found. Statistics from the war (including classified) differ considerably.

3) Due to very limited use of Arab airpower for CAS or battlefield air interdiction, the study will primarily focus on the Israeli Air Force.

CHAPTER 1

NOTES

1. FM 100-5, Operations, 1982, p. 7-11.

2. FM 101-5-1, Operational Terms and Symbols, 1985, p. 1-4.

3. USREDCOM PAM 525-8, General Operating Procedures for Joint Attack of the Second Echelon, 1984, p. 2-7.

4. FM 101-5-1, Operational Terms and Symbols, 1985, p. 1-24.

5. The Insight Team of the London Sunday Times. The Yom Kippur War (Garden City, NY: Doubleday & Company, Inc., 1974), p. 88.

6. Foy D. Kohler, et al, The Soviet Union and the October 1973 Middle East War (Miami FL.: Center for Advanced International Studies, 1974), pp. 57-66.

7. James C. Kantor, "A-10 Warthog Meets All Needs for Close Air Support," Army Times, 25 Nov. 1985, p. 29.

CHAPTER 2

REVIEW OF RESEARCH LITERATURE

This chapter reviews the research literature upon which the study is based. It is divided by type of publication for ease of reference to the bibliography.

This study is based on sources which differ by type and date of publication. Most of the periodical and newspaper articles where written during or soon after the war. The reports and theses were written within the first few years of the conflict. The books are of two types. Some were written right after the cease fire, others several years latter when the War could be studied more objectively. A selection of doctrinal material was also used since the historical lessons about the use of BAI will be used to make conclusions in reference to today's battlefield.

The research began with a quest to locate everything written about the 1973 War that concerned the Israeli and Arab Air Forces, supply systems, battle damage assessment, and any related fields. This search produced a number of books, articles, reports, theses, and research projects published commercially or, in the case of most reports, by a defense agency. There were also a lot of journal articles from professional military organizations and schools, as well

as various aviation and defense oriented periodicals. All classified, declassified and unclassified sources available were reviewed before the decision was made to write an unclassified report. The classification problem was resolved after a review of the classified sources and a comparison to those that were unclassified. This showed that most of the classified data did not agree and that unclassified data was very close or the same as the classified. Much of the information which was classified initially was latter published in unclassified publications, especially in books and reports.

Books

Like every big event, there was an initial surge of books published while the subject was fresh in the public's minds. However, the best books, for this study, were those published a few years after the War. By the time they were written, the authors had a better understanding of the entire War and its impact. A problem of this type of source was objectivity. An author's nationality had a great bearing on his evaluation of how the War was fought and even its outcome. The major benefit of using books for this particular study is that most of the reports on the War are classified. The same or similar data found in books is unclassified and usable for this study.

An excellent book on the War is October Earthquake - Yom Kippur 1973 by Zeev Schiff. Schiff is a member of the editorial board of Haorety, Israel's leading daily newspaper.

The book won the Soholov Prize as the outstanding journalistic work of 1974. What separates this book from most others is the author's ability to open files and give verbatim extracts from the actual logbook records of the fighting units. This allows the reader to derive more primary material from this work than most other sources. The book is very well organized. The author uses one day of war per chapter except when he includes an "interlude" section on some special subject of relevance to the day and chapter he is about to or has just covered.

Trevor Dupuy wrote three books used in this study. The first two, The Evalution of Weapons and Warfare, and Numbers, Prediction, and War - Using History to Evaluate Combat Factors and Predict the Outcome of Battles, are both good background reading especially in conjunction with the articles and reports prepared by his HERO (Historical Evaluation and Research Organization) staff. His best work is Elusive Victory which was published in 1978. Although the book includes all of the Israeli-Arab conflicts to 1978, it contains over 250 pages on the 1973 War. It is an excellent source for several reasons. First, by 1978, a better analysis could be made of the War. Some of the hasty conclusions about the War were found to be myths. Dupuy is a meticulous researcher and presents new evidence on certain subjects. The author's objectivity is an asset not found in many books published on the War. Depuy's reputation, as a soldier-historian, opens sources that are unavailable to

others. The author's ability to research, analyze and interpret the whole story makes this book very valuable.

Two other very objective books are, Insight on the Middle East War and The Yom Kippur War. Both were written by reporters of The Sunday Times (London). The two works contain about the same material. The insight team covered in detail the causes, preparation, tactics, and weapons used in the War. They do not take sides and illustrate the successes and failures of all combatants. The only problem is that the books were written shortly after the War. It would be very interesting to have the same writers go back to the battlefield and again examine what took place to re-assess their initial observations.

M.G. Chaim Herzog wrote two works covering the War, The War of Atonement, October 1973, and The Arab-Israeli Wars. The second book covers all the Middle East wars. The section on the 1973 War is taken almost word for word from his first book. It provides good background reading on the events leading to the 1973 War. The War of Atonement, October 1973 is an excellent account of the War but it does not go into the depth of analysis of other works such as those by Depuy. Also Herzog lacks objectivity. Some of his criticism of Israeli leaders may be politically oriented. The actual story of the fighting soldiers and day to day details on both sides, is very good.

Two excellent case studies of the War were written for the Air Force's and Army's Command and Staff Colleges.

The 1973 Mideast War from Air Command and Staff College (ACSC) and Selected Readings in Tactics-The 1973 Middle East War from the U.S. Army Command and General Staff College (USACGSC), are exceptional background readings to understand the day to day flow of the War. Both also have good bibliographies and maps.

Theses

USACGSC theses are a good source of material. Most of these were written just after the War or in the last few years when many of the topics dealt with airland battle. They provide a wealth of bibliographic information. The majority of these studies were written by Air Force officers. This gives a unique view to the value and deployment of the air assets during the War.

"A-10 Effectiveness Against Soviet Offensive Operations in Central Europe," by D.K Burke, uses experiences of the Stuka pilots of the German Luftwaffe during World War II and a few lessons from the 1973 War to illustrate the requirements for a close air support aircraft in Europe. Very little data can be gained from this thesis but excellent insight on close air support (CAS) requirements makes it a valuable source.

A USACGSC international student from Egypt, LTC A.H.S. Hafiz wrote, "A Comparison Between US-Soviet Military Doctrine from an Egyptian Point of View." It describes the tactics used by Egyptian ground commanders during the 1973 War. It confirms the weaknesses of Soviet tactics that hurt

the Arab forces. The author is a veteran of the 1973 War.

Several studies completed in the last few years examined how the Air Force is going to perform the mission of BAI on the modern battlefield. "Close Air Support and Battlefield Air Interdiction in the Airland Battle," by David Hamilton, "The 'Air' in the Airland Battle," by J.R. Henderson Jr., "The Joint Airland Battle System: An Alternative to Air Ground Operations System," by H.R. Nichols, "Air Superiority Concepts: 1980-2000," by David E. Rickert, and "Close Air Support - Can it Survive the '80's?" by Ross L. Smith, are good references about how the Air Force plans to incorporate air support within the airland battle doctrine.

Two good historical sources are, "The Air Superiority Battle in the Middle East, 1967-1973," by C.E. Olschner, and "Airpower Theory and Application: An Historical Perspective," by Donald A. Streater. The first report provides excellent information about the air-to-air war and the use of air defense systems. The second covers World War II, Korea, and Vietnam but not the Middle East. It does point out the usefulness not only of studying history, but also of applying lessons from the past to doctrine of today and concepts for the future.

A 1985 thesis, "Tactical Airpower and the Rear Battle: Defeating the Operational Maneuver Group," by Albert Allenbach, is interesting because the problem of stopping the Soviet Operational Maneuver Group (OMG) 10-50 kilometers

behind the friendly Forward Edge of the Battle Area (FEBA) involves many of the same problems as stopping a large reinforcing unit the same distance on the enemy side of the FEBA. Although the report is shallow, the author provides a useful discussion of the value of changing the enemy's timing and tempo and how to do it.

Doctrine

The basis for airland battle doctrine is found in Field Manual (FM) 100-5, Operations (1982). This manual gives a general overview of airland battle and its components. It also serves as the capstone for a series of manuals that detail the specifics of doctrine for maneuver units, combat support and combat service support units. It stimulated the development of publications for joint service doctrine because of its emphasis on the use of airpower in the overall scheme of the ground commander. Among the more important Army manuals are: FM 6-20, Fire Support in Combined Arms Operations, FM 100-2-1, The Soviet Army-Operations and Tactics, FM 100-2-3, The Soviet Army-Troops, Organization, and Equipment, FM 100-15(Final Draft), Corps Operations and FM 101-5-1, Operational Terms and Symbols. Added to these Army manuals are Air Force Manual (AFM) 1-1, Functions and Basic Doctrine of the United States Air Force, Tactical Air Command Manual (TACM) 2-1, Tactical Air Operations, and USREDCOM Pamphlet 525-8, General Operations for Joint Attack of the Second Echelon.

These publications tell how the airland battle will

be fought by specific types of units. They establish procedures to be followed. Unfortunately, they present only generalized situations and can offer only a school solution. Despite these shortcomings, they are the starting point of the study and establish a set of boundries within which to focus.

Periodicals

Most of the articles used were written either during or just after the War. These give the initial impressions of what took place but have little reflection about why. Some articles published within the first few years after the War are commentary on the War's outcome, specific phases of the War, and weapons systems used. There was a period when almost nothing was written in periodicals but with the acceptance of airland battle doctrine, a resurgence of analysis has occured, especially in Army publications.

The best source of immediate reactions concerning air support is a series of articles appearing in Aviation Week & Space Technology. The first articles, "The Mideast Surprise," and "Soviet Aid Sparks Arab Gains," appeared in the 15 October, 1973 issue only a week after the War started. Both articles report the effectiveness of new weapons systems such as the SA-6 anti-aircraft missile and the Saggar anti-tank missile. The first article, an editorial, also reminded the readers that in 1971, the journal reported the missile belt along the Sinai. They had also noted that this new air defense system changed the strategic balance of

airpower over the Suez Canal. The article reported that this news was taken with great skepticism by Israel.

Other articles such as "Israeli Aircraft, Arab-SAMs in Key Battle," "U.S. Spurs Countermeasures to Israel," "Mideast Cease-fire Spurs New Tensions," and "Israeli Losses May Spur ECM Restudy," were published in the October issues. They provide immediate impressions of weapons, tactics, and mistakes on both sides. The evaluation of doctrinal changes while the War was still going on is especially interesting, as are impressions about the impact of new technology. This last issue was stressed again in a November article, "U.S. Equips Israel With Soviet Guided Weapons."

The next few months provided the initial articles analyzing the airwar. December articles included, "The Lessons of October," "Israeli Air Force Decisive in War, " and "Egypt Assesses Lessons of October War." All three articles covered the overall impact of the war in the air and how the application of airpower changed during the course of the War. They also reflect how the War may have changed future doctrine.

The Journal of the Royal United Services Institute for Defense Studies, which for the rest of the study will be referred to as RUSI, published several articles in the early years after the cease fire which analyzed the conflict and postulated a series of lessons learned from the War. These articles, "Middle East Tank Killers, " "The Middle East War-An Assessment, " "Israel After the Yom Kippur War: Zahal

Reflects on the Lessons," and "The Assault on Mount Hermon: an Episode of the October War," bring out information learned from the War which is now incorporated in Israeli Defense Force (IDF) doctrine.

The best article in RUSI is the text of a lecture given to the RUSI staff on 6 November, 1974 by General Chaim Herzog, former Chief of Israeli Military Intelligence. It appeared in the March 1975 issue prior to General Herzog's books on the War. The lecture is a good general overview of the preparation leading to the War and its overall conduct. One particularly interesting point is that General Herzog did not try to coverup the intelligence failure of foreseeing the attack by the Egyptians. Although the lecture does not contain a lot on the day to day air activities, General Herzogc makes several very important observations on the usefulness of airpower and the effect of the dense Arab air defense systems.

Military Review published several articles about the War. Most of these were written in 1974 just after the War, in 1976 when data from the War had been analyzed, and in 1978 in two specialized articles.

An excellent article, "The Yom Kippur War," appeared in the March 1973 issue. The author, Kenneth S. Brower, gave a complete overview of the War. He pointed out problems that writers were going to have when analyzing the conflict. Initial results from the battles led people to make hasty conclusions. Upon deeper study of the final statistics from

the War, a different picture was formed. He gave the example of the very high success rate of the IDF in 1967 and analysis condemning their performance in 1973. Actually, loss rate per 1000 sorties was less in 1973 than 1967.

In January 1976 S.L.A. Marshall submitted an article from an anonymous author (probably Avigdor Kahalani) who was a tanker on the Golan Heights front. It is very useful because it describes the effects of enemy airstrikes on armor. An interesting article, "The Syrian Side of the Hill," was published in February. The author, Charles Wakebridge, traveled to Golan and interviewed both sides, including Syrian Defense Minister, General Tlass. It is interesting to read the illusions of the Syrian high command in their interpretations of the War. This is especially true about the "success" of their Air Force.

An excellent article, "Israel's Defense Doctrine: Background and Dynamics," by MG Israel Tal, Israeli assistant minister of defense and deputy chief of the general staff during the 1973 War, was published in March 1978. It gives an overview of the IDF defense doctrine, strategy and tactics. The author tells how these principles of defense have worked through each Israeli conflict. The article provides excellent background material and gives important insight on why the IDF arms itself and why it uses specific tactics to protect the country.

"The Sixth Arab-Israeli Conflict: The Military Lessons for American Defense Planning," by Anthony H.

Cordesman, is found in the August 1982 issue of Armed Forces Journal. It offers a good update of how the Israelis applied lessons learned in the 1973 War to the invasion of Lebanon in 1982.

Two articles that give extensive coverage to the airwar are "October War," from Strategy and Tactics and "Holy Day Air War," from Air Enthusiast International. Both sources provide a good overview of the airwar effects on the outcome of the ground battle.

Newsweek is an important source of analysis and on-the-spot reporting. Amaud de Borchgrave, senior editor, traveled 800 miles in 24 hours in a taxi from Libya to Cairo to start his reports and establish a team of reporters for Newsweek. His personal relationship with President Sadat allowed him more freedom than many journalists. His extensive knowledge of the region, its leaders, and its history, facilitated detailed analysis of the War. Eyewitness reports from Nicholas C. Proffitt were also informative and well written.

Most of the Newsweek articles are unsigned. They are the day to day reports compiled in the weekly issue such as "Tactics: How the Arabs Scored Their Surprise," "The Mideast Erupts," and "Israel Scores a Breakthrough." Many articles are about special subjects that related to the War like, "Tank Warfare: World War I to West of Suez," "Restocking the Arsenals," and "Five Lessons of the War."

Reports

Most of the reports were written by research firms under government contract. The majority were written within the first few years of the War. Most are classified but contain some unclassified data. Much of the classified data is found elsewhere in unclassified sources. The classified sources provide a good starting point for the search for data that is relevant and is usable if found in declassified sources.

An unclassified report by Martin von Creveld, Military Lessons of the Yom Kippur War: Historical Perspectives, was published by the Center for Strategic and International Studies in 1975. This excellent source, analyzes the weapons, tactics, and strategy of the War. The author's keen insight into what actually went on during the conflict makes this report valuable reading.

T.N. Dupuy's Historical Evaluation and Research Organization (HERO), produced a report, "Assessment of Arab-Israeli Conflict Effectiveness: 1973 War Combat Performance," for Mathematica, Inc.. It is an excellent source of statistical data concerning weapons, troop strength, etc. The firm uses a historical method to produce a formula for computing battle results. Through this formula, the reports give combat effectiveness ratios to each side. The significance of the reports, for this study, is the enormous amount of information on effects of weapons and detailed analysis of how certain battles were fought. Another report from HERO, "The Arab-Israeli War 1973," also provides

good weapons data.

Two of the first unclassified reports completed by the Army are, "Lessons Learned from the 1973 Middle East Crisis," and "Air Defense in the Middle East," The first report, contains a separate section on air operations. This covers use of air controllers, the air-to-ground war, and air defense. The second report discusses Arab air defense systems both ground and air. It also relates how the initial effectiveness of these systems changed IAF support to ground forces.

A Department of Defense study, "The October 1973 Middle East War-Volume IV: Air Operations," and a Department of the Army study, "Analysis of Combat Data-1973 Mideast War Appendix E-Air Operations," are excellent sources. They were written shortly after the War and are classified. Most of the information in them is found in unclassified or declassified sources.

A report that confirms many of the problems associated with CAS is "The Fast FAC in Southeast Asia and its Utility in Future Conflicts." It examines the problems involved with controlling CAS near friendly forces in a high Threat air defense environment. Although the study is about Vietnam, it refers to the problems of the IAF in 1973. It confirms several facts about the actual percentage of use of CAS versus BAI.

Several reports use lessons from the 1973 War to illustrate future applications of airpower on the European

battlefield. "Air Defense of the Covering Force in Central Europe," "Strategic and Doctrinal Implications of Deep Attack Concepts for the Defense of Central Europe," "Interdiction in Central Europe in the 1980's - An Analysis of Forces and Capabilities," and "An Assessment of the Impact of the October 1973 War on Soviet Doctrine, Tactics, and Material," all discuss the implications of the 1973 War on modern doctrine. A portion of each study is devoted to the importance of CAS or BAI and the problems of carrying out these missions in a highly developed air defense environment. With the similarities in tactics and weapons systems the 1973 War is used easily to project what may happen against Warsaw Pact forces. The problem is that most of the authors spend a great deal of effort relating the similarities but do not give enough analysis to the differences between the Middle East in 1973 and contemporary Europe.

Several good reports are found on the effect of air defense on the accomplishment of the air-to-ground mission during the War. "The Battle for Air Superiority during the 1973 Arab-Israeli War," "Defense Suppression," "Suppression in Support of Offensive Air Operations," and "Operational Methods Against Ground to Air AA Rockets as Conducted by the IAF," all express the view that the air-to-ground mission cannot be accomplished until the air-to-air and ground-to-air war is won or at least kept under control for limited periods. The reports give statistics on losses due to SAM's and interceptors. They also are informative about how the air

defense systems were defeated or controlled to allow at least partial air support to ground forces.

Air-to-ground weapons effectiveness is of great concern to this study. Several reports are helpful in this area. "The Yom Kippur War: Analysis of Weapons Implications," is an excellent source not only of weapons data but it is also a good analysis of the total effectiveness of airpower during the War. "Middle East Game," from the U.S. Army Concepts Analysis Agency and "Historical Effects of Air Interdiction," describe the use of airpower in the 1973 War and its importance in stopping forces moving to the front. The reports analyze use of conventional air weapons against different types of targets such as tanks, trucks, and bridges. An excellent report on the damage done to tanks and personnel is "Value of Close Air Support." Although it was written to recommend the uses of CAS, it contains a section on airpower during the 1973 War with data from several studies.

One of the first reports about the War was written by S.L.A. Marshall for the Army Material Systems Analysis Agency. The report, "The October War - A Synopsis of the 1973 Sinai - Suez Campaign and a Critique of Weapons and Tactics," was published in January 1974. BG Marshall gave a good chronology of the War and then a preliminary analysis of what took place and why it happened the way it did. He evaluated different weapons systems and their uses. He believed one of the biggest influences on the War was the

strong air defense. This thinking, that SAM's destroyed the IAF, is prevalent throughout most books, articles and reports written immediately after the War. It illustrates the caution an analyst must take when studying an event immediately after its completion.

Another excellent report, "31 January - 12 February (1974) Visit to the Israeli Defense forces," was published in March 1974 by TRADOC. It was written prior to the IDF publishing a report of lessons learned. The research staff got a feel for the initial lessons of the War by interviewing officers at all levels.

"The Israeli Air Force," was written for the Foreign Technology Division at the Air Force Systems Command. The report is very pro-IAF. It is a short chronology of the development of the IAF. Although a few facts are taken from the report, its lack of objectivity cloud the report's usefulness.

Newspapers

The newspaper is an excellent source of primary material. The papers examined were, The New York Times, The Times (London), and The Sunday Times (London).

The Sunday Times started an indepth series about the day to day fighting, tactics used, weapons systems, and advantages or disadvantages of each side. It had the luxury of being able to take a week's worth of reports from all the wire services and analyze them before going to press. The paper sent an insight team to Israel, Beirut, the United

Nations, Cairo, and Washington, to get a complete story on all the related events. This same team latter published their accounts in Insight on the Middle East War and The Yom Kippur War.

The Times (London) had reporters on each front as well as in Beirut. Each reporter was able to give personal reports of the fighting from the ground level but there was no analysis of what was going on or why. The overall coverage seems shallow. It may be due to leaving analysis to The Sunday Times.

Excellent reports can be found in the New York Times. The coverage is extensive on all fronts and in critical areas around the world. Here too a problem of balanced reporting existed although the accounts differ considerably. The reporter in Damascus, Juan de Onis, was limited to what could be sent and most of it was official statements of the Syrian government. Henry Tanner, at the Cairo desk, was allowed a little more freedom to visit the soldiers on the front lines. The best reports are from Terence Smith who covered the Golan Heights battle and was one of only three reporters to be allowed by the IDF to join their Sinai offensive to the west bank.

Expert analysis of the War came from Drew Middleton who had access to hundreds of stories coming over the wire services. Middleton is able to distinguish the true and meaningful stories and relate to the readers the significance of what takes place.

Newspapers are a good source of first hand information although they have little relevance to BAI. But, in a few articles, important on the spot reports on the effectiveness of airpower are found. The other benefit from this source is the analysis by The Sunday Times and Drew Middleton.

Chapter 3

METHODOLOGY

There are several advantages and disadvantages to writing about a historical event that is only a little more than ten years old. The major advantage is the number of documents and personal observations that have been printed and published. Unlike wars of the past, there is an abundance of first hand writings from the soldiers who fought the War, the generals who directed it, the politician who caused it, and the people who paid for it. The major disadvantage is that many reports are classified and can not be used unless the information is found in an unclassified or declassified source. Luckily, this was usually the case. Several books published immediately after the War contained information that later appeared in classified documents. Another disadvantage is objectivity and limited views of the writers. A participant in one phase of the War often wrote as if he was everywhere on the battlefield.

Using historical methodology, this study examines the following questions pertaining to the 1973 Middle East War:

1. The percentage of sorties used in BAI type missions.
2. The command and control of BAI.
3. The effectiveness of BAI.

4. The types of targets that gave the best results.

5. The problem areas that affected BAI.

The study is divided into five chapters. Definitions are placed in an appendix to enable a more informed reader to study the report faster and easier. Endnotes are used at the end of each chapter for ease of reading.

Chapter One is the thesis introduction. It presents the problem statement, purpose, research question, assumptions and significance of the study. It also establishes definitions that will be used and limitations of the study.

The review of literature in Chapter Two is designed to aid researchers studying similar subjects or considering the same sources. Most major sources are reviewed for their value to the study and support of the thesis research question. Where possible, several sources are examined together. All sources in the bibliography were analyzed in relation to the study though they may not appear in Chapter Two.

The methodology, Chapter Three, gives the reader a framework of how the study was performed and how it is organized. This is to assist the reader in his understanding of how the material in the study was derived.

Chapter Four covers the historical findings from the research. It first defines several key terms used throughout the rest of the paper. It is then organized into several chronological parts. The first part deals with the period

between the end of the 1967 Six-Day War and the start of the 1973 War. This was a very important period and the action is written in detail because it covers the complete change of Arab air defense systems, which had a major impact on the air-to-ground war. This is also an important period because of the influence of the super powers that helped shape the air defense systems, doctrine, and tactics of each air force.

The pre-war events are followed by a short summary of the ground war. This is necessary to understand what took place during air-to-ground operations.

The airwar is the next section. It covers how and when BAI was used, as well providing an evaluation of its effectiveness. Also in this portion are the variables that contributed to effectiveness of BAI such as the air defense system, electronic warfare, and command and control.

Chapter Five, states the conclusions drawn from this study. It discusses the NATO Central European scenario and addresses how the conclusions of the thesis can affect future air-to-ground support in that environment.

The research for the historical study began with a comprehensive search through all services of the Combined Arms Research Library of Ft. Leavenworth, Kansas. The computer search of the Defense Technology Information Center was especially useful. The library had 90% of all documents needed either hardcover or on microforms. They were able to provide most others within a few weeks. Some references were unobtainable due either to being lost or destroyed.

While references were collected, the actual search for information about BAI took place. This was difficult at first because BAI was not a term used by either side and most of the initial studies are classified. After reading the reports, it appears that almost all the classified material could be found in articles and books. However, there is a void of any material written about the Arab countries airwar.

Another excellent source of information was interviews. The first was with Captain Ali Aklouche of the Algerian Army. CPT Aklouche did not participate in the 1973 War but has commanded a BMP battalion and is a graduate of two Soviet staff schools. His insight into the tactics and equipment used was very useful. The second interview was with COL. Doron Kadmiel, an artillery officer with the IDF. He was deputy commander of an artillery battalion in the Sinai during the War. His interview was very valuable to get the flavor of war and because the IAF CAS missions are controlled by artillery ground observers. He was also able to comment on the effects of Egyptian BAI on artillery positions.

This study uses the information collected to analyze the value of the BAI campaign during the War. It than draws conclusions as to its usefulness for the future.

CHAPTER 4

THE 1973 MIDDLE EAST WAR

Introduction

Before examining the role of BAI in the 1973 War, some common definitions must be established. Air Supremacy is the complete control of airspace to allow air operations to be conducted anywhere and anytime. Air superiority is the ability to gain contol of airspace at a specific place and time. It is usually held for a limited duration.[1] The Israeli Air Force uses almost the same definition of close air support as the U.S. Air Force. MG Binyamin Peled, Chief of Staff of the IAF during the 1973 War, states, "Close air support in our definition is that type of air-to-ground operation where a ground commander assesses his own situation, evaluates that he needs an air weapon to solve his immediate problems, calls for it."[2] In other words, CAS is called for in a local emergency at or behind the Forward Line of Troops (FLOT). The term battlefield air interdiction was not used by the IAF. The U.S. definition was stated earlier in this paper.[3]

Prelude to War

In 1973 the Israeli Air Force failed to play its proper role during the early days of fighting because events

prior to the War. For this reason, an explanation of the pre-war period is critical to the study of the performance of the battlefield air interdiction mission during the War.

Preparations for the 1973 conflict began shortly after the 1967 Six-Day War. The foundations for planning, tactics, and weapon systems were based on the results of the outcome in 1967. The Arabs used their defeat to learn from their mistakes and grow in their strategic and operational level planning. The Israeli Defense Force (IDF) learned from the War too. But, as is the case in many armies, they trained for the 1967 War instead of the next one. The lessons learned from the Six-Day War were modified by new developments that occurred during the post-war period.

It seemed to most of the world that the 1967 Six-Day War was a complete victory for Israel. The IDF killed or wounded 68,000 Arabs, destroyed over 1,000 tanks, and destroyed the air forces of Egypt, Jordan, and Syria. Israel occupied 26,000 square miles of Arab land. This provided a greatly increased defensive buffer and the complete occupation of Jerusalem. All of this cost only 780 Israeli dead and 2,600 wounded. The Israeli Air Force (IAF) lost only forty-six aircraft, an almost ten to one margin of damage compared to the Arab air forces. Also, the Israelis made up for their losses in material with the capture of enormous stocks from the Arabs.[4] The balance of power in the Middle East shifted radically in favor of Israel. For the Arab countries it was a humiliating defeat.

The 1967 War gave little peace to Israel. Defeat only served to strengthen the ties among the Arab countries and confirm their will to destroy Israel. By flying a pre-emptive air strike against the Arabs on the first day of the War, Israel hoped to prevent a long costly war by destroying enemy military power quickly. They hoped this would force the Arabs to recognize the state of Israel and put an end to the state of belligerency that had existed in the region since 1948. Despite its impressive victory, Israel could not force the Arab nations to concede the goals it desperately wanted. The victory only antagonized the Arabs and weakened the influence of Arab moderates. The loss of sacred Arab national soil and numerous Muslim shrines made the Arabs even more determined.

Internationally, Israel's pre-emptive strike cost her major support among former allies. It also became a major factor in the 1973 War. The French condemned Israel for starting the War and put an embargo on war materials to Israel. President de Gaulle stopped shipment of fifty Mirage fighter aircraft to the IAF even though they had been paid for in advance. The embargo also included parts. This hurt the IAF because the majority of its aircraft were French.[5] The War also helped to polarize the relations between the two superpowers. The Arabs, criticizing the U.S. for supporting Israel, turned to the Soviets for support. The Soviets, having supported and supplied arms to the Arabs for many years, seized an opportunity for further influence in the

region by strongly condemning Israel and starting an enormous military aid program to the Arabs. Overall, the Six-Day War created additional problems instead of accomplishing the Israeli goals. Although, on the surface, Israel's victory was impressive, it did not bring peace and served to create the foundation for the next war.

The War of Attrition which followed, is probably the least known and understood of all the Middle East wars. It too had a great impact on the airwar in 1973. The War of Attrition was a protracted series of raids, shelling, terrorist attacks and air strikes on both sides of the 1967 cease fire lines. It was costly to the IDF in manpower (367 killed and 999 wounded) and was a drain on the economy. The lessons of the War helped shape the Arab air forces. Additionally, Soviet pilots took an active part toward the end of the War.

Immediately following the 1967 cease fire, there was an unparalleled degree of cooperation developed between the powers of much of the Arab world, especially Egyptian President Nasser, and the Soviet Union. Recognizing the air superiority of the IAF, President Nasser let the Russians have almost complete control over Egyptian air defenses in hope of building up a counter-force to the IAF's domination of the battlefield. The Soviets, who wanted to establish a permanent presence in the region, were willing to make a massive commitment to the Arabs. As a result, the Soviets invested thousands of advisors and technicians, billions of

rubles worth of military hardware, and even the lives of some of their pilots.

The Soviet buildup of the devastated Arab air forces started immediately after the cease fire. By the twenty-fifth of June, due to a massive Russian airlift, the Egyptians had almost 200 aircraft. These new MIG-21s and Sukhoi-7s gave the Egyptian Air Force (EAF) a more formidable force than the one the Israelis destroyed.[7]

Because most of the Arab planes were destroyed on the ground, they retained a sizeable nucleus of pilots. These, plus new pilot candidates, were sent to the Soviet Union for training.[8] The training they received was, by Western criteria substandard. The Soviet training method of set piece tactics was used. Manuals were written in Russian or English that meant few pilots or crews had complete knowledge of their aircraft. There was little training in air-to-air or air-to-ground combat that did not fit into a set scenario. Just prior to the 1973 War, flying time was curtailed to conserve fuel, munitions, and aircraft. This meant a drop in combat readiness before going into action against the Israelis.[9]

As a result of the 1967 pre-emptive strike, the Arabs learned that aircraft need to be dispersed and protected and that their early warning system was inadequate. A new program of runway improvement and hardened hangar construction was started. They also requested a better radar system from the Soviets.[10]

The IAF found huge obstacles in the way of their efforts to rebuild their Air Force. The French arms embargo became absolute on 4 January 1969. Since the air strike capability of the IAF was based on the French Mirage IIIC, this was a major set back. The U.S. took over the task of aiding the rebuilding of the IAF. The U.S. had supplied aircraft in the past but, for political reasons, these were not in great quantities. With the U.S. watching the massive Soviet buildup, President Johnson decided to send fifty F-4 Phantoms and some A-4 Skyhawks to Israel beginning in early 1969.[11]

The F-4 was a multi-role fighter with a Mach-2 speed and a 1000 mile combat radius. It performed about thirty-five to fifty percent in a ground role in 1973. The A-4 became the premier ground attack aircraft in the 1973 War. It was originally designed for carrier takeoffs. It was a single seat light attack bomber and it was extremely maneuverable. By 1971, The IAF had about seventy F-4s and eighty-eight A-4s.

The changeover from French to U.S. aircraft was a quantum leap for the IAF. The pilots and ground crews found the American aircraft simpler, yet more sophisticated more reliable, and better able to sustain damage and keep flying.[12]

The War of Attrition

Although the War of Attrition is generally considered to have started in the summer of 1969, it actually started a

few weeks after the cease fire. On 1 July, 1967, an Israeli patrol was ambushed and cut off by Egyptian infiltrators. This type of low level conflict continued on the Egyptian, Jordanian, Syrian and Lebanese fronts until an August 1970 cease fire agreement. The War went through several phases, from guerrilla war to dog-fights between Israeli and Soviet pilots. The War had a single unifying theme in that, for the first time, Israel had to fight a predominantly defensive battle that would not be resolved by a decisive military victory on the battlefield.[13]

The first aircraft to be shot down was an Egyptian MIG-17 on 4 July, 1967. This was less than a month after the cease fire of the Six-Day War. A week later, on 14 July, six Egyptian MIG's and one Israeli aircraft were shot down during a combined air and ground battle in the Suez area.[14]

Artillery shelling, commando raids, and deep interdiction air strikes were continuous until the summer of 1969. Then the violence escalated. In May, eight MIG's were shot down by IAF pilots and one was shot down by an American made Hawk ground-to-air missile. Between the middle of June and 7 July, the War escalated in all areas with nine Egyptian planes shotdown.

One of the most decisive actions by the IAF occurred on 17 June. It had a major impact on the Egyptian air defense policy. Two IAF Mirages flew through the air defense system at low altitude and high speed to Cairo where they produced a loud sonic boom that shattered windows throughout

the prestigious suburbs of Manshieh el Bakri and Heliopolis. As a result, Nasser fired both his air force and air defense commanders. The raid also created a serious commitment to rebuild the Egyptian air defense system.

Egypt began improving her air defense network in both early warning devices and surface-to-air missiles (SAMs). These latter were improved both in quality and quantity. Egypt received SA2s before the end of the Six-Day War but they were not operational prior to the cease fire. When the Egyptians tried to move SAMs closer to the Canal, the IAF bombed them before or shortly after they became operational. On 25 December, in a continuous eight hour raid, the IAF attacked and destroyed every missile battery from Quantara to Suez City.

Additional raids and interdiction airstrikes against an almost completely unprotected Egyptian airspace finally forced Nasser to admit that the EAF could not protect Egypt. On 22 January 1970, President Nasser flew to Moscow to stress that Israel had achieved air supremacy and that massive Soviet assistance in air defense would be needed. The Russians were already aware of the Eygptian's vulnerability.[18]

It was decided by the Soviets that the air defense system would be rebuilt in stages. First, pilots and air defense personnel continued to be trained while the Soviets developed an extensive air defense plan. Then, a massive airlift of new weapons (including SA3 missiles) arrived

starting in late January. The first systems were put around Alexandria, with SA3s manned by Russians, to protect the airlift that sometimes extended to as many as five transports per hour. New MIG-21Js were then sent to Cairo piloted by Russians. Ten squadrons, totaling 150 aircraft were stationed at five different airfields.

By the end of March, the Soviets had installed a completely new defense system for the Eygptians. An air defense division was flown out of the Odessa air defense district to the Western Egyptian delta region with its headquarters in Alexandria. A forward air transport command was headquartered in Cairo. MIG-21J and KSU-15 squadrons were posted around Cairo and the Delta.

Now that Egyptian confidence was restored, they increased the shelling along the Canal. The IAF flew deep interdiction missions as well as BAI missions against artillery emplacements.

On April 18, while flying south of Cairo, IAF pilots heard Soviet voices on the radio and saw they were flying against MIG-21Js instead of the Egyptian model. The pilots broke rontact and returned to home base. A new policy of flying only in the air space around the Suez Canal was established to avoid confrontation with the Russians who were protecting Cairo.

By July, Soviet pilots were playing a major role in the air defense of Egypt. They were actively challenging IAF planes. On 25 July, two MIG-21Js flown by Russians, damaged

an IAF A-4. This prompted Israel to retaliate. On 30 July they ambushed three flights of MIG-21Js. They downed five while sustaining damage to one of their own aircraft.

Shortly after this air battle, in August 1970, a United Nations cease fire went into effect. Egypt immediately started moving air defense batteries into the cease fire area. Between 7 August and 5 September, forty-five missile sites were constructed.[16]

The cease fire did not change the political or geographical situation in the Middle East. When Anwar el Sadat became president, he hoped to regain the lost Sinai. He prepared a treaty that ended the state of belligerence, recognized Israel's independence, and respected Israel's right to live within secure borders if Israel would return the Sinai. The Israelis refused, confident that their superior military power could retain the occupied territory. Trying to put pressure on Israel to negotiate, the U.S. cut off further shipments of aircraft. However, in January 1972, under pressure from pro-Israeli groups and with presidential and congressional elections approaching, President Nixon agreed to supply needed A-4s and F-4s to the IAF.[17]

Early in 1972, President Sadat began considering a limited military campaign against Israel to create an international crisis and thus to bring the superpowers influence to bear on Israel to give up lost Arab territory. Sadat knew he would need additional aircraft, missiles, and tanks from the Soviets who were unwilling to supply them due

to the questionable reliability of President Sadat. In July 1972, Sadat told the 21,000 Soviet advisors to go home. Although this appeared to the world as a complete breakdown of relations between the Soviet Union and Egypt, there were still a large number of advisors and technicians who stayed. In mid-November he decided to launch a campaign during 1973.

Ironically, relations with the U.S.S.R. got better and arms again flooded into Eygpt. Between December 1972 and June 1973, Eygpt received more weapons than in the two preceding years.[18] Along the Suez Canal, the Soviets helped establish the most dense and comprehensive air defense missile system in the world outside the Soviet Union itself.

The most critical planning problem for the Egyptians was how to avoid annihilation of their forces by the IAF during the establishment of initial bridgeheads across the Suez Canal. They knew they could control the air because Israeli fighter-bombers had to come into the Egyptian air defense belt to attack the bridges and follow on forces supporting the crossing infantry. The Egyptians had faith in their air defense umbrella.

By the early 1970s, the Egyptian air defense network was complete. The system, created for Egypt by their Soviet advisors, was based on experiences from Vietnam and the Middle East. The SA2, with its 30 kilometer range, was used for high altitude aircraft and was supplemented with the SA3 which was faster and more agile. The SA6 was the primary missile against low altitude aircraft. It was mounted on

mobile carriers and had the capability to change positions and radar frequencies. This made it hard to destroy or evade. The SA7 light anti-air missile was also abundant. It was carried individually or mounted on a vehicle with eight launchers. The missiles, along with thousands of anti-aircraft machineguns, radar controlled multi-barreled cannons, individual weapons, and of course the EAF, formed an almost impenetrable air defense umbrella.[19]

On the west bank of the Canal, the air defence sites operated as part of an integrated, mutually supporting network. They were protected by walls of earth and concrete and had anti-aircraft guns around them for protection against the IAF. Command and control elements were in underground bunkers. These supervised the integration of the missiles, guns, and fighter interceptors.

The typical missile site was a circular position of either SA2s or SA3s deployed in pairs. The command post was in the center of the position in a bunker. It was surrounded by the latest Soviet radar trailers. Around the site were decoy launchers made of wood. These made the identification of the real launcher very difficult. Outside the position, a network of multi-barreled anti-aircraft guns covered all approaches. The communications system was extensive throughout the air defense network. It consisted of radio and underground telephone cables. The SAM sites were integrated into a mutually supporting sector system controlled by a sector coordination site and equipped with

additional radars. About sixty sites were deployed along the Canal in a strip 160 kilometers long and twenty kilometers deep. Approximately one hundred other sites were dispersed throughout the rest of Egypt to discourage deep interdiction missions and air attacks against EAF airfields. The Arabs regarded their missile network as a counter to IAF air supremacy.

During the War of Attrition, the IAF encountered many missile sites, mostly SA2s, and were quite confident that they could evade and destroy the missiles. But the Soviets brought in new missiles, radars, and electronic systems that rendered the previous IAF anti-missile tactics ineffective.

In the final days of the War of Attrition, nine IAF F-4s were shot down by the Egyptian missile system. The message should have been clear to Israel that to gain air supremacy, the Arab air defense belt must first be destroyed.[20]

By late 1972 the Egyptian Minister of War and Commander-in-Chief, General Ahmed Ismail, had finished a detailed plan for the Sinai campaign. It was based on Egyptian strengths and Israeli weaknesses. The Egyptians believed that Israel's major strengths were in airpower and the rapid mobility of her armor. The Egyptians felt that their Army was strong in a static defense because of their larger manpower base. The Israelis could be defeated by the attrition of their forces in attacks against Egyptian defensive positions if the IAF was unable to support their

ground units or stop Egyptian reinforcements and supplies. Also, a two front war would divide IDF military power.

The final Egyptian plan called for an attack across the Canal on a wide front in order to deny the IDF the ability to mass their forces at any one critical area. An attack on a small front would have given Israel an ideal target for air strikes while the Egyptians marshalled their forces prior to and during the Canal crossings. Another reason for attacking on a wide front was the placement of Egyptian forces already defending along the Canal. If the Israelis counterattacked along the wide front, the Egyptian SAMs would be more effective against a lesser density of aircraft. If the IAF tried to interdict only one or two bridges, the Arab forces would still have many more bridges available.

The plan called for a five infantry division attack, each reinforced by an armored brigade. The divisions were to attack in five major sectors, using numerous crossing sites, and to establish bridgehead lines of about three miles wide per division. The objectives were to seize the Bar Lev Line, establish a defensive line within the SAM umbrella and defeat Israeli counterattacks. The SAMs would, for the most part, stay on the west bank out of artillery range. Once dug in, the Egyptians felt they could strip away the IAF air support from the attacking armor formations. They could then inflict heavy losses on the IDF, and exploit the Israeli's limited manpower and sensitivity to casualties. They felt that the

superpowers would intervene within the first few days to impose a cease fire and a negotiated settlement favorable to the Arabs. If this did not occur, the Arabs would engage in another war of attrition until the IDF strength was so depleted that another attack could be launched to regain the rest of the Sinai.[21]

The Egyptians decided against attacking to secure the critical passes in the Sinai for several reasons. First was the limited EAF ability to support ground forces and carry out TAR. Second was the shortage of a mobile air defense network except for their SA6s and SA7s. Without an air defense umbrella, the IAF could interdict reinforcements and lines of communications (LOCs), while providing ground support to their own forces.

In January 1973, President Sadat was able to get President Assad of Syria to agree to join forces for Operation Badar (the code name for the attack) under an Egyptian commander. Although Syria was weaker than Egypt, the second front was needed to divide IDF forces, especially their air assets. Russia continued to supply Egypt and Syria with MIGs as well as significant amounts of the advanced and mobile SA6. Sadat also convinced Assad to abandon Syria's goal of destroying Israel in favor of simply recovering its lost territory. This would help the Arabs gain the superpowers' support during negotiations after the cease fire. The Egyptians and Syrians finalized plans for Operation Badar on 2 October with a decision to launch the

attack at 1400 hours on 6 October.[22]

Like Egypt, Syria had been preparing for war since 1967. The Soviets supplied enormous amounts of military equipment, especially SAMs which made up for Syria's lack of interceptors and pilots. In May 1973, an agreement with the Soviets provided Syria with a complete SAM defense system and an additional forty MIG-21s.[23]

The Syrian plan, developed in conjunction with Egyptians for an offensive on the Golan Heights, was to attack with three mechanized divisions followed by two armored divisions. The Syrian Air Force (SAF) would be used immediately in a BAI role to stop reinforcement by closely positioned units of IDF defensive positions along the border. These positions would be sealed off, suppressed by a massive artillery preparation, and then captured or destroyed by Syrian ground forces.[24]

In contrast to the Arabs, the IDF did not learn as much from the Six-Day War. Their total victory gave them a defensive buffer area and a sense of complacency. They developed an inflated estimate of their own power and an unrealistic opinion of Arab military proficiency and capabilities. This attitude was expressed by General Ariel Sharon shortly after the end of the war in 1967 when he said,

> After our success this time, I am very much afraid that by the time of the next war we are all going to be too old, and the next generation will have to take care of it, because...the enemy is not going to be able to fight for many, many, years.[25]

In analyzing the 1967 War, the IDF attributed their success to better planning , generalship, and manpower. They concluded that the combination of air support and armored power appeared to be the foremost cause of their victory. They failed to analyze what would have happened if they had not had air supremacy. They failed to evaluate the major effect that the IAF had both physically and psychologically, on Arab ground forces. The IDF's greatest success came after they achieved air supremacy. It is not surprising then, that during the period between wars the IDF devoted most of their defense spending to strengthening their Air Force and armored forces. Over seventy-five percent of their defense budget went to these two branches, with over fifty percent going to the IAF alone.[24] It was decided that infantry and artillery would only play a secondary role. The Air Force would be used as flying artillery with the ability to bring much more fire power to bear on the enemy than cannon field artillery. Flying weather in the Middle East was so good that artillery would only have to fire at night when the IAF did little flying.

After the Six-Day War, it was assumed that the IAF could gain aerial supremacy at any time over the Arabs, serve as the strategic arm of the IDF, and give full support to the ground attack. Israeli defense plans were built around the speed and lethality of the IAF. It was the main force multiplier. The War of Attrition only served to strengthen

these beliefs. The Egyptian missile build up at the end of 1970 was considered minor.[27]

Along the Suez Canal the IDF plan of defense was based on a widely spaced series of defensive positions along the Canal, called the Bar Lev Line. The strongpoints of the Bar Lev Line were safe from shellfire and did not require many troops. These positions were not designed to fight against even light attacks. They were designed for observation and requesting fire support to delay the enemy until reinforcements arrived. The infantry manning them had only small arms, machineguns and light anti-tank weapons.[28] The IDF felt they could be supported by artillery in two minutes and with armor in ten to twenty minutes. This would blunt the attacks while the IAF flew ground support missions against enemy troop concentrations.

In the Sinai the Israeli strategic defensive positions were located along a line roughly parallel to the Canal and fifty to sixty kilometers east of it. The positions controlled the Khatmia Pass, Giddi Pass, and the Mitla Pass. There are four major roads across the Sinai. The three passes control east-west movement along the central, southern and south eastern routes.[29]

On the Golan Heights, Israel did not have a large buffer like the Sinai nor were their defensive positions as elaborate. If the Syrians broke through the initial defensive belt, their next objective would be to cross the Jordan River. If they crossed the River, they could drive

through the heart of Israel.

A major part of the overall defense plan was an IAF pre-emptive strike into Arab territory to halt units moving to crossing sites, destroy enemy airpower, and support ground forces. Due to the reliance on the pre-emptive airstrike, the first IAF priority was to create narrow corridors in the Arab air defenses through which the IAF could fly to attack their targets. This was planned for in two ways. One way was to use ground forces to cross the Canal to destroy SAM sites and forward airfields. The other plan was for the IAF to attack the SAM sites in a less densely covered corridor.[30]

The Arabs were now ready for war. They believed their air defense systems would stop the IAF from supporting ground elements and from preventing Arab reinforcements from building a massive attacking force. They knew their air forces were not prepared to do battle with the elite of Israel's military power, the IAF pilots. Arab planes would be used for initial surprise BAI and interdiction strikes behind the forward edge of the battle area (FEBA) against tank parks, reserves, command and control elements, airfields, and supply depots. The air forces would then return to bases deep in their own territory to play a secondary air defense role. Very little air-to-ground support would be available to Arab ground commanders.

Israel had complete trust and faith in its Air Force. In 1971, an IAF spokesman stated:

> We are convinced we have the full answer to missiles. In July 1970, we didn't have it. Now there will be no serious problems. There will be losses, but smaller than those we sustained on the eve of the cease fire [War of Attrition]. This should be proven within the first two or three hours of war. We will overcome the whole system within two or three days.[31]

Because Israel believed the missiles were vulnerable to a concerted effort, they felt the fight for air supremacy would be won primarily in air-to-air combat over the inferior Arab Air Forces. In 1973, Israeli intelligence estimated that the Arab air forces would not be a serious threat for several years. Without an effective counter to IAF air supremacy, Israel believed any Arab ground attack would be destroyed by its Air Force. This over confidence in airpower caused Israel to misinterpret intelligence data on the upcoming war.[32]

Pre-War Summary

The period between the Six-Day War and the 1973 War is important to the study of BAI for several reasons. First the development of the Arab air defense system took away the IAF air supremacy. This lead the Arabs to believe that they could attack Israel without the IAF destroying their ground forces. The airpower balance had changed. This opened the door for war. Second, as the Arabs changed their plans to overcome their weaknesses, Israel reinforced what appeared to have given them victory in 1967. The IDF plans were built around the assumption that the IAF could destroy Arab air

forces rapidly, without worrying about being shot down, prior to supporting the IDF ground attack. They also failed to adjust to a change in Arab tactics that would cause the IAF to initially fail in the ground support mission. Third, during this the period time superpowers made their full commitments to their client countries. This not only changed the balance of air supremacy as the Soviets built up the Arab air defense systems, but also helped change the IAF by converting it to American planes. This commitment, latter in the War, also kept the conflict going longer because of the massive resupply efforts by both superpowers.

TABLE I

AIR ORDER OF BATTLE, 6 OCTOBER 1973

	EGYPT	SYRIA		ISRAEL
FIGHTER-BOMBERS				
SU-7	130	45	A-4	150
MIG-17	200	120	F-4	140
MIG-19	60	--	SUPER MYSTERE	12
MIG-21	160	110	MIRAGE	50
	550	275		352
BOMBERS				
TU-16	18	--	VAUTOUR	8
IL-28	30	--		
	48			
SAM LAUNCHERS				
SA-2/3	800	300	HAWK	75
SA-6	80	60		
SA-7	920	532		
	1,800	892		
AA GUNS				
ZU-23	450	258	20-MM	770
ZSU-23-4	300	184	40-MM	212
57MM	550	294		982
	1,300	736		

Source: Historical Evaluations and Research Organization (HERO), "The Arab-Israeli October War, 1973," Combat Data Subscription Service, Vol.2, No.2, Spring 1977, pp. 3-7.[33]

Opening Moves

On the fourth of October, the Israeli Air Force found very strong evidence of an Egyptian intent to attack during examination of film from special TAR flights along the Canal. It was evident that bridging and water crossing equipment was being positioned along the Canal.

Early on the fifth, the films were shown to the head of the IDF military intelligence, the Defense Minister and the Chief of Staff. It was decided that a higher state of alert would be enacted but mobilization was not started. The IAF was so alarmed by recent reports that it made a telephonic call-up on the fourth. This was possible because of the small number of reservists in the IAF.[34]

The decision not to mobilize had drastic effects on the IAF although it had most of its manpower ready for duty. Complete mobilization takes seventy-two hours to expand the IDF from 80,000 to 300,000 personnel. Because the Army was not mobilized, the IAF had to allocate a larger percentage of its sorties to CAS and BAI support to compensate for the lack of reserve armor and artillery that were not at the front.[35]

From intelligence data, analyzed over a two week period, a message was sent to the Chief of Staff, David Elazar, at 0400 hours on the sixth, that war was eminent and that the Syrians and Egyptians would attack at 1800 hours that evening. At 0800 hours, Defense Minister Moshe Dayan,

Elazar, and Prime Minister Golda Meir met to discuss their options. Besides total mobilization, Elazar wanted a pre-emptive strike. Dayan disagreed with a pre-emptive strike. Meir ordered a mobilization but no airstrike. Meir and Dayan worried about world opinion, especially that of the United States. Another consideration for not allowing the pre-emptive strike was that the world would now see that Israel needed the buffer area it captured in 1967, separating it from the Arab nations, for its own preservation.[36] Also, the military balance was different now than in 1967. In the Six-Day War, total IAF resources were used in the pre-emptive strike to destroy Arab planes on the ground. Now, with the new radars and missiles, a large part of the IAF had to be used for SAM suppression and planes would be lost. The effects of the 1967 airstrike would not have the same results. The IAF could not destroy the Arab air forces, control the skies with limited planes, and then turn the vast majority of their sorties to ground support. BAI sorties would now have to be flown into areas where the IAF did not have air superiority. But, Israel felt it would not take long to destroy the Arab missile belt.

Since the decision was made not to fly a pre-emptive strike, the IAF planned to launch a counter-air campaign on the morning of the seventh. Approaching darkness on the sixth at 1800 hours, the given time of the Arab attack, precluded effective counter-air strikes.[37]

The Ground War

The War began sooner than the Israeli intelligence anticipated. On the southern front, Egyptian fighter-bombers crossed the Suez Canal at 1405 hours on the sixth on their way to bomb Israeli airfields, headquarters, tank parks, reserve motor pools and supply areas. Over 2,000 guns started firing simultaneously on the Bar Lev Line. During the barrage, 8,000 troops crossed the Canal in rubber boats, bypassed the IDF strongpoints, and moved three to six miles east to set up a defensive position. Commandos were also sent east to set up ambush positions to slow the movement of reserve forces to the front. The capture of the strongpoints was left up to the second and third echelons.

By 2200 hours, the Egyptians had cut gaps in the sand wall of the Canal bank and had six bridges across the Canal. They continued rafting and bridging operations all night in support of the buildup of their defensive positions.

Within twenty-four hours, most of the strongpoints were captured and local counterattacks were beaten back. The Egyptian perimeter consisted of a large number of anti-tank guided missiles, anti-tank guns, and tanks. The Israelis, denied air support by the Arab air defense system, counterattacked with their armor. Since they were within enemy artillery range, did not advance with their infantry, and had very limited artillery of their own, their attacks caused heavy losses without breaking the Egyptian line.

The front stablized by the tenth. While Egypt was planning their next offensive action, IDF General Sharon was

scouting Canal crossing sites that he built three years prior to the War. He wanted to attack across the Canal immediately but was told to wait until more Egyptian armor crossed to the east bank which would give his attack, Operation Gazelle, a better chance of success.

The Egyptian offensive began on 14 October with an assault by 1,500 tanks. This time, the Arabs did not have their air umbrella to hide behind because it had not displaced forward. They were stopped and turned back with the loss of over 200 tanks.

Sharon was now given permission to begin Operation Gazelle. After hard fighting by Sharon's force, a bridgehead was formed. Although the Egyptians first thought the crossing was only a raid, they soon realized it was a major attempt to encircle them. They attacked the bridgehead on the west bank sending elements of two divisions south. One brigade was ambushed losing twenty-six tanks. The other armor units failed to cut off the corridor across the Canal.

The Israelis on the west bank began overrunning SAM sites which allowed for IAF support. Sharon moved to threatened Ismailia. The divisions of Generals Magan and Aden crossed through Sharon's bridgehead and turned south toward Suez City to cut off the Third Egyptian Army. Although part of the Egyptian force was cutoff, the Second Army was entrenched and the IDF could not break their hold in the Sinai. But, the Egyptians could not move forward. Even though both sides were receiving massive resupplies from the

superpowers, they were exhausted. A cease fire went into effect on 24 October.

On the northern front, the Syrians started their attack at the same time as Egypt. Their offensive started with a massive armor force supported by airstrikes and an artillery barrage. The two IDF brigades on the Golan Heights fought a series of tank battles against as much as twelve to one odds. They were pushed back to the 1967 cease fire line.

The IDF's first priority was the Golan Heights because there was little room there for withdrawal into Israel. The Sinai offered a larger area in which to fallback. The majority of mobilized reserves, supplies, and firepower was sent against the Syrians during the first days of the War. By the tenth of October, the Israelis had pushed the enemy back to their original positions. The battle cost both sides heavily. Every Israeli tank on the line on the first day of fighting was hit. The Syrians lost over 800 tanks within Israeli territory.

Now it was time for the IDF to attack. On the eleventh, a two division operation was launched toward Damascus. Both Iraqi and Jordanian units were sent to stop the advance. Although large numbers of Arab forces were destroyed, they could not stop the IDF until the fourteenth when the advance was finally halted short of Sasa. However, Damascus was in range of Israeli 175mm guns and was continually shelled. Also, on the twenty-first, the IDF was able to recapture Mount Hermon which was lost to the Syrians

on the first day of the War. The cease fire followed.[38]

Air-To-Ground Operations

Operation Badar started four hours earlier than IDF intelligence predicted. In the Sinai, Egyptian artillery fired a twenty minute preparation on the Bar Lev Line at 1405 hours to start the War. Simultaneously, a coordinated airstrike with approximately 220 Egyptian planes sought revenge for the 1967 IAF pre-emptive strike by attacking airfields at Bir Gifgafa, Bir el Thamada, Ras Nasrani, Ophira, El Arish, Akaba, and Ras Sedar. Their aim was to strip away Israeli air cover and ground support aircraft. More strikes were directed against forward command and control facilities at Tasa and Bir Gifgafa along with eight to ten Hawk air defense batteries. BAI strikes were flown against artillery batteries and reserve positions.[39] More sorties were flown against electronic monitoring and jamming stations near Om Khushaib and Om Morgan. Other air operations tried to close roads leading to the front and supply depots. The EAF admitted the loss of ten aircraft. Israel says it shot down sixteen Egyptian planes.[40]

The EAF was very well prepared for the air offensive. Many target replicas were built in Libya for rehearsals. The strikes were carried out without much opposition from the IAF or Hawk air defense batteries. Losses of Egyptian aircraft were light considering that the IAF was on full alert. Whether the inability of Israel to react to the air strikes

was due to surprise or because they were loaded for their pre-emptive strike is unknown.[41]

Because of the distance between the two fronts, the lack of artillery, and the slowness of the armor reserve, the IAF was the only possible tactical reserve that could be used to stop the attack. Because of this, the IAF had to abandon their normal policy of clearing enemy air defense systems prior to supporting ground operations. Also, pilots sacrificed the use of counter measures against the air defense systems for faster direct attacks on the crossing forces. This caused heavier losses than anticipated. Not only were the attacks flying directly into the air defense system, but the numbers, tactics, and coordinated effort of the Egyptian air defense forces caught the IAF surprised and unprepared.[42]

The IAF's F-4 Phantoms and A-4 Skyhawks were in action within twenty-six minutes from the first reports of the Egyptian crossings. Their attempts to stop the crossing were frustrated by the new comprehensive air defense system. They were forced to fly low to stay away from the SA2s and SA3s. This put them in range of the ZSU-23-4s, SA6s, and SA7s.[43] The IAF losses mounted rapidly. The ground support promised to the maneuver forces did not come close to what was requested.

The Egyptians were surprised at how easy the crossing was. They expected thousands of casualties but only had 180 dead in the first wave. The bridgehead on the west bank was

packed with vehicles and troops waiting to cross the bridges, an excellent BAI target. But, the IAF could not attack the targets without a high risk of being shot down. During the afternoon, an IDF general told his officers, "If only I had more artillery."[44] Israel was paying a high price for basing its fire support on airpower and neglecting the field artillery. Targets that were attacked by air were limited to one pass. This was not considered effective.

Field artillery was used to try to fill the airpower void. The artillery became over committed for its numbers and ammunition supplies. Due to the heavy volume of Egyptian artillery and accuracy of their counter-battery radar, Israeli artillery became heavily engaged by the Arabs. Many batteries were required to move twenty minutes after occupation of a new position or risk being targeted. Egyptian forward observers were also sent behind Israeli lines to call in fire on IDF batteries.[45] Little fire support reached the troops on the Bar Lev Line.

One of the most significant developments of the War was that the IAF did not have air supremacy as in previous wars. They could not fly ground support until the SAMs were destroyed without risking a high lose rate. Appalled by the losses, the Israeli Chief of Staff suspended all air operations just after 1600 hours. Because the urgency for ground support and a rapidly deteriorating situation, he sent the IAF back into the air about an hour latter.[46]

Although shocked by the Egyptian air defense belt and

the knowledge that their effectiveness would not be as planned, the IAF made repeated attacks on both sides of the Canal. Egyptian armor units, vehicles and troops were attacked at Port Said. Second echelon forces attacking strongpoints were attacked as were a few missile sites. Israel claims to have hit ten of the bridges across the Canal within the first twenty-four hours of the War. The IAF believe that Egypt lost thirty-seven planes downed in air battles or by Israeli anti-aircraft fire.[47]

The Egyptian Army tried to cross the Canal with twenty commando battalions to seize crossroads and passes, destroy command and control facilities, and stop reinforcements moving to the front. In effect, the commandos were trying to perform some of the same functions as BAI. Throughout the War, commando raids were substituted by the Arabs for a lack of BAI effort since the EAF was afraid to fly out of their air defense belt. Israel also used commandos to make up for a lack of BAI at night or in coordination with BAI. An Egyptian raid the first night suffered heavy casualties with loss, according to the Israelis of eight helicoptors.[48]

The major effort of the IAF the first day was in the Sinai in a BAI role. The IAF flew approximately 200 sorties before dark. They lost five A-4s and one F-4.[49]

The second day of the War began for the IAF at 0645 hours when their aircraft made a number of preparatory strikes against the missile system before coming in for

ground support missions. Due to the deteriorating situation on the Golan Heights, the mission priority of effort was directed to the northern front.[50]

At 1400 hours, in another shift of command direction, a considerable number of sorties were launched against the Suez Canal bridges. They were not easy targets because the aircraft had to approach from the west bank because of the high berm of sand on the east bank. The west bank, of course, was packed with guns and missiles. Two A-7s were shot down during these attempts to destroy the bridges.[51] Additional missions were directed in support of the Bar Lev strongpoints still holding out along the Canal.[52]

The Egyptian Air Force continued with its limited air attacks and additional helicopter raids on the seventh. At 1200 hours, the EAF claimed to have raided targets in the Sinai and attacked near Bir Gifgafa in the late afternoon. Several attacks around 1400 hours were directed against strongpoints and various targets near Baluza with forty SU-7, MIG-17s and MIG-21s.[53]

EAF attacks on ground targets continued on the eighth. Sorties were flown against targets that included air bases, Hawk batteries, radar stations, and reserve armor units moving to the front.

From the eighth through the thirteenth of October, the IAF continued significant air activity on the Sinai front. Again on the eighth, raids struck at the Egyptian bridges and damaged several. Airstrikes were started against

military targets in the Port Said area to stop attempts to send reinforcements from the north and to keep ground-to-ground missiles out of the area.[54] Also on the eighth, aircraft missions were flown in support of ground attacks in the northern sectors with about twenty-four sorties carried out around the Fridan bridge. Air-to-ground coordination was poor and some Israeli aircraft attacked their own Natke brigade.[55] On the ninth, the IAF attacked an Egyptian armor advance in the the south towards Ras Sudar, beyond the covering Egyptian air defenses. It was severely damaged by Israeli aircraft in support of the defending paratroopers. Later in the day, Israeli leadership again directed the priority of effort towards the Golan front in support of an Israeli offensive.[56]

The EAF flew limited attacks between the ninth and thirteenth. Missions they flew were low level attacks by small numbers of aircraft which remained behind the air defense umbrella.

The following is an account by an Israeli of BAI attacks in his area during the early days of the War.

> A painful event occurred that day in my sector. In a show of daring, the Egyptians dispatched planes that carried out short, low altitude sorties over our lines. Two of these planes hit a point on the Ma'adim Road where four tanks from one of Nate's battalions were reloading with ammunition; two platoon leaders were killed and crewmen were wounded. At 1400 hours two other enemy aircraft bombed a point that was some 15 kilometers east of the front line, on the Ma'adim Road. This was a working site for one of our forward ordnance companies, repairing tanks. Fuel

> tanks were there also, as well as vehicles loaded with ammunition and nearly two hundred men....The men overconfidently thought that our air force was in control of the skies and that the Egyptians would not dare send their planes into our territory. This was a serious miscalculation, and we paid dearly for it: fuel trucks caught fire, ammunition began exploding all around, and eighty of our men were wounded.[57]

On the fourteenth, the Egyptians tried to expand their bridgehead. The EAF flew support into the Sinai against forces moving to stop their advance. Deeper attacks were again directed at Hawk missile batteries and electronic jamming stations to the rear of the front lines commencing at 0615 hours.[58] This was an attempt to open corridors to let ground support sorties fly without concern of being shot down by Israeli air defense weapons. The ground support sorties began at 0620 hours with Egyptian aircraft carrying out attacks to support the divergent drives of the armored forces. These were generally brief attacks with no appreciable impact on the battlefield. The commandos were countered by Israeli paratroopers.[59]

The IAF reacted powerfully to the Egyptian offensive on the fourteenth. One Egyptian tank column penetrated twelve miles to the Mitle-Ras Sudan road where they were held up by Israeli paratroopers. Israeli aircraft attacked and severely damaged the column. Within two hours of the opening of the offensive, Israeli aircraft accounted for sixty Egyptian tanks and a large quantity of armored personnel carriers and artillery.[60] By this time replacement of

Phantoms and Skyhawks began to arrive from the United States along with resupplies of ammunition and other ordnance.

The Israeli plan to cross the Canal was feasible due to the ability of the IAF to switch their priority back to the Sinai front. The IAF vigorously supported the crossing effort as well as the battles, such as the Chinese Farm, that led up to the advance into Egypt. On the evening of the sixteenth, reinforcements arrived near the Chinese Farm including an airborne battalion brought in by helicopters. On the morning of the seventeenth, frequent air attacks were delivered against the Egyptian units of the 25th Armored Brigade which were moving north on artillery road against the Israeli corridor separating the Egyptian armies. Additional air support was delivered as the Israelis methodically pounded the Egyptian positions around and to the north of the Chinese Farm.[41] The forces on the west bank of the Canal fanned out and destroyed missile batteries creating a fifteen mile wide SAM free corridor. Israeli pilots quickly adopted new tactics. The Israeli ground attack aircraft approached very low over the Sinai, climbed to gain height in the area of airspace now cleared of surface-to-air missiles, then dove to create a wall of rocket and cannon fire for the Israeli forces around the perimeter of the bridgehead. For the first time, Israeli ground commanders could count on the IAF clearing positions well ahead of their advance. The Egyptians on the west bank again faced the classic Israeli combination of armor and airpower. Slowly, the Egyptians

were overrun or retreated as the bridgehead expanded.[42]

The withdrawal and destruction of the Egyptian missile batteries opened up the skies for the Israelis during the final days of the War. Starting on the nineteenth, armor forces, advancing south to encircle the Egyptian Third Army, received the best air support of the War. The airfield of Fayid fell affording the Israelis an important airhead that was used for resupply.[43]

For the rest of the War on the Sinai front, the IAF enjoyed almost complete air superiority which again allowed them to support the ground forces without the losses they had experienced during the first days of the War. The rapid gains and light losses associated with the final offensive drives of the Army highlighted a professional display of combined arms tactics much like that of 1967.[44]

A period of Egyptian air inactivity followed until the Israeli attacks across the Canal. Major efforts by the Egyptians were mounted against the IDF forces during the battle of the Chinese Farm on the sixteenth and then in the battle to stop Israeli advances into Egypt from the seventeenth through the nineteenth. On the seventeenth, the EAF attacked the Israeli Canal crossings sites and pontoon barges ferrying tanks across the Canal. In the most concentrated attack so far, rockets and bombs hit one of the ferries making it inoperable. The attacks on the crossing sites came in waves. Each wave was made up of jets and helicopters attempting to bomb the bridges and ferries. By

the last attack, late on the afternoon of the eighteenth, despite crippling losses, damage was inflicted upon the bridge.[64]

On the nineteenth, because of the serious threat posed by the Israeli bridgehead, the Egyptian Supreme Command committed most of the air reserve to the fight. As in previous days, the EAF attacked in waves with SU-7 and MIG-17 fighter-bombers protected from above by MIG-21 Fighters.[65] Throughout the 19-24 October period, large numbers of fighters attempted to interfere with the ground support being flown by the IAF. Air defense efforts by the Egyptian forces did interfere with this support to some extent, but Egyptian air-to-air losses were severe.[66]

On the northern front, the Syrian Air Force started the War exactly like the Egyptians, with a large coordinated air strike. Almost one hundred Syrian planes took part in the initial attacks which were directed at Israeli command posts, observation posts, artillery positions, armor track parks, and fortifications. Principal targets were the observation positions on Mount Hermon and the command and control headquarters at Naffak. The main purpose of the strikes was to delay and disrupt IDF attempts to get their forces to the front before the massive Syrian armor attack could overrun the IDF positions. The SU-7 and MIG-17 fighter-bombers came in very low while MIG-21 fighters provided cover from IAF fighters. Some of these aircraft tried to penetrate into the Huleh Valley but were reportedly

driven off by Israeli Hawk fire.[47] Israeli interceptors interfered with these initial strikes very little.

The necessity to conduct simultaneous air combat operations on the Golan front, while combat raged in the Sinai, caused heavy additional demands on the IAF. On a number of occasions these critical demands were met by shifting the emphasis of air operations from one front to another. This did not mean that a particular front was stripped of aircraft, but rather a prioritization of sorties available went to the front with the most fighting. Because of the initial ground gained by the Syrians and the lack of terrain in which to defend, the Israeli priority after the confusion and surprise of the sixth was initially directed toward Syria.

On the Golan Heights, Israeli reaction to the Syrian advance mirrored that in the Sinai. Like the southern front, initial airstrikes flew into the SA6 and intense anti-aircraft artillery fire. Ground losses rose quickly during the suspension of airstrikes. Upon their renewal the Israeli aircraft adopted the tactic of a low altitude, high speed approach to the north over Jordanian territory with a quick pop-up over the Golan plateau to strike the Syrian armor from the flank and curve away west of Mount Hermon. This was partially successful and air losses were reduced.

Due to the all night advance of the Syrian armor, the situation was again critical on the morning of the seventh. The airborne pounding began at dawn with successive waves of

Phantoms and Shyhawks streaking across the Heights firing rockets, cannons, and dropping bombs against the Syrian columns. The missiles and dense anti-aircraft fire wreaked havoc. For example, in the area of Juheder, an Israeli battalion commander asked for air support at first light. As the sun rose, four Skyhawks penetrated to bomb the Syrians, but as they approached their targets the tell tale smoke trails of the SAMs were seen. All four planes exploded in the air in full view of the hard pressed troops of the battalion. Undeterred, a second flight of four attacked and two exploded.[48] The intermingling of forces made identification of ground targets difficult and CAS impossible. At the same time additional strikes were directed specifically at Syrian air defenses. By 1500 hours, the Syrian thrust was halted but with heavy aircraft losses. Attempts by Syrian fignters to support their ground forces on the seventh had little effect on the battle since the IAF had air superiority in areas outside the Syrian air defense screen.

The extremely heavy Israeli air attacks during the first few days of the War were not only directed at the Syrian ground penetrations, but also at the SAM batteries and supporting anti-aircraft artillery positions themselves. Initially, the air defense forces were very successful against the Israeli attacks, extracting a high toll of Israeli aircraft. As was the case with the Egyptians, when the Syrian ground forces attacked outside their air defense

umbrella, the level of protection fell.[69]

On the eighth of October, Israeli Phantoms raided the Omer, Halhul, Nasseriya, and Seikal air bases around Damascus while intensive efforts continued against the Syrian ground forces on the Golan.

The Israelis executed a counter offensive from the ninth to the thirteenth. In preparation for the offensive, the Air Force attempted to clear the area north of Hushnizal of SAM batteries. The Israelis concentrated their efforts into one of the heaviest raids against the Syrian air defense barrier. Ninety-five aircraft attacked and by the end of the day heavy smoke was observed over fifteen batteries.[70] In addition, on the ninth and tenth, a series of deep strikes penetrated into Syria. In one raid six Phantoms appeared over Damascus and bombed a half dozen buildings including the Ministry of Defense, Syrian Air Force headquarters, a radio station, the city's power station, and, by accident, foreign embassies. Other raids struck oil storage tanks and electric power generators at Homs. The fuel tanks and loading facilities at Adra, Tartous, and Lalakia were bombed as well as the Mediterranean terminal for Iraqi crude oil at Baniyas. Additionally, raids destroyed the computerized control center for the Syrian air defense network, and two Phantoms attacked the radar station on the 7000 foot high Barouch Ridge in Lebanon.[71] On the tenth, Israeli aircraft stuck deep into Syria again aiming at airbases including those at Habeb and Damir. These attacks on airbases continued on the eleventh

as did more strikes against other economic targets.[72] Large air battles occurred during the strikes and also during the Israeli ground support missions which experienced less and less interference from Syrian ground based air defenses. The purpose of these raids deep into Syria was to cause strategic destruction and force the Syrians to redistribute their air defense assets. This diluted their defenses on the Golan Heights allowing more freedom of action for IAF ground support.

Although the IAF pilots ruled the skies in areas outside the Syrian air defense network, the Syrian Air Force kept sending out sorties to stop the Israeli attack. Though they suffured heavy casualties, they were successful.[73]

Starting on the thirteenth, faced with stiffening Syrian ground resistance, intervention of other Arab forces, and Sinai front priorities, the battle line stabilized. Israeli air efforts continued to interdict supplies, provided by the Soviets, as they were being transported to the front.

The Israelis combined commando raids with BAI as a means of interdicting Syrian lines of advance. One example of this occurred on 13 October when an Iraqi division size unit, moving to the front, was trapped on a road ten kilometers behind the front lines by Israeli paratroopers. The Israelis blew up a bridge to the front of the advance and useing 106mm recoilless rifle fire, hit the rear vehicles trapping the convoy of the road. With the vehicles unable to move, the IAF attacked and destroyed the entire convoy.[74]

A second example of an ingenious use of BAI occured during the recapture on Mount Hermon during the last days of the War. Paratroopers were lifted by helicopter with fighter planes covering them while other aircraft conducted a raid on Damascus to further divert the Syrian Air Force. The airmobile operation started at 1400 hours on the twenty-first of October. The Syrians soon discovered that the attempt to recapture Mount Hermon was taking place. They rushed reinforcements to their defensive positions. The IAF anticipated that the Syrian reinforcements would use the road east of Mount Hermon. When the Syrian vehicles started moving along the road to the front, the IAF was waiting for them and destroyed the attempt to reinforce the defenders of Mount Hermon by road. The Syrians responded with fighters and counterattacking airmobile assaults. Again, the IAF anticipated the Syrian plans. The airmobile assault was neutralized when the Israelis destroyed six escorting Syrian fighters and three infantry laden helicopters.[73]

The stablization of the front lines during the last days of the War allowed the Syrians and Iraqis to provide air support for their counterattacks. These attacks were uncoordinated and resulted in Iraqi aircraft attacking Syrian positions and Syrian aircraft mistaking the Jordanians for Israelis. Also, throughout the War, Syrian air defense batteries shot and hit Arab planes numerous times.[74]

Use of Battlefield Air Interdiction

On the second day of the War, American military analysts reported that the IAF's two main objectives were to first isolate the Egyptian bridgehead east of the Suez Canal by systematically attacking the bridging equipment to prevent reinforcement of the strong Egyptian force that crossed on the sixth, and by establishing local control of the air over the bridgehead to prevent helicopters or transport aircraft from reinforcing the enemy divisions. The second objective was the liquidation of the Egyptian and Syrian surface-to-air missile sites. The analysts said the role of the SAMs was to shield advancing ground forces against IAF attacks and, "equally important, provide cover for the support forces on the lines of communication."[77]

American analysts recognized that the key to the use of the IAF was in isolating the FEBA from the enemy follow on forces and supplies. These reinforcements and badly needed supplies could be brought into the area by helicopter, transport aircraft, or across the bridges and roads. No matter how they attempted to get to the front, it was the Air Forces job to keep them away. They knew that this would alter the pace of the attack and give Israel time to mobilize and set up a defense. The mission these analysts discribed was battlefield air interdiction.

The Israelis do not use the term battlefield air interdiction. They refer to CAS and interdiction interchangeably when speaking of BAI type missions. They also consider SAM suppression a part of ground support

missions. However, during the War, over 90% of all missions rated as CAS, were flown at least five kilometers behind the FEBA and had no positive control measures that are normally used in CAS missions.[78] The majority of the sorties flown during the War were actually BAI as described earlier in this chapter. MG Binyamin Peled, Chief of Staff of the IAF during the War stated:

> All the other operations of the Air Force that were loosely called close support were never really close support; they were a combination of information put through ground forces channels to Air Force planners and decision makers, with the autonomous capability of the Air Force to overfly the battlefield, find the enemy, report its position, ask for an immediate decision and start picking them off the ground.[79]

The IAF studied air-to-ground doctrine from World War II and Vietnam. They reached the conclusion that the doctrine of air-to-ground operations, laid down by Lord Tedder in the campaigns of North Africa and the experiences of the U.S. Air Force, were correct for those times and circumstances. The 1973 War proved to the IAF that the old method using CAS did not work and should only be used in an emergency. They believed that the missile denied the capability of the pilot to fly over the battlefield, contact the ground commander, and then try to find and attack the target. Furthermore, this new threat meant that the pilot could not be completely dependent on the information provided by the ground commander. The fact that the ground commander cannot see much above his normal horizon makes him limited as

a source of information. The pilot needed more than a rough idea of where the enemy was, the location of friendly troops, and the topography. He needed a complete lay out of the air defense systems that would interfere with his bomb run and a detailed briefing on geographical features he could use to hide behind prior to the bomb run. This information had to be given to him by Air Force sources.[80]

These ideas were not new nor isolated to Israel. United States General William W. Momyer, former Commander of the Seventh Air Force in southeast Asia, and later Commander of Tactical Air Command, made the following statement five months prior to the start of the 1973 War:

> Close air support in another war will be far more demanding than what it was in Vietnam and probably World War II....Thus, close air support will, in all probability, have to be conducted in the face of enemy air opposition. In addition, the enemy can be expected to have large numbers of anti-aircraft weapons and surface-to-air missiles. It will be necessary to conduct electronic warfare to neutralize the radars that control these missiles and to conduct direct air attacks to destroy them. Close air support in such a scenario is a different way of life than what our forces saw in Vietnam.[81]

It must be remembered that the U.S. Air Force did not use the term battlefield air interdiction during the time of General Momyer's statement. None the less, it was evident that the use of ground support was going to have to change.

The Israelis also believed that CAS was a wasted asset. It supported only a localized situation where the enemy was already dispersed. It also took too long for the

fighter-bombers to attack each individual target once they had been deployed. The results were small gains in small items.[82]

The IAF concluded that CAS was not the best use of planes in the ground support role. MG Peled said, "The place to get them [the enemy] is where they are concentrated."[83] The idea was to hit the enemy prior to deployment of their forces into attack formation. The destruction of the Iraqi division, related earlier, was caused by an attack while moving to the battlefield. It is an example of how the IAF decided to use their air-to-ground assets.

The Chief of Staff of the IDF, LTG David Elazar, agreed with MG Peled that CAS was not used in the classical way nor would it be used in that role under the same air defense conditions. He said:

> I see the Air Force's main role in the support of ground forces in interdiction...to achieve destruction of the enemy's military infrastructure, cause havoc among troop movements and, in one word, to paralyze the enemy forces. Even before 1973, I considered the subject of close air support the last priority task of the Air Force. I always believed that ground forces, secure from the enemy's air activity, should defeat enemy ground forces unaided. The October War reconfirmed my belief that close air support is costly in casualties, and that there is no positive ratio between relatively great losses and limited results.[84]

In an interview at the international symposium on military aspects of the Israeli-Arab conflict, MG Peled gave three examples of the most important uses of air-to-ground

support during the War. All of them were BAI missions.

His first example was the effort needed to keep the major supply and reinforcement route between Gaza and the Suez Canal closed to three enemy brigades. He felt that if the Egyptians could have gotten this route open, they would have started a major offensive in that area. Airpower cut the road needed to resupply and reinforce the offensive. Another example MG Peled gave was the isolation of the Egyptian Third Army from reinforcements or supplies. He believes that all the bridges were destroyed and although four were rebuilt, they could only be used at night. By attacking the roads leading to the Canal, the lodgemont area near the bridges and the bridges themselves, the Air Force helped strangle the Egyptian forces already across. His final example was on the Golan Heights. He believes that airpower should not be measured by the number of tanks that the IAF destroyed but by the fact that the Syrians were turned back along the two main routes through the Golan Heights at 0530 hours on 7 October and did not advance along those routes the rest of the War. Between 0530 hours and 1030 hours, there were no ground forces along those routes. Only the IAF was used to defend them.[85]

There are other reasons, besides the air defense network of the Arabs, that had a major impact on the IAF decision to change the majority of their missions from CAS to BAI. Neither General Elazor nor Peled admitted these reasons publicly. First, unlike the U.S., the Israelis used Army

forward observers to call for and adjust CAS. Prior to the 1973 War, these observers received little realistic training. The majority of them were reservist. During the mobilization, for some unexplained reason, many of the observers went to the wrong locations and did not deploy with their normal units. It was several days before this situation was corrected.[86]

Another problem the observers had was trying to talk to pilots from the ground. The Arabs had a good jamming ability which caused trouble in adjusting the aircraft and may have been responsible for IAF planes attacking their own ground forces.[87]

Finally, there was a problem getting intelligence of the area to the pilots who were flying into it. TAR flights were flown but their intelligence was four to six hours old by the time it was processed. The mobility of the SA6 and ZSU-23-4s prevented pilots, going to support a unit, from knowing what defenses they would have to contend with.[88]

Egyptian use of BAI is harder to define because little information has been printed of the use of the EAF during the War. It was used primarily during the first day of the War, during the crossing of the Canal by the IDF in an attempt to destroy the pontoon bridges as forces moved to them.[89] Most of the War, the EAF stayed in the rear to prevent deep interdiction raids. This was due to the realization that the IAF was far superior in flying ability and in recognition of a lack of a workable identification

system by the Egyptian air defense network. Several planes were shot down by their own ground forces. It is estimated that eighty to ninety percent of the Arab sorties were air defense sorties over their own territory.[70]

These same problems kept the Syrian Air Forces ground support to a minimum. They too were successful with their BAI missions the first few hours of the War. Unlike the EAF, the Syrians continued to try to support their ground troops. This effort was soon greatly reduced because of the IAF's high kill ratio of Syrian planes and the Syrian air defense system's inability to distinguish friend from foe. Also, when the IAF started their deep interdiction campaign, the Syrians kept back planes to protect the home territory. Like the Egyptians, eighty to ninety percent of Syrian sorties were dedicated to home defense.[71]

TABLE II

Israeli BAI Sortie Rates

Total number of sorties flown - 11,233.

Sorties for air cover, deep interdiction, air defense - 3,961.

Air-to-ground (CAS and BAI) sorties, Golan - 1,830.

Air-to-ground (CAS and BAI) sorties, Sinai - 5,442

Total air-to-ground sorties - 7,272.

BAI sorties, Golan - 1647.

BAI sorties, Sinai - 4898.

Total BAI sorties - 6545.

Total CAS sorties - 700

Percentage of total sorties flown that were BAI - 58%.

--All numbers are approximately what was flown. Several versions of actual sorties flown have been published.[72]

--Although a total number of AI sorties cannot be found, it is estimated to less than 200. The raids on or near Damascus were the only major AI campaign.

Factors Affecting BAI

Air Defense Systems

The influence of the extensive Arab air defense network was over emphasized during and shortly after the war. It was suggested that the air would now be controlled from the ground. It is true that serious losses were inflicted on the IAF by the Arab defense system. But, initial estimates were somewhat exaggerated. In many ways, these air defense weapons were operated under very favorable conditions. The heavy Egyptian concentration was deployed prior to hostilities and under the supervision of Soviet technical experts and instructors.[73]

It also must be remembered that the initial attacks by the IAF were not in accordance with doctrine. Because of the incomplete mobilization, the Air Force was tasked to stop the advancing forces on two fronts and keep reinforcements from strengthening enemy positions. To complete this mission, until ground forces could get to the front, the doctrine of destroying enemy air defense systems prior to ground attacks had to be abandoned. Israeli planes attacked ground targets knowing they were extremely vulnerable.

The IAF also flew against a new weapons system, the SA6. This mobile launcher, working with the ZSU-23-4 anti-aircraft gun, was unknown to Israeli pilots. But, like most new weapons systems, there was an antidote to nullify or at least reduce the effectiveness of this system. When

electronic counter measures (ECM) or flying tactics could not be used, ground forces attacked across the Canal with the mission of destroying the SAM sites.

However, the technological surprise achieved by the Arab forces greatly reduced the effectiveness of the IAF, at least during the early stages of the War. The air defense network challenged the air supremacy that Israel traditionally enjoyed. Not only did they inflict heavy losses, they limited the IAF's airpower the freedom of battlefield air interdiction and almost put a complete halt to close air support. In addition, the IAF required ground forces to aid in the suppression of missile air defenses along the Canal.

In summary, the IAF was denied air supremacy not by Arab air forces but by anti-aircraft ground defenses. However, the Arab success was temporary, indicating that they could be countered one way or another.[74] General Peled argues that the War, rather than demonstrating the superiority of missiles over aircraft, proved that the trend is aircraft over air defense systems.[75]

Electronic Warfare

Electronic countermeasures (ECM) played a major role in the 1973 War. General Hod, former commander of the IAF said, "An ounce of ECM is worth a pound of additional aircraft, in the presence of dense, sophisticated air defense."[76]

A vulnerability of the Arab air defense system was its heavy reliance on electronic radars for early detection, tracking, and targeting of Israeli planes. In many cases, these radars could be neutralized by active ECM. Israel knew what an important force multiplier the control of the electronmagnetic spectrum was. Both sides used extensive and advanced ECM and electronic counter-countermeasures (ECCM). When a radar or communications facility was disrupted or jammed, the air defense and command and control networks became ineffective. Radars, command and control headquarters and electronic sensing devices were the target of interception, interdiction, deception and jamming. The suppression of the Arab air defense network featured the use of direction finding, massive jamming, and radar homing missiles."[7]

In the first few days of the War, the IAF determined that their equipment, used during the War of Attrition, was inadequate in quantity and quality to counter the new Arab systems and tactics. The SA6, SA7, and ZSU-23-4 presented a wider range of frequencies, greater operational capabilities, and previously unsuspecting operational modes. Other problem areas encountered were employment concepts, a lack of knowledge of the threat, poor planning and unfamiliarity with their own countermeasures equipment. Most of the shortcomings were worked out in the first few days of the War. The initial loss rates for the first three days of combat were more than three times those of the remaining days

of the conflict."[8]

Israel soon received ECM help from the United States. This included 200 ECM pods and chaff which consisted of thin metal strips that were dropped to appear as aircraft on Arab radar. Advanced U.S. ECMs were able to counter the improved SA2s and SA3s but American technical experts could not devise a counter for the SA6 or ZSU-23-4. Most of the SA6s had to be destroyed by ground artillery fire, by hitting their antennas, or by being captured by maneuver units."[9]

Command and Control

The command and control of the three forces was markedly different. This had a definite effect on the use of airpower by each side.

Israel displayed flexibility and adaptability in their command structure. The IAF operated in small units while flying in combat but were organized into large units on the ground to reduce maintenance and organizational cost. In order to operate with a large unit that would break into smaller units, they used a centralized control system that could delegate authority for a short time to lower echelons but regain centralized control when needed, according to changing situations and priorities. This was demonstrated during the War when the IAF changed major front priorities from the Sinai on six October, to the Golan Heights from seven to thirteen October, and back to the Sinai from fourteen to twenty-four October. This clearly demonstrated both the flexibility of airpower and the IAF effectiveness in

controlling such transfers. During the War, the changing tactical situations were quickly accommodated by reapportioning the sorties to BAI, deep interdiction, SAM suppression or to what ever was needed to execute the mission.[100]

The Arab air forces recognized that they were no match in air-to-air combat with the IAF. They decided to maintain a defensive posture for the most part. Their commands emphasized the air defense mission and the need to keep Israel from flying deep interdiction missions. The air forces were centrally controlled but had little flexibility to meet changing requirements. A large number of planes were sent out on specific missions and were normally unable to change from the plan. When large casualties occured with these formations, smaller units of one or two aircraft were sent out that was an unfamiliar tactic to the pilots. Several planes were downed because they followed a single predictable plan no matter what the situation. An example was such as the attacks on the Israeli bridges near the end of the War. The formation of separate air defense commands simplified the command problems, but hampered coordination with the air defense missile command. Both Syria and Egypt admit to shooting down some of their own aircraft. The Syrians shot down several Iraqi planes because of improper use of the identification, friend or foe (IFF) system. The Egyptians used the air defense tactic of rapidly switching the entire air defense network, or selected parts of it, on

and off. This method was used very selectively. The preferred method of protection from the IAF was the air defense missile barrier itself. The missile system was usually left on and EAF pilots had to attempt to fly through it to return to their oases.[101]

Weapons and Targets

Both air forces used the normal air-to-ground conventional munitions. There was only limited use of napalm. The IAF did not strafe in large amounts except for 30mm cannon fire against armor. And the IAF used a limited number of electro-optical smart munitions. In general, the IAF used general purpose bombs against interdiction targets, Cluster Bomb Units (CBUs) were used, when available, against deployed formations of light armor. Smart munitions or 30mm cannon were used against armor. The Arabs used mostly strafing, unguided rockets, and general purpose bombs. The MIG-17 carries a 37mm cannon and was considered effective against tracked vehicles.[102]

The electro-optical munitions sent in limited quantities to the IAF by the U.S. were very effective. The Maverick TV guided air-to-ground missile was used in the closing days of the War and was proven successful against tanks. The Israelis were also resupplied with two electro-optical glide bombs, the Rockwell International homing bomb system (HOBOS) and the Martin Marietta Walleye 1 as well as the Northrop target identification system electro-optical (TISEO).[103]

The effectiveness of the air forces were not as great as expected. This was due in a large part to the inaccuracy inherent in the aircraft as it had to fly low, and fast, and take evasive maneuvers while in the air defense belt.

The IAF claimed to have hit every bridge the Egyptians put across the Canal but this did not stop the flow of troops and supplies. Hundreds of Egyptian sorties were flown against Israeli bridges across the Suez during the final days of the War with the same unsatisfactory results. Neither side could interdict reinforcing troops and supplies by concentrating effort against bridges. There was a high price paid even to get an aircraft to the bridges because numerous air defense systems were usually deployed around it. The accuracy of the ordnance was usually poor because the pilot flew low, fast, and tried to evade anti-aircraft fire. Even if the bridge was hit and damaged, it was usually built in sections which could easily be replaced. Bridges were not an effective BAI target during the War.

Another myth that was illustrated during the War was the use of airpower to kill tanks. There seems to be no scientific evidence to qualify the effectiveness of IAF or Arab airpower in the anti-armor role. Most disabled vehicles, inspected by Israeli ordnance analysts after the War, had received multiple hits so it was not possible to decide what weapons system had made the kill. On the Golan, by accepting heavy casualties in order to play a part in reversing the Syrian armor attack, the IAF certainly had some

effect. But, a German tank officer who visited the scene in early November 1973 estimated that eighty percent of Syrian tank losses could be directly attributed to Israeli tank fire where as only twenty percent were destroyed by effects of artillery or air force. This small number of tank losses is compared to the ten to fourteen percent sortie loss rate during the same battle.[104]

Studies of the 1967 War demonstrated that aircraft flying at high speeds and using conventional unguided weapons had limited effect against armor. This lack of effectiveness was greatly increased during the 1973 War when the pilots used unguided general purpose bombs, rockets, and aircraft guns against tanks in an intense anti-air defense environment. It was not until the Arab air defense belt started breaking up and the IAF began using smart munitions that tanks were killed at an acceptable sortie/tank ratio.[105]

Summary

The 1973 Middle East war was primarily a ground action. Israeli airpower did not significantly affect the overall outcome of the land campaigns as it did in 1967.[106] However, the IAF and Arab air forces were heavily committed and, at times, played an important part in specific battles. Because of the extensive integrated Arab air defense system, the IAF did not dominate the battle on the ground as it did during the Six-Day War in 1967.

The reasons for the IAF failure to control the

battlefield as it had six years prior are found in a study of the years between the wars. It started with the Soviet Union increasing support to the Arab countries. The Egyptians first tried to regain their lost territory back during the War of Attrition. When this failed, the Soviets resupplied them, as well as Syria, with the most extensive air defense network outside the Soviet Union. This event changed the balance of airpower in the Middle East. The IAF no longer ruled the skies nor would they be able to give their ground troops the support to which they had become accustomed.

Based on the experience of the Six-Day War and the years leading to the 1973 War, the IAF based its operations plans on the following assumptions:

1. Israel would have at least twenty-four hours notice of an attack.

2. All forces would mobilized and deployed prior to the start of hostilities.

3. Israeli offensive actions would be immediately decisive.

4. Loss of equipment would not be significant and would be comparable to that of the Six-Day War.

5. The "fog of War" would have minimum affect on Israel because of their pre-war planning.[107]

The first priority of the IAF was to defend Israel, to support the ground forces by keeping Arab planes away from them, and by supporting their maneuver plan with fire support. Israeli fighters, antiaircraft artillery, or

missiles contested most Arab air attacks, destroying scores of planes. However, Israeli fighter-bombers were unable to provide effective support for ground units until the Arab air defense network was suppressed.[108]

Israeli aircraft, attacking near the FEBA on both the Sinai and Golan fronts, suffered heavy casualties the first few days. The IAF was forced to abandon their normal tactics of air suppression first, because of the massive attacks by the Arabs. MG Peled said, "Instead of carrying out air defense suppression operations in an orderly manner, we rightly preferred to break them up into small operations and try to do them in the periods in between other things more important at the time."[109]

Losses were heavy and until the mobilization could be completed, the IAF was the only effective military force available. Attacking the Syrian armor, protected by the mobile SA6 and SA7 missiles with the interlocking fires of selfpropelled ZSU-23-4 anti-aircraft guns, proved extremely costly. Approximately thirty-five aircraft were shot down during the afternoon of the sixth.[110]

The major Arab offensive was based on massive attacks of infantry and armor. The primary role of the Arab air forces was to defend their home territory from the IAF. They started the War with a large number of air strikes to slow Israeli reaction to the invasion. Air-to-ground operations were then limited due to the high losses in air-to-air combat with Israeli pilots. The Egyptians made a massive attempt to

stop the IDF Canal crossings by bombing the bridges and reinforcements. The Egyptians fought eighteen battles over the bridgehead. In the last week of the War, the Egyptians flew more than 2,500 sorties trying to destroy the bridges and troop concentrations.[111] Again, the IAF destroyed the Egyptian fighter-bombers.

The Arabs generally left defense of their FEBA to their anti-aircraft missile and artillery systems rather than applying fighter cover. Very little information is available on the total sorties flown during the War. Semi-official figures in Arab publications, state that 6,815 Egyptian sorties were flown during the War. The smaller Syrian Air Force and other Arab air forces logged fewer than half the number flown by the Egyptian Air Force. Therefore, it can be estimated that during the War, Arab sorties totaled between 9,000 and 10,000. Approximately half of these were flown for defensive operations while the rest were CAS, BAI, or deep interdiction.[112]

During the War, the IAF fought with its full range of air-to-ground weapons. Most frequently, general purpose bombs were carried by strike aircraft. Cluster bomb units (CBUs) were dropped on SAM sites, convoys, and large area targets. Shrike anti-radiation missiles were frequently fired at SAM radars. Even napalm and unguided rockets were used against ground forces.[113]

Late in the War, the U.S. supplied Israel with a variety of smart munitions including Maverick television

camera guided missiles and laser guided bombs. These weapons proved very effective. Although introduced only in the final days of the war, the Maverick missile allegedly destroyed between thirty and fifty Arab vehicles, and bunkers.[114]

The IAF has not officially released any reports on the strike tactics it evolved while attempting to circumvent and destroy the intense Arab air defenses. It is known that Israeli planes attacked SA6 batteries from high angle dives. They struck other targets inside the Arab defenses at low level and then popped up to release bombs while evading SAMs.[115]

The Israeli Air Force achieved major results in four areas. First, the IAF successfully defended all air space outside the Arab missile system. Israel claims that only five Arab air strikes penetrated the Israeli front lines. Second, they played a major role in stopping the massive Syrian tank attack that penetrated almost all of the 1967 occupied territory and was nearing the Jordan River. For the first two days of the War, the IAF was the major effective force opposing the 1,000 tank Syrian armored thrust. Third, they defeated the Syrian SAM network protecting the armored ground forces in a bitter battle that destroyed fifty percent of the batteries and helped force the remainder to pull back to fixed positions near Damascus. Finally, a significant portion of the Syrian war economy was destroyed through deep interdiction strikes or BAI while supplies were moving to the front.[116]

Trying to determine losses on either side is a difficult task because of the wide range of estimates. For instance, the IAF claims that only four of their aircraft were shot down in air-to-air combat. But, the commander of an Egyptian MIG-21 fighter regiment told an Aviation Week & Space Technology writer that his three squadrons had accounted for twenty-two gun-camera confirmed air-to-air kills during the War and had the film to prove it.[117]

MG Peled stated that altogether Israel lost 115 aircraft (including helicopters): four fighters in air combat, another one shot down accidentally by an Israeli fighter, ten by accidents or unknown causes, forty-eight by SAMs, and fifty-two by anti-aircraft fire. Peled added that overall, Israel lost one aircraft per one hundred sorties - a figure that compared quite favorable with the loss rate in the 1967 War of four per one hundred sorties.[118]

U.S. intelligence sources estimated that Arab missiles and antiaircraft artillery claimed eighty percent of the Israeli aircraft shot down, air combat ten percent, and ten percent of unknown causes. According to the same sources, 242 Egyptian aircraft, 179 Syrian aircraft, and twenty-one Iraqi aircraft were destroyed by all causes.[119]

While both sides suffered heavy losses, the Soviet Union and later the United States brought in massive amounts of equipment. Soviet transports flew 934 round trips to Egypt and Syria carrying missiles, ammunition, crated aircraft, and other materiel. In addition, an extensive

sealift operation supplied an unknown quantity.[120]

U.S. Air Force C-5 and C-141 cargo planes flew 566 round trips to Israel, totaling 22,395 tons. Israeli El Al cargo aircraft carried a further 5,500 tons, and American sealift operation delivered an additional unknown amount. Israel received more than eighty A-4 Skyhawks, forty-eight F-4E Phantoms, a dozen C-130 transports, and a number of helicopters.[121]

Studying how the IDF changed after the War is useful in determining what lessons were learned from it. The pro-Israeli magazine Defence Update commented, "Probably one of the most important lessons the IDF learned from the October war was the unreliability of its air support . The Air Force, aware of its limitations, advocted the acquisition of combat helicopters, especially for tank-killing."[122] During the Lebanon invasion of 1982, the IAF did use helicopters instead of fighter-bombers as the primary air-to-ground tank killer. Military commanders reported a high degree of success using helicopters in an anti-armor role. They reported that sixty percent of the tanks and light armor vehicles were destroyed by helicopter gunships.[123] To compensate for the loss of CAS to the front line troops, the IDF increased their artillery from the end of the 1973 War to the 1982 invasion by 219 percent and made most of it mobile.[124] Although the IAF stayed away from the CAS mission in Lebanon, they learned the usefulness of BAI in 1973 and again used it successfully in 1982. Chaim Herzog

report, "The Israeli Air Force was successful in interdiction and in preventing reinforcements from reaching the battlefield, as when a brigade of the Syrian 3rd Armoured Division was caught in a narrow defile and badly mauled."[125] From these statements it can be concluded that the IAF has turned the CAS mission over to the artillery and attack helicopters. Also, they are stressing BAI instead of CAS as the main use of ground support aircraft.

The War changed the way air forces will fly in the future, if faced with the same type of air defense network. No longer will the air force be able to supply close air support in the numbers and accuracy that IDF ground forces expected since the 1967 War and that American troops had available in Vietnam. The Arab air defense network, a lack of intelligence, and poor command and control forced the IAF to fly few CAS missions and use more BAI. It was then that they found that BAI was more effective against ground troops because the pilots were attacking the reinforcements and supplies while moving to the front, before they could disperse. Damage to the enemy was more widespread. The front forces became cut off and could then be handled by the IDF ground forces. Numerous vehicles on both Arab fronts were abandoned because they ran out of gas. The resupply trucks could not get to the front. Battlefield air interdiction was responsible for isolating the first echelons and destroying reinforcements and resupplies.

The main lessons learned about air power in the

ground support role during the 1973 War are now quite evident. In a high intensity air defense environment, close air support is too costly. Interdicting the enemy prior to his deployment on the battlefield is the most affective method of attacking him from the air. Also, suppression of the enemy air defense is necessary to have an effective air-to-ground operation. The SEAD program is not just an air force task but must be a joint service obligation.

CHAPTER 4

NOTES

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9. Jimmy H. Church and Robert T. Osterthaler, "The Battle for Air Superiority During the '73 Arab-Israeli War," Paper. USMC Command and Staff College, 1983, p. 34.

10. Committee on Armed Services, Report of the Special Subcommittee on the Middle East (Washington: GPO, 1973), p. 6.

The IAF Commander, MG Peled, said that the EAF lessons from the 1967 War were the need for adequate surveillance systems

to identify incoming aircraft and how effective a counter-air strike can be on unprotected and non-dispersed aircraft.

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By May, 1970, at the height of the airwar of the War of Attrition, only thirty-two Phantoms had arrived in Israel. F-4s and what was left of the Mirages flew against the MIG-21s which had the same speed but a much shorter range.

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48. Nicolle, p. 242.

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50. Schiff, October Earthquake, p. 78.

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CHAPTER 5

CONCLUSIONS

Before drawing conclusions about the affects of the battlefield air interdiction campaign of the 1973 Middle East War, several other matters should be addressed. The historical lessons are more valuable if they can be interpreted in a contemporary setting. Therefore, this chapter includes the following:

1. The differences between the Middle East theater and that of NATO. These differences are contrasts of:
    a. Terrain
    b. Human habitation
    c. Weather
    d. Distance
    e. Arab and Soviet tactics.
2. The changes in technology which have occured since 1973 and the implications of these new systems on the airwar.
3. Conclusions made from the study in relation to the future use of the air-to-ground mission.

The NATO Environment

A comparison of Central Europe to the Middle East is necessary because the differences between the theaters impact

on the BAI mission. Geographically, the rolling hills, trees, fog and dwellings in Central Europe combine to greatly reduce the range at which tanks and similar vehicles can be acquired by pilots. The vehicles can easily blend into the countryside. Of course, the terrain features also serve to channel the threat forces, making routes of advance somewhat more predictable and deployment into battle formation harder. Terrain features also serve to impede lateral movement across the battlefield as well as to cause greater reliance to be placed upon existing road and rail networks. In contrast to the broad open Sinai, much of European terrain dictates less ground maneuver and closer engagement ranges than those of the 1973 War. A pilot will have a harder time acquiring a target and less time to aim or direct a shot because of the vegetation and hills. But target planners will have an easier time establishing where and when specific threat units will be. BAI targets will be easier to attack because the second echelon threat will stay on the roads and, if attacked, may have a harder time deploying due to the terrain and urbanization. If the enemy is already deployed into an attack formation, the pilot will have a harder time finding the target.[1]

The manmade obstacles and urbanization are another terrain difference. There is greater opportunity for the BAI pilot to slow the enemy by attacking the numerous choke points in the villages of Europe. The road network is much more established throughout Europe but there are many more

bridges and tunnels that have been built through, over, or around water obstacles and mountains. Although it was evident from the 1973 War that bridges are not good targets to attack, they can be attacked prior to the enemy getting to them. Also, because of the numerous obstacles, a very significant portion of the enemy's transportation resources will be needed to carry bridging equipment.

Flying time to the FEBA is another important difference between the IAF's environment and that of NATO forces. In most cases, the Israelis were only a few minutes flying time from the front. They were able to carry more ordnance and loiter longer than NATO pilots can. The IAF also had shorter turn around times and were closer to maintenance facilities. Some NATO missions originate from England. Although forward basing is used, higher level maintenance for many aircraft is still done in England.[2]

Another major difference between the Middle East and Europe is the flying weather. During the 1973 War, weather was not a factor in reducing flying time. This is not the case in Europe. When asked about European weather, General Charles A. Gabriel, U.S. Air Forces in Europe and Commander, Allied Air Forces Central Europe stated that due to the ceiling and visibility during eighty percent of the winter, the only plane that can do a credible job is the F-111.[3]

Not only will the weather ground many aircraft, the low ceiling and haze will affect standoff weapons such as the Maverick. Weather needed for an Imaging-Infrared (IIR)

Maverick (AGM-65D) to obtain target detection at six kilometers, five degrees elevation and launch at four kilometers is only present about fifty-five percent of the time during the winter months.[4]

Comparing Arab and Soviet Forces

The capabilities displayed by the Arab countries in the 1973 War did not necessarily reflect the Soviet strengths and weaknesses at that time. The Arabs received a tremendous amount of new equipment between 1967 and 1973. The Arabs' lack of technical sophistication and language problems both with instructors and in manuals, limited the proficiency of the operators. In addition, neither the equipment nor the employment of assets were representative of what the Soviets could do. Therefore, it is incorrect to make the assumption that the airwar of 1973 was strictly comparable to a U.S.-Soviet conflict.

The Soviets declined to provide the Arab air forces with the newest Soviet aircraft. Had they provided the newest generation of fighter bombers the Egyptians might have been more effective in their attempt to stop the IDF from crossing the Canal. Also, because the Arabs did not have a significant medium bomber threat, the IAF could use a larger portion of their sorties for offensive air support rather than keeping a sizable force back for air defense of their cities.

Although the Arab emphasis on SAM's and anti-aircraft guns does reflect a strong Russian influence, both the

equipment and employment of the Arabs differed significantly from that of the Soviets. The Arab countries were not provided the full range of complementary SAM systems which makes the Soviet air defense system so hard to penetrate. If the Arabs had had operational long range high altitude SA4s, their SA3s and SA6s would have been less vulnerable to attack. Besides the range, the Arabs lacked the density of assets which makes the Soviet defense so formidable. The lack of density of SAM's on the Sinai front enabled the Israelis to ultimately achieve air superiority over the Egyptian Third Army. Conversely, the Israelis never gained a high degree of air superiority over the Golan Heights where the density of SAM's was higher for much of the War.[8]

The limitations on equipment was compounded by the Arabs refusal to totally employ Soviet doctrine. The SA6 and ZSU-23-4 are highly mobile systems that were developed to stay as close to the FEBA as possible. Their mobility makes them well suited for offensive operations because they can keep up with mechanized and armor forces. The Egyptians, however, did not aggressively echelon these weapons across the Canal after the units had established defensive positions. Because of this, the systems were not utilized to their full potential in the Sinai. Egyptian attacks did not have the air defense support needed and were defeated when ever they ventured out of the protective air defense umbrella.

In conclusion, although the Arab countries used Soviet equipment and were trained by Russians, it would not be accurate to believe that their performance was a good indication of Soviet capabilities in 1973. Flying against the Arabs was probably the best trained and most experience air force in the world. It was certainly equipped with more sophisticated and modern technical equipment than its enemy.

Technical Changes

There have been many changes to the East-West weapons systems that were used during the 1973 War. As better aircraft have been developed, so have better surface-to-air missiles, as well as ECMs to jam the SAMs. Other developments also have had a considerable impact on the conduct of air operations.

Three developments would seem to have the potential to bring dramatic changes to the conduct of air warfare. These are the use of airborne early warning and control systems, drones, and stand-off weapons.

The use of airborne early warning and control systems has emerged since the 1973 War. They are highly sophisticated airborne platforms with extensive radar and electronic equipment. They can look over the horizon to identify targets and direct friendly forces to intercept them. The U.S. Air Force's version known as the Airborne Warning and Control System (AWACS) is in an E-3A aircraft which is air refuelable. The Navy has its own version to detect not only aircraft but also ships and submarines.

These systems are used to control friendly assets by identifying targets and directing their destruction. The airborne system can also be used with ground air defense units. The U.S. will be fielding the Adaptable Surface Interface Terminal (ASIT) which will allow direct link between AWACS and an air defense battalion.* This system is a major force multiplier because of its ability to look out beyond ground radars, track multiple targets at the same time, determine target data, and direct aircraft or SAMs to interdict the threat.

Drones and remotely piloted vehicles (RPVs) are pilotless aircraft used for reconnaissance, target acquisition, deception, and targeting. A drone flies a preprogrammed course, sometimes with onboard navigation equipment for correction of inflight deviations. The RPV is controlled from the ground using radio or onboard television cameras. RPVs can be jammed but drones cannot. The advantages of these types of aircraft is obvious. They cost less than a plane, are almost impossible to shoot down, and pilots are not wasted.

The primary mission of drones is reconnaissance. The electronic sensors on board are light and reusable. The drone flys slow and low, and because of its size, it is hard to detect even on radar.

Target acquisition is another mission for the pilotless aircraft. The artillery can have direct link with the RPV to give instant target identification. The U.S. RPV

was first tested with the artillery as the main proponet. Due to the lengthy loiter time, the RPV can stay over the battlefield to give corrections to air or ground units attacking a target and then give bomb damage assessment (BDA).

Drones and RPVs also have combat roles. They can carry electronic gear to simulate a larger aircraft or groups of aircraft. Acting as decoys, they can spearhead strike missions by detecting enemy radar and allowing piloted aircraft using antiradiation missiles to attack enemy air defense systems.[7]

The U.S. RPV flys with a laser device for targeting. Its TV picture is transmitted to the controller who can find a target and mark it with a laser. The target is then attacked with an artillery round or air-to-ground missile which uses the laser to home in on the target. A secondary mission for RPVs is to identify and mark a target for destruction. An example is using it to find and mark a target while another aircraft fires a precision missile and leaves the area before being detected or within range of air defense weapons.

There is little distinction between powered air-to-surface missiles and electro-optically controlled bombs and glide bombs which rely on kinetic energy to reach the target once released. Guidance systems include radio and wire command guidance, laser homing and various optical applications such as TV and imaging infrared. These

munitions allow the pilot to attack a target from a distance without having to fly over it.

Another advantage is that one precision munition from one sortie can destroy a target that many sorties would have to attack with conventional munitions. Precision guided munitions, although used in Vietnam and at the end of the 1973 War by the IAF, did not have great impact due to their limited employment. If the IAF had had access to air delivered precision guided munitions at the start of the War, they could have hit the bridges without taking heavy casualties. The same case can be made with the extremely high loss rate suffered by the Egyptians when they tried to destroy the Israeli bridges at the end of the War with conventional munitions.

The most prolific of the precision weapons is the Maverick. It possesses a range of guidance techniques and a hard target or a blast fragmentation warhead. Initially, the Maverick was developed using a TV guidance system. There are now 19,000 of this model, the AGM-65A, in the USAF inventory. The "B" model has significant scene magnification allowing a longer range of small targets. There are approximately 7,000AGM-65Bs in the inventory. The AGM-65C uses a laser system. An air or ground laser marks the target for the missile to home in on. This is good in a close support role to kill tanks now that the Army ground observers have laser designators. The AGM-65D is imaging infrared controlled and can function in darkness or smoke against camouflaged

targets.

There are some problems with precision munitions. All but the very latest and most advanced have a hard time finding a target during times of limited visibility. They can lock on to a different target than the one selected by the pilot, for example, a burning vehicle near the designated target.

The Bekaa Valley

The 1982 Israeli invasion of southern Lebanon, Operation "Peace for Galilee," has been portrayed by many analysts as evidence of the complete domination of the new air weapons systems over air defense. Indeed the IAF used the new systems to their full advantage.

On June 9, the IDF attacked north against Palastine Liberation Organization (PLO) and Syrian positions. The invasion itself started on 6 June. At 1400 hours, The IAF, working in concert with the field artillery, attacked the Syrian defense system in the Bekaa Valley. The Syrian defenses were formidable. They included fifteen SA6, two SA3, and two SA2 missile batteries with some 2[illegible] missiles ready to launch and supporting anti-aircraft guns. These were concentrated in the valley and along the Syrian border. The IAF had been working on a plan to destroy the Syrian air defenses since the end of the 1973 War. The plan successfully incorporated the use of the newest technical equipment available.

Using artillery, surface-to-surface missiles, EW

jamming and deception, the IAF was able to knock out ten of the nineteen SAM batteries within the first ten minutes of their first air attack. Before the attack was over, the IAF claims to have destroyed seventeen batteries and damaged two others without losing an aircraft.[10]

The Syrians counter-attacked by sending up sixty MIG-21 and MIG-23 fighters to drive the IAF off. But, the Israelis had stripped away the ground control devices used by the Syrian pilots and had an airborne early warning plane to vector them to attack headings to intercept the Syrians. In other words, the Syrians were flying blind while the IAF was aware of where the Syrians were and the best way to attack them. In one of the largest dogfights since World War II, the Syrians lost twenty-nine aircraft while the IAF says it did not lose a single plane.[11]

The Syrians rushed in additional missile batteries into Lebanon to reconstitute an effective air defense umbrella. The IAF destroyed them as fast as they were deployed and swept Syrian interceptors from the air. By 12 June, Syria had lost eighty planes in air combat without an Israeli loss. The IAF did lose one plane to ground fire.[12] According to U.S. sources, a total of twenty-three SAM batteries were destroyed.[13]

There are two major reasons for the success of the IAF. First, the Israelis were able to change their tactics to take advantage of the new weapons systems and command and control devices. Second, the Syrians were inefficient. The

Israelis used RPV's for over a year to gain reconnaissance information on the Syrian SAM batteries. They knew the location of every site. The tactics employed to destroy the Syrian air defense system were much like those used by the U.S. Air Force in Vietnam but with innovations. Jamming and deception were extensive using RPV's, drones, and manned aircraft. The unmanned aircraft were able to get the Syrians to turn on their radars which opened them up for jamming or destruction by anti-radiation missiles. While this was happening, artillery was destroying any batteries within range. The aircraft flying SAM suppression flew against a diluted network and knew the location of each battery that it was to destroy.[14]

The majority of the blame for the destruction on the Syrian air defense system has to lie with the Syrians themselves. They did not employ Soviet air defense tactics. Once positioned in the Bekaa Valley, most of the batteries failed to move again or dig in to improve their chances of survivability. Also, many radars were activated to track the unmanned aircraft that the Israelis flew at them. This gave away their position and frequency. The lack of dummy emitters and decoy SAM batteries reduced radar longevity.[15]

The Battle of the Bekaa Valley is important to the use of battlefield air interdiction for several reasons. First, it shows the capabilities of systems that have become available since the 1973 War. It demonstrates how air defense networks can be overcome to allow for air-to-ground

support missions. Finally, it shows the importance of tactics keeping pace with technology. However, too much emphasis is sometimes placed on this battle. Although the IAF totally destroyed the Syrian Air Force and air defense system, it must be remembered that the major reasons for their defeat were errors made by the Syrians themselves and not just the superiority of the new technology used by the IAF. The Soviets will probably not make the same mistakes as the Syrians.

Conclusions

The most startling aspect of the 1973 War was the curtailment of Israeli air supremacy. In 1967, the roads were cluttered with burned out Arab vehicles that had been attacked by the IAF. After 1967, Israel thought their airpower would continue to make up for a lack of manpower and weapons systems. Their Air Force received the vast majority of defense funding and other support. The Israeli General Staff failed to plan for the contingency of not having control of the skys and not being able to use their "flying artillery" to stop ground attacks.

However, the Egyptians and, to a lesser degree, the Syrians, learned a lot from the 1967 War. They planned to correct their weaknesses, limit Israeli strengths, and take advantage of Israeli shortcomings. The Arab's pre-1973 years were a time of planning new strategy and tactics, testing them during the War of Attrition, and then refining their plans and re-arming themselves for the 1973 War.

When the 1973 War started, the IAF had, in order, three main missions: the air defense of Israeli territory and the battlefield, interdiction of the enemy supply, reinforcement, and transportation system in order to paralyze his forces, and close air support of the ground forces.[14] The IAF was successful in its first mission of air defense. Arab aircraft and missiles did not have an impact on the mobilization, deployment, or ground operations of the IDF. Arab planes were unable to penetrate into Israeli airspace. Israeli aircraft were also able to interdict the Arab forces, destroying an Iraqi division before it engaged Israeli ground forces. In Egypt, where approximately a hundred SAM sites were deployed in rear areas and another sixty batteries were deployed near the Canal, Israeli aircraft penetrated and attacked targets of importance. This had the effect of forcing the Arab air forces to allot eighty to ninety percent of their sorties to air defense. But, even when these successes are accepted, no question exists that the Arab air defense system succeeded in certain cases in neutralizing one of the better air forces in the world.

The Arab air defense system was the most extensive in the world outside of the Soviet Union. The Arabs knew that this system had to be able to deny the IAF the airspace over the Arab maneuver forces. Without it the Arab forces would be destroyed from the air as they had been in 1967. The system was a complex network of fully integrated SA2, SA3, and SA6, missiles along with the ZSU-23-4 anti-aircraft gun.

The shoulder fired SA7, also sometimes mounted on a vehicle, was also used. The Arabs knew their pilots and planes were not a match for the Israelis so they were kept to the rear for air defense. If airpower was taken from Israel, the Arabs believed their ground units could defeat the IDF or at least win a large enough victory to gain a political settlement that would return their lost territory to them.

The use of SAMs by the enemy seriously affected the IAF's mission in at least two ways. First, it forced the diversion of aircraft into suppression missions so that they were not available for other activities. This did not change Israeli doctrine, which still gives the Air Force an initial role against air defenses, including missiles. The Israelis felt that a main objective of the Air Force is to destroy as many enemy ground forces as it can. It must be able to act independently against the air defenses of enemy ground units. Although they accept that their own ground forces can act in support of aircraft by placing artillery against enemy missile batteries, the need for the Air Force to act quickly and in places out of range of the weapons of Israeli ground units, makes it impossible for the Air Force to give up the suppression mission.

A second way in which the Arab air defense network affected the Air Force's mission was to make ground support more difficult and CAS almost impossible. This, of course, was a big change from the 1967 War. In ideal conditions of no enemy opposition and complete freedom to overfly and

reconnoiter the battlefield almost completely safe from meaningful air defense systems, the IAF was a very important weapons system.

Since the 1973 War, the Israelis object to the old procedures of close air support for the following reasons. First, CAS is no longer possible because the introduction of the missile now prohibits the pilot from loitering over the battlefield to acquaint himself with the terrain and the flow of battle before launching an attack. The IAF has concluded that CAS is not the best way of using airpower because with the enemy already dispersed, it is difficult for the Air Force to select and attack targets. The time to attack the enemy is when he is concentrated, before he has deployed. The Iraqi division was destroyed while moving to the battle, not on the FEBA. Also, CAS is costly and often there is no positive correlation between great losses and results. Finally, ground forces, if secure from enemy air activity, should be able to defeat enemy forces unaided. Nonetheless, in spite of these arguments, both Israeli ground and air commanders agree that some situations will demand close air support.

The air defense missile has also changed the nature of intelligence required by the Air Force. Intelligence must be far more detailed and topographical, concerned with things like lines of sight for missile defenses. The ground commander, who cannot see above the horizon, and is too busy with his own problems, cannot supply this type of

information. Therefore, the IAF believes that the format, speed, and clarity of their information about the situation on the ground, particularly in the combat zone, should be the responsibility of the Air Force.[17]

Another lesson that the IAF has drawn from the War is the need to restructure its command and control system. Because the IAF cannot afford the quantity of aircraft that would permit the establishment of separate commands for each type of mission, it needs a command and control system that permits centralized control, delegation of that control for short periods, and the reestablishment of central control, when needed. Only in this way can they use the same aircraft in different roles.[18]

The new technology developed since the War would appear to have profound effect on the airwar. Especially if only the Bekaa Valley is examined. But countermeasures and counter-tactics are also being developed. Bekaa Valley was a great IAF success but so was the pre-emptive strike of 1967. The stand-off weapon, such as the Maverick, will mean that fewer sorties will be needed to destroy a point target but it is still limited by range of the system and its control device. Also, there are anti-aircraft missiles that can fire out to the range of the aircraft thus nullifying part of its advantage. Other problem areas or counter-devices will effect the performance of the technology developed since the War that was mentioned earlier in this chapter.

The success of the Arab air defense umbrella is

interpreted by many to demonstrate that air superiority will no longer have a significant effect on the ground support battle. It is argued that given more time, electronic countermeasures would have reduced the effectiveness of the SAM's. But countermeasures lead to counter-countermeasures and it is impossible to predict if attack or defense is likely to be more successful. It should be remembered that the reason the air defense umbrella was not fully effective against the IAF operating over the west bank of the Canal was that Israeli ground forces had neutralized many of the SAM batteries.

The future of the combat aircraft is still unsettled. But from the 1973 War, it is obvious that although it still is a powerful weapons system, it is no longer supreme in a sophisticated air defense environment. For that reason, the U.S. Air Force's doctrine and the Army's expectations for close air support could result in a costly waste of resources. It was proven in the 1973 War that battlefield air interdiction was less costly and more effective to the overall defense plan of Israel.

Based on this study, it can be concluded that:

1. Close air support is not the best use of air assets in a high density air defense environment.
2. Battlefield air interdiction is more effective to the operational ground commander than close air support.
3. Localized control of air defense systems is needed to allow the use of air-to-ground assets.

4. Suppression of enemy air defense systems is a joint service responsibility.

Areas for Further Study

This study has raised additional issues and areas that lend themselves to additional in depth research. Suggested topics are as follows:

1. The most effective command and control system needed to exercise the ground support mission.
2. The establishment of a joint element at corps and higher headquarters whose sole mission is joint attack of enemy air defense.
3. A priority classification system for BAI targets.
4. The use of Army forward air controllers.

CHAPTER 5

NOTES

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APPENDICES

APPENDIX 1

ABBREVIATIONS

ACC	Air Component Commander
ADA	Air Defense Artillery
AI	Air Interdiction
AWACS	Airborne Warning and Control System
BAI	Battlefield Air Interdiction
BCE	Battlefield Coordination Element
CAS	Close Air Support
EAF	Egyptian Air Force
EW	Electronic Warfare
FLOT	Forward Line of Own Troops
FSCL	Fire Support Coordination Line
IAF	Israeli Air Force
IDF	Israeli Defense Force
JFC	Joint Force Commander
LCC	Land Component Commander
SAF	Syrian Air Force
SAM	Surface-to-air Missile
SEAD	Suppression of Enemy Air Defenses
TAR	Tactical Air Reconnaissance
USACGSC	U.S. Army Command and General Staff College

APPENDIX 2

DEFINITION OF TERMS

1. Air Interdiction--Air operations conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear effectively against friendly forces, at such distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required.

2. Allocation--The translation by the tactical air control center of the apportionment decision into total numbers of sorties by aircraft type available for each operation or task.

3. Apportionment--The determination and assignment of the total expected effort by percentage and/or geographic areas for a given period of time.

4. Battlefield Air Inderdiction(BAI)--Air action against hostile surface targets which are in a position to directly affect friendly forces and which requires joint planning and coordination. While BAI requires coordination in joint planning, continuous coordination may not be required during the execution stage.

5. Battlefield Coordination Element(BCE)--A land component

commander liaison element which is collocated with the requests for tactical air support, monitors and interprets the land battle situation for the TACC, and provides the necessary interface for the exchange of current intelligence and operational data.

6. Close Air Support(CAS)--Air support of surface operations by attacking hostile targets in close proximity to friendly surface forces and that requires detailed integration of each air mission with the fire and movement of those forces.

7. Counter Air--Air operations conducted to attain and maintain a desired degree of air superiority by the destruction or neutralization of enemy forces.

8. Forward Edge of the Battlefield(FEBA)--The forward limit of the main battle area(MBA).

9. Fire Support Coordination Line(FSCL)--A line established by a ground commander to facilitate the rapid execution of fires by surface to surface or to air to surface means. It is usually well forward of the FEBA.

10. Forward Line of Own Troops (FLOT)--A line which indicates the most forward positions of friendly forces in any kind of military operation at a specific time.

11. Second Echelon--Enemy ground military formations not directly engaged in the battle at the FLOT and positioned behind the forces in contact as a reserve force, a Soviet-style second echelon, an operational maneuver group, or a follow-on force.

12. Sortie--One aircraft making one takeoff and one landing.

An operational flight by one aircraft.

13. Suppression of Enemy Air Defenses(SEAD)--That activity that neutralizes, destroys, or temporarily degrades enemy air defense systems in specific area by physical attack and/or electronic warfare to enable tactical air operations to be successfully conducted.

14. Tactical Air Control Center(TACC)--The principle air operations installation from which all aircraft and air warning functions of tactical air operations are controlled.

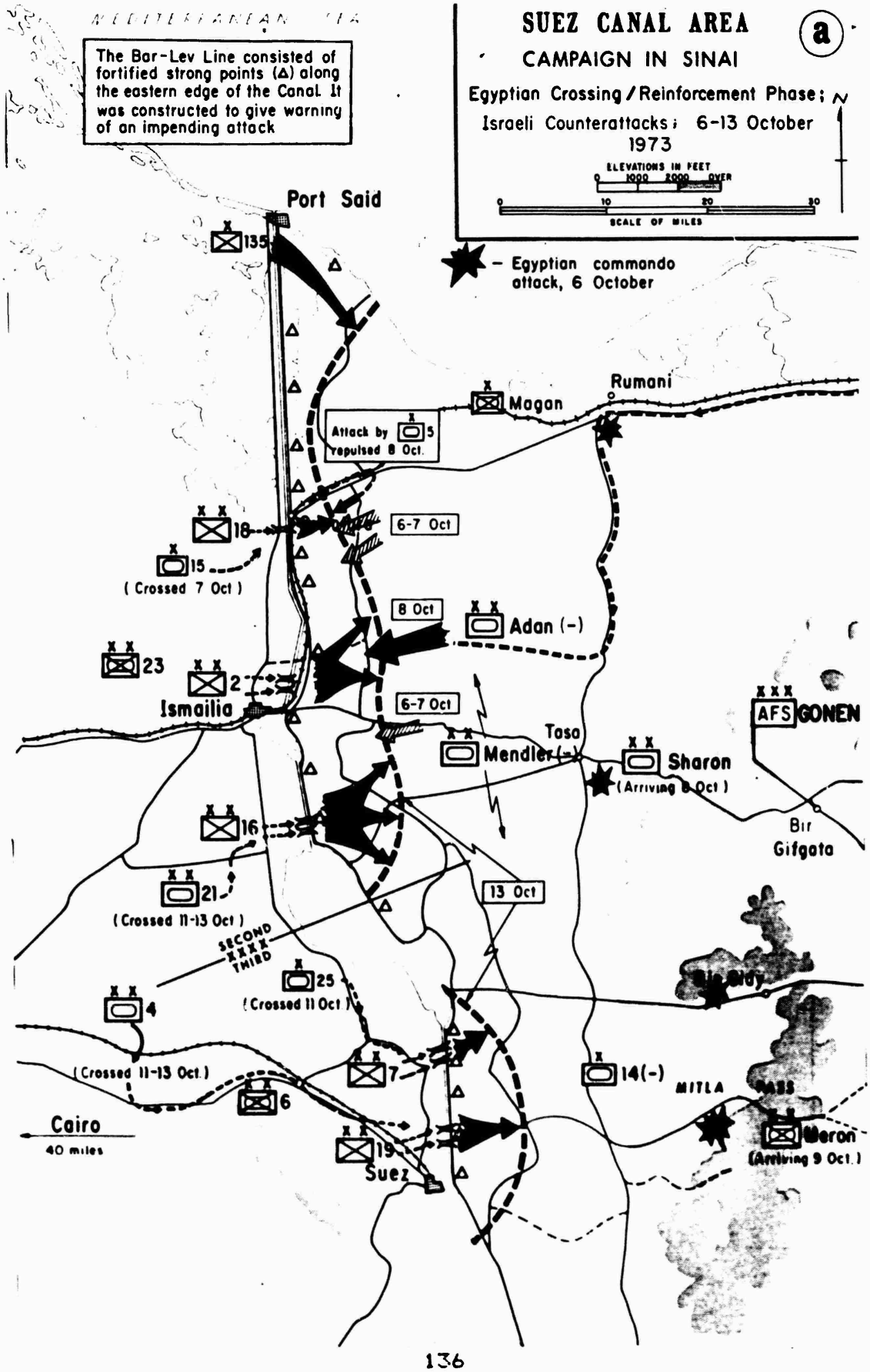
Source: FM 101-5-1, Operational Terms and Symbols (Final Draft), 1985.

APPENDIX 3

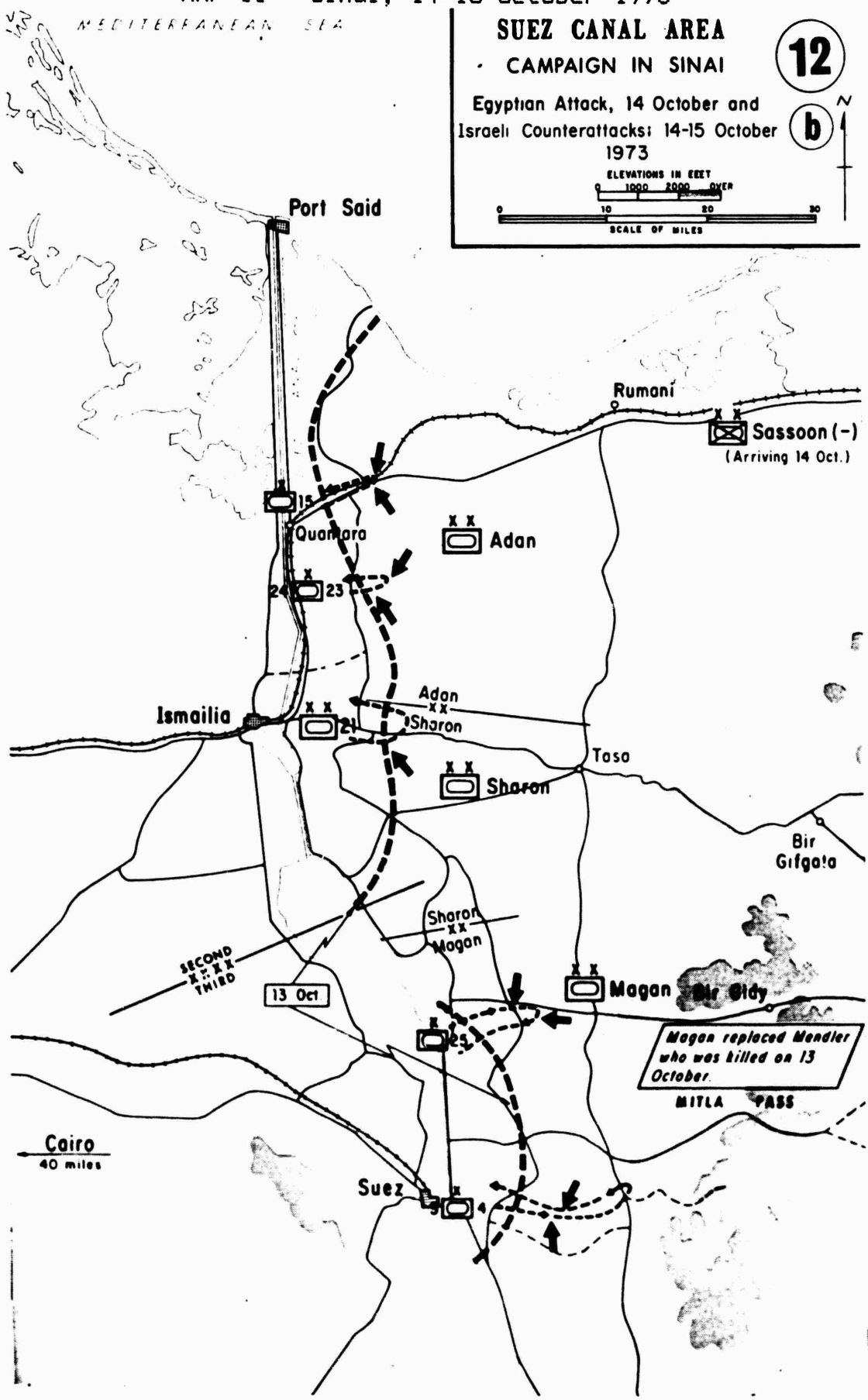
MAPS

Source: Department of History, Selected Readings in Warfare Since 1945, West Point, N.Y.: USMA, 1981.

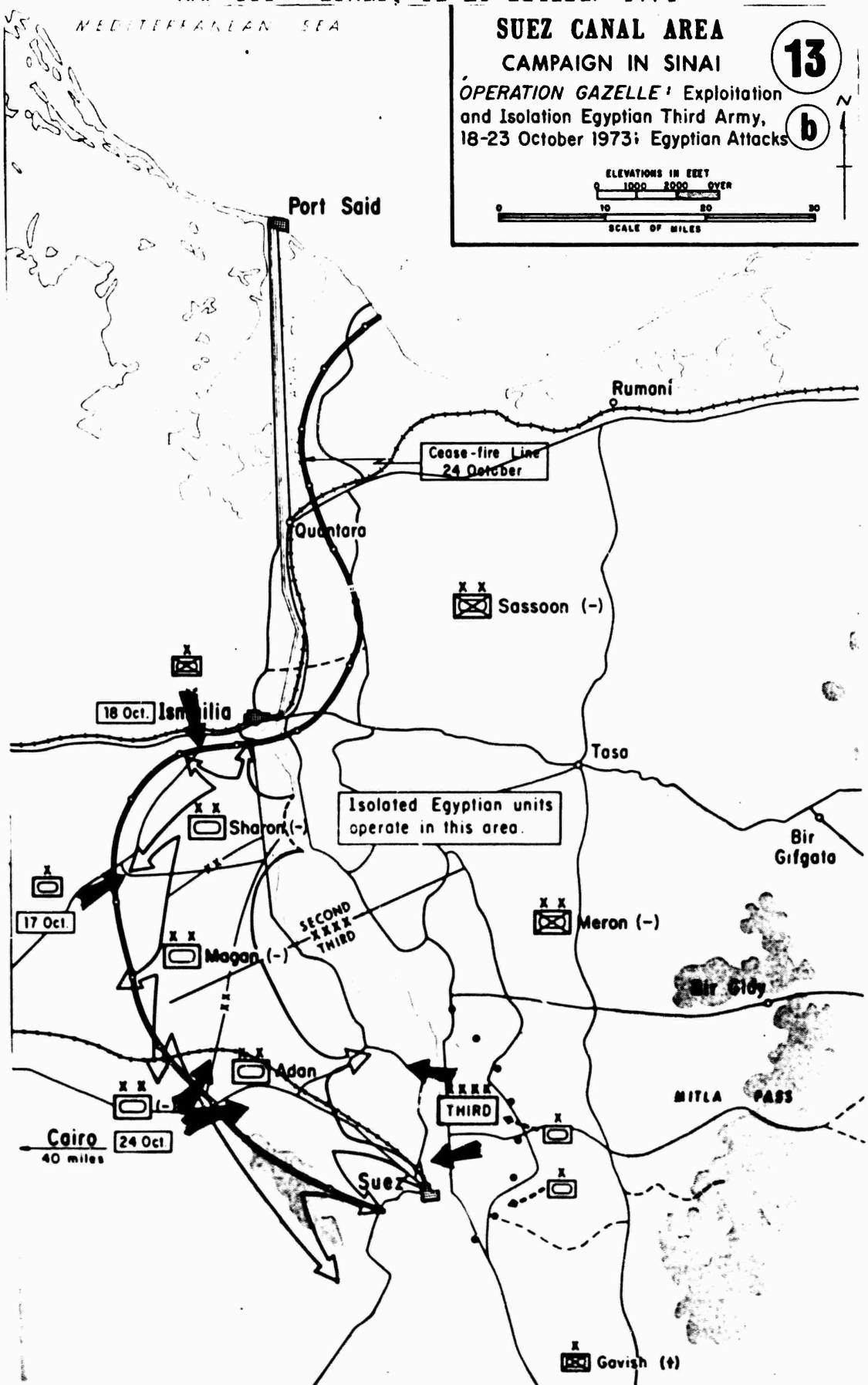
MAP I - Sinai, 6-13 October 1973



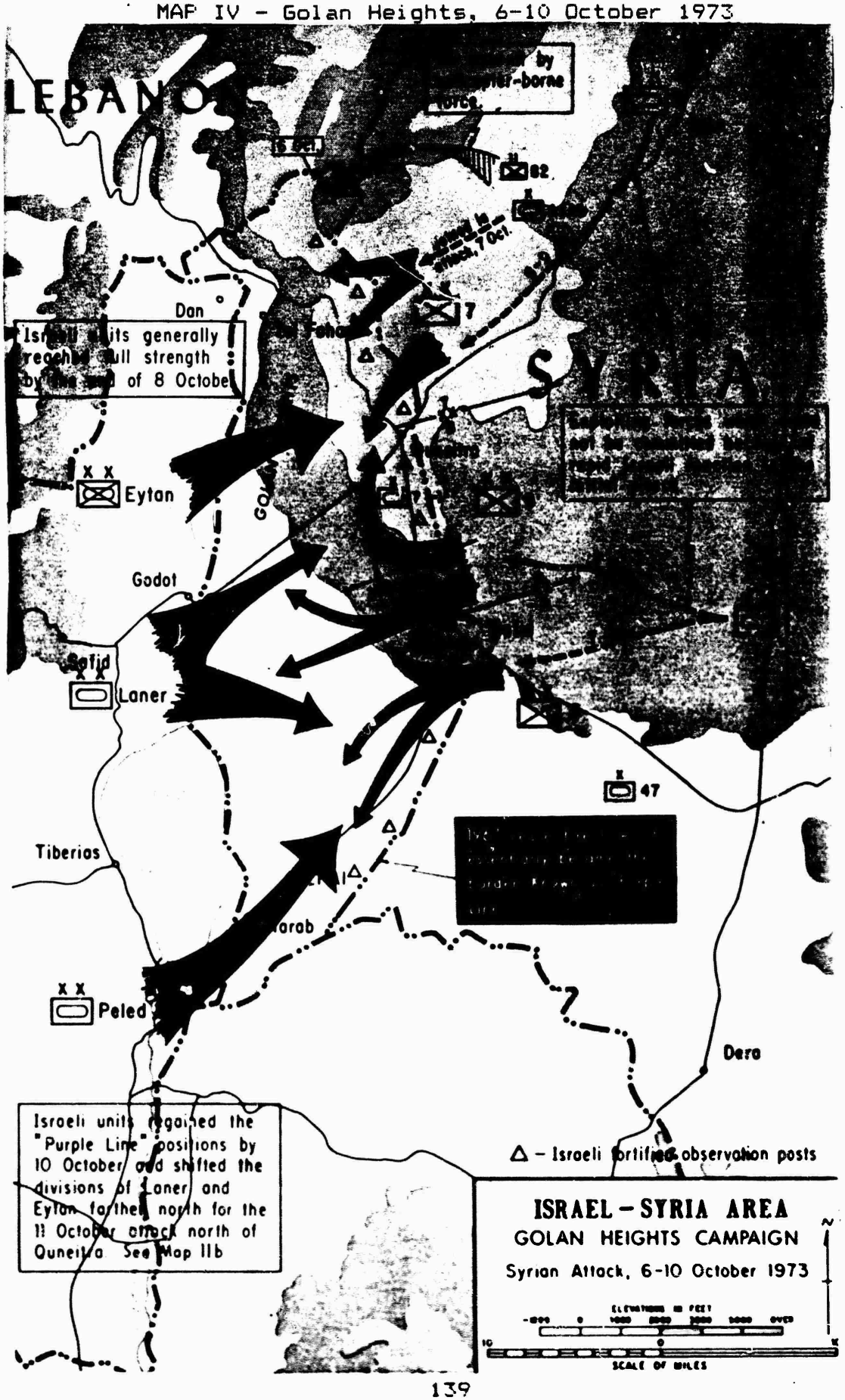
MAP II - Sinai, 14-15 October 1973



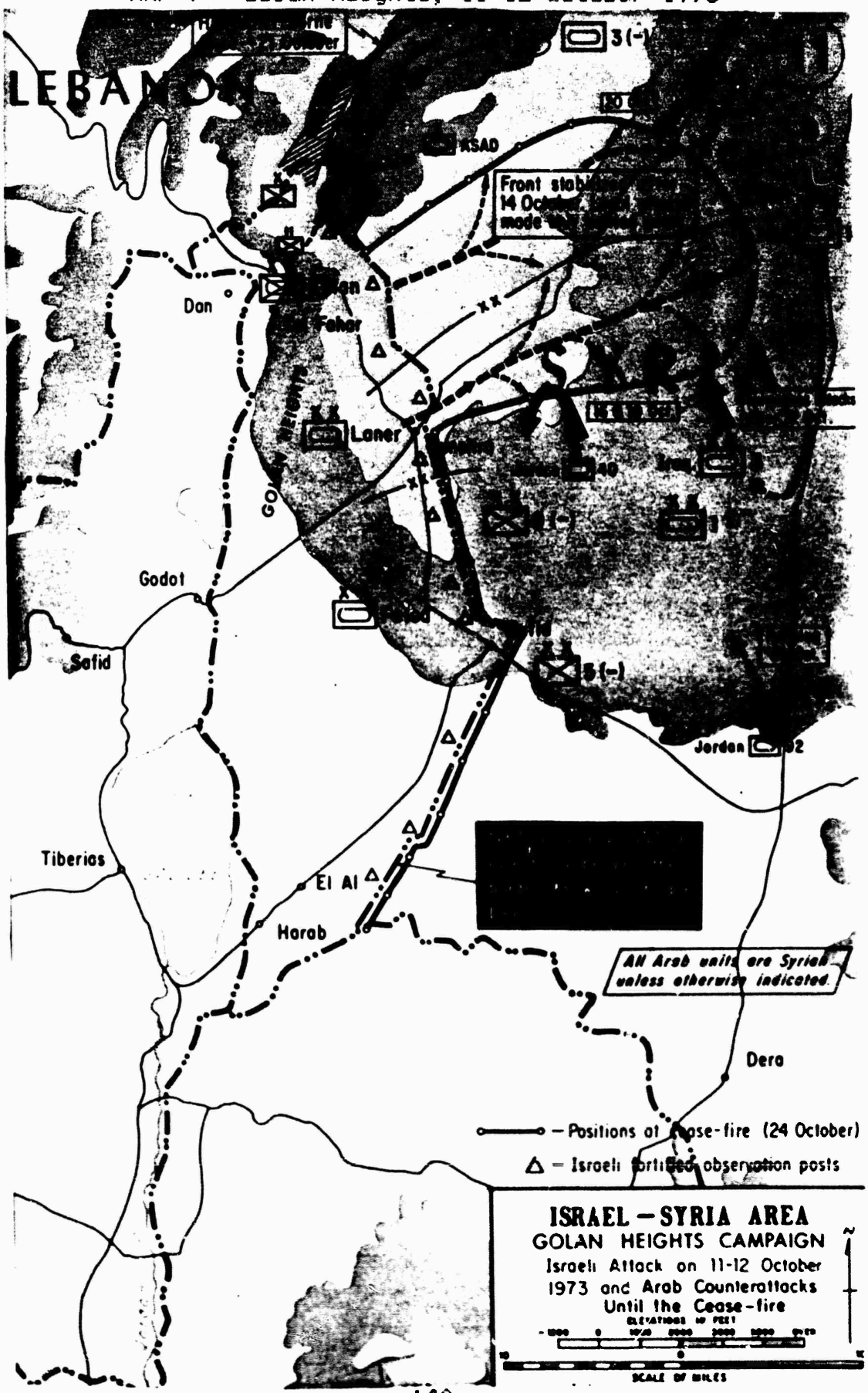
MAP III - Sinai, 18-23 October 1973



MAP IV - Golan Heights, 6-10 October 1973



MAP V - Golan Heights, 11-12 October 1973



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