

**Command and Control
of Third World Forces:
The Transfer of
Military Capabilities**

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Program on Information Resources Policy

Harvard University

Center for Information
Policy Research

Cambridge, Massachusetts

A publication of the Program on Information Resources Policy.

**Command and Control of Third World Forces:
The Transfer of Military Capabilities**

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July 1987, P-87-4

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The Program on Information Resources Policy is jointly sponsored by Harvard University and the Center for Information Policy Research.

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Ray P. Linville is an Air Force officer and wrote this report as a visiting fellow with the Program.

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Acknowledgments

The interest and support of several members of my family -- Mary Ann, Russell, Rachel, Wayne, and Wanda -- were significant while this project was being completed.

Special thanks are due to the following persons who reviewed and commented critically on drafts of this report: Francis W. A'Hearn, Robert Conley, Edmund S. Finegold, John G. Grimes, I. B. Holley, H. Allan Holmes, Rodney W. Jones, Edward A. Kolodziej, Donald C. Latham, Clarence E. McKnight, Jr., Stephanie G. Neuman, Donald B. Rassier, and Julia B. Wetzel.

These reviewers and the Program's affiliates are not, however, responsible for or necessarily in agreement with the views expressed herein; nor should they be blamed for any errors of fact or interpretation.

Executive Summary

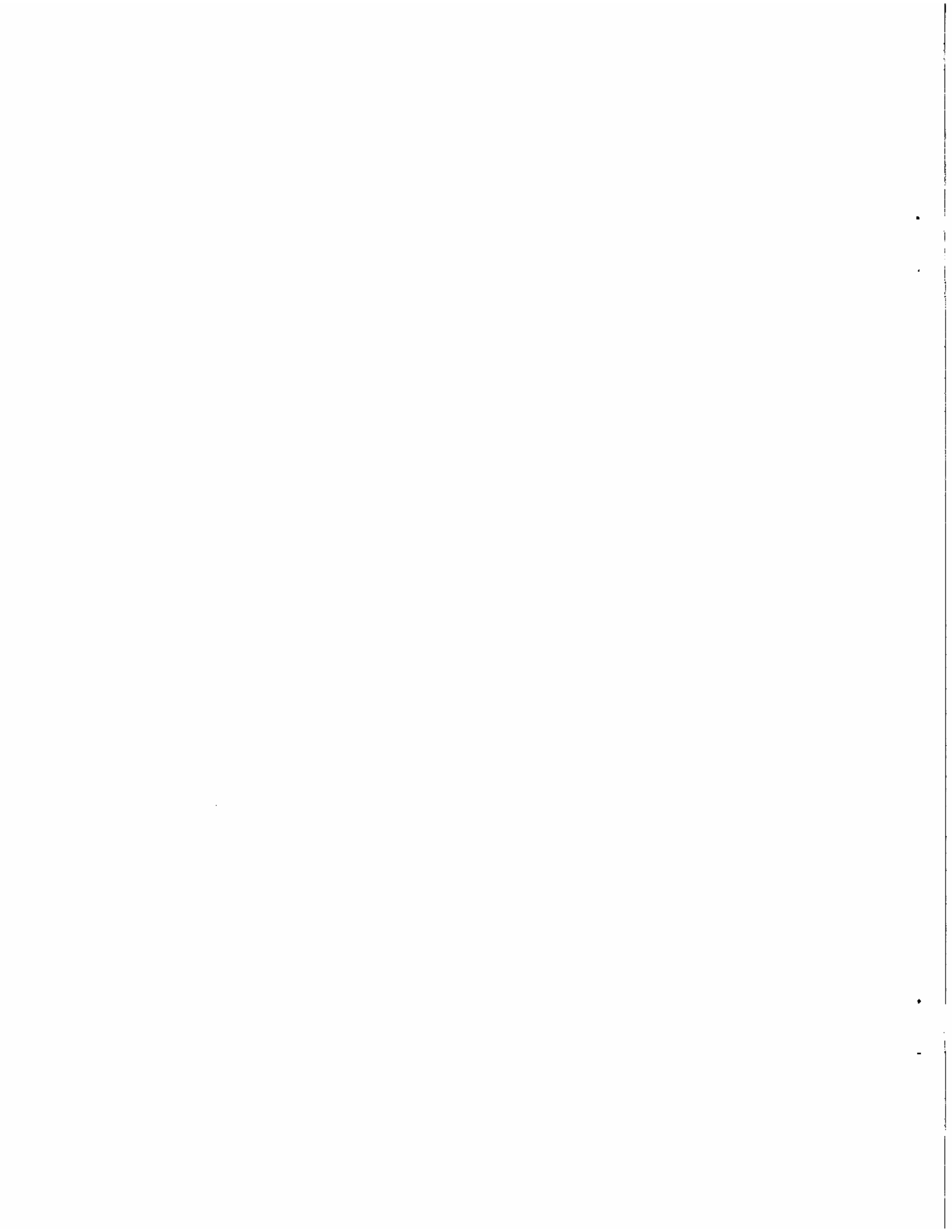
- The transfer of command and control capabilities to Third World forces has led directly to significant military improvements. It has also created other changes with major policy implications. For example, supplier-recipient relations have been altered, balances of power in some regions have been affected, tactics and doctrine have been revised, and vulnerability problems have increased. In addition, new policy questions concern the opportunities and risks involved, the objectives being supported, the involvement of the superpowers and other major nations, and even the nature of warfare itself.
- Arms transfers historically have been used as an instrument of diplomatic, military, and economic policy. The transfer of command and control capabilities is becoming a prominent element of these transfers and is being used increasingly to support international objectives. The resulting military modernization in the Third World has been accompanied by an increase in the command and control capabilities of many nations.
- The transfer of command and control capabilities includes more than just hardware. It includes other assistance such as concepts, training, intelligence reports, and communications links. Command and control is the exercise of authority and direction over military forces using a web of systems, programs, people, facilities, procedures, and concepts which provide both information for making decisions and the tools for implementing them. Efforts to improve command and control systems and procedures have gained great momentum. These efforts are not new, but they have been stimulated substantially by advances in technology.
- Although weapons production in the Third World has expanded significantly in the last two decades, indigenous design and development of command and control systems are limited. In addition to the inherent manufacturing difficulties in this high technology field, indigenous production is considerably more expensive than importing such systems. However, several developing countries have obtained licenses to manufacture components for command and control systems.
- Israel seems to be unique in the Third World in its development and production of advanced command and control systems. Indigenously built radar and communications systems have increased the effectiveness of Israeli military forces in recent combat engagements, and Israel is marketing some command and control systems to other Third World countries.
- Superior command and control procedures and advanced command and control systems have proven to be a decisive factor in the outcome of several recent Third World conflicts. The lack of effective command and control capabilities has led some Third World countries to improve their "battlefield management" activities by upgrading their command and control equipment. As a result, improving command and control capabilities has become a major goal of many Third World countries. This effort is most pronounced in the Middle East and Persian Gulf.
- U.S. security assistance objectives for several Third World nations are aimed at improving their command and control capabilities. However, some Third World members have difficulties assimilating advanced command and control systems because of technology absorption problems. Despite these problems, they are buying new command and control equipment from the leading arms suppliers, causing an increase in export sales for these systems. The trend is continuing despite new tactics and

advances in electronic warfare which make some command and control systems more vulnerable to interference and attack.

- The transfer of command and control capabilities includes more than just hardware. It includes other assistance such as concepts, training, intelligence reports, and communications links.
- The United States and the Soviet Union have been quick to provide command and control assistance to countries engaged in Third World conflicts. This assistance also includes support from their space-based assets. Newer systems coming into the inventory hold not only additional opportunities for providing assistance but also increase risks.

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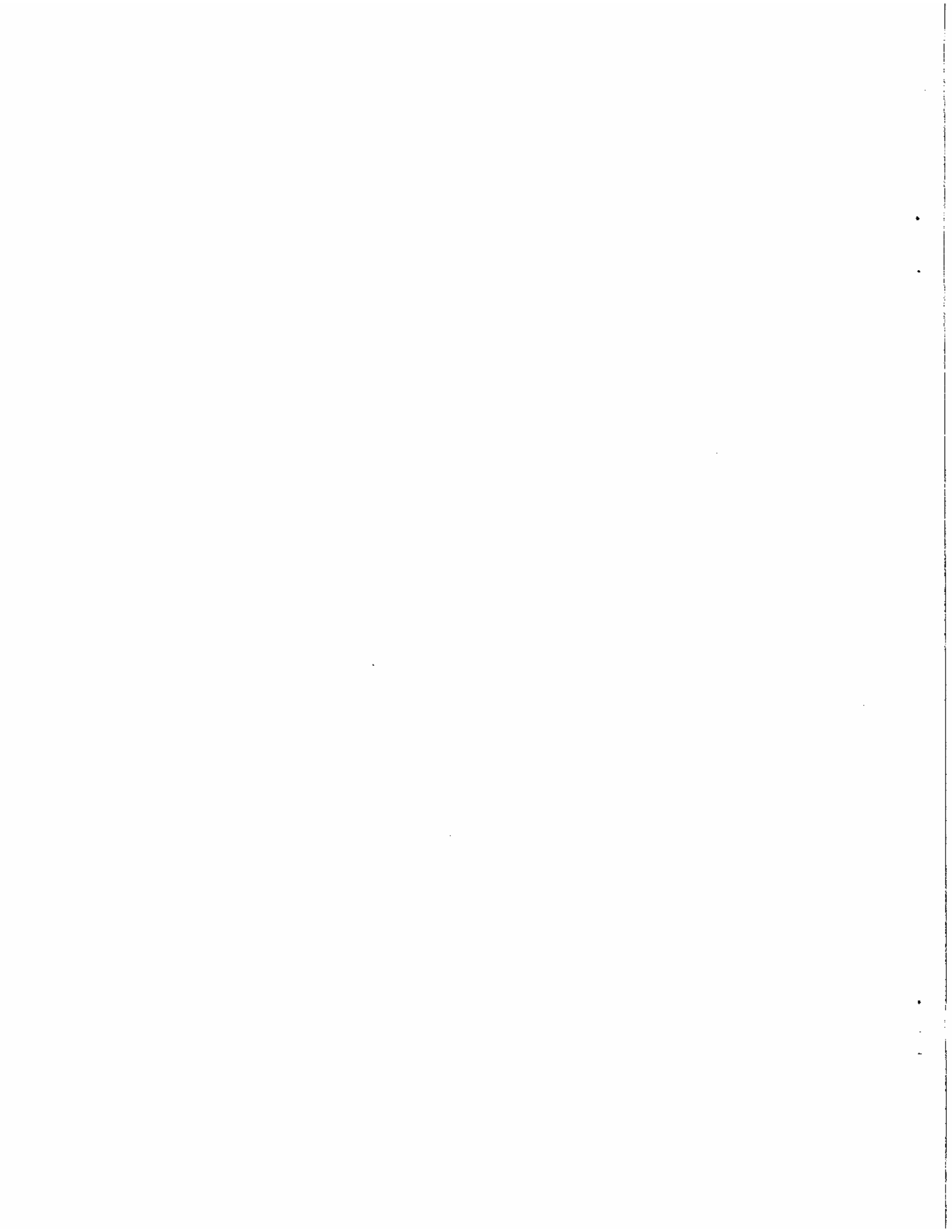


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INTRODUCTION

The Third World is acquiring advanced military technology and obtaining more sophisticated arms. The growing emphasis that many Third World countries are placing on improving and expanding their command and control capabilities has significant implications for arms transfer policy with developing countries. Through modernization programs, Third World armed forces are receiving superior weapons, warning systems, state-of-the-art communications, and intelligence capabilities. Advances in computers and progress in electronic technologies have pushed many of the advances in the command and control systems and procedures. The Soviets, for example, believe that the introduction of the computer to automate command and control systems has caused a "revolution in military affairs." New developments in command and control technologies are continuing, and these may lead to further transfers of new systems and other assistance to the Third World.

Third World Studies

Various studies have examined the sources of conflict in the Third World, causes of international stability, use of force in Third World conflicts, patterns in wars of the Third World, trends in arms trade with the Third World, and other related subjects. But the literature is scarce in its study of command and control of Third World forces and how this essential military element is being improved through arms transfers and assistance from the superpowers and the other leading arms suppliers. As a result, in some areas it is difficult to draw conclusions concerning the transfer of command and control capabilities and the extent to which they have played a positive role in recent Third World conflicts.

This study examines the dynamics of providing advanced command and control systems, procedures, concepts, and other assistance to the Third World. It looks at the extent of this transfer, the trends, the major players, and their interests.

Problems

Third World countries face several problems concerning command and control capabilities. These include ineffective systems and procedures, the lack of indigenous production capabilities for advanced equipment, the absorption of technology transfers with a limited skill base, the use of sophisticated weapons and technology without extensive external support, and a rapid military modernization by several neighboring states that is altering their region's balance of power.

Arms suppliers (both the governments that fund the transactions and the firms that supply the equipment) also face several problems. These include:

- . Determining how to provide command and control capabilities without destabilizing a Third World region,
- . Deterring aggressive moves by an adversary,
- . Obtaining access rights to military facilities in the Third World,
- . Avoiding entrapment in Third World conflicts when linked to one of the participants through security assistance programs,
- . Providing advanced equipment to the Third World without jeopardizing their own military operations in the future,
- . Maintaining authority over how the systems are used and preventing further transfers to third parties,
- . Maintaining technological superiority in designing and producing new systems,

- . Avoiding compromises in technological secrets that could increase the vulnerability of their systems,
- . Negotiating production arrangements in the Third World without undermining potential export sales, and
- . Maintaining a healthy defense industry.

Issues

These problems lead to several issues in which the various players have competing stakes in the outcome. The major arms suppliers are competing with each other for the export market in the Third World. They are also using the transfer of command and control capabilities to advance their national interests and to deny any adversary from achieving its objectives. For the Third World countries, the stakes include improving their position in their region's balance of power to deter attack or to project their military power effectively. Third World stakes also include the ability to use force unilaterally without being dependent on suppliers for support or any assistance which might inhibit their freedom to act militarily.

Questions

To confront these problems and issues, several questions must be considered if effective policies are to be determined for the transfer of command and control capabilities to the Third World. The following questions are not easily answered, and their solutions are regarded by many as significant challenges. However, these questions must still be considered by policy officials in the military, government, and industry.

- . How has the transfer of command and control capabilities to the Third World evolved?

- . What types of command and control assistance have been provided to the Third World?
- . How has command and control assistance been used to achieve political, economic, and foreign policy goals?
- . What has generated the interest by Third World countries to acquire advanced command and control systems?
- . Why is the transfer of command and control capabilities becoming an increasingly significant aspect of security assistance and arms transfers?
- . What is the nature and scope of present command and control capabilities being transferred?
- . What inherent problems do Third World countries face in designing and producing advanced command and control systems?
- . How successful has the Third World been in developing and producing command and control equipment?
- . What difficulties are faced by supplier and recipient nations in the transfer of sophisticated command and control systems?
- . How are command and control systems being used to improve Third World military capabilities?
- . How have command and control systems and concepts been used by Third World countries?
- . What role has the command and control structure played in Third World conflicts?
- . Have command and control systems and procedures been a factor in determining the outcome of these wars?
- . How has ineffective command and control structure hindered Third World countries in pursuing military objectives?

These questions include those that policy officials may wish to consider in their decision making. Some may be less applicable to a decision when other overarching political, economic, or military objectives are paramount.

The purpose of this study is to provide useful insights to these and other questions concerning the transfer of command and control capabilities to the Third World. It does not address political questions such as restraints or efforts to control arms transfers. It also is not a technical discussion of the various kinds of command and control systems available, their capabilities and vulnerabilities, and the difference they might have made in recent Third World conflicts. In addition, it does not try to assess how well current command and control systems would actually perform or describe in detail actual command and control procedures in use today. It is more important for the policy community to focus on the implications of command and control capabilities transfer rather than on the ever-changing details of systems or concepts being used.

General Approach

A broad framework for understanding the concept of command and control is presented in Chapter 1. It addresses the function of command and control and explains how various elements of the command and control network are related as a web of systems. The historical development and general advances in command and control capabilities also are discussed.

Chapter 2 focuses on arms trade with the Third World. It examines that group of nations called the Third World, how arms transfers to it have become a major element in international relations, and why the transfer of command and control capabilities is becoming a significant element of arms trade.

The next three chapters concentrate on actual transfers and efforts by Third World countries to enhance their command and control capabilities. Chapter 3 begins by examining the background and the latest developments in the Third World to produce command and control systems. Problems in acquiring this capability are presented with the results of production efforts being undertaken.

Chapter 4 describes how the transfers of new systems have improved Third World command and control effectiveness. It discusses how these transfers have become an important part of export sales of many supplier nations and a major element of security assistance programs. Problems of technology absorption, vulnerability, and control over the use of a system once it has been delivered are presented. Recent examples of how advanced command and control systems (and the lack of them) have affected the outcome of Third World conflicts are illustrated.

Chapter 5 continues to examine efforts to improve command and control capabilities of Third World nations, but focuses on assistance other than the transfer of equipment. It shows how concepts, procedures, intelligence, and other command and control assistance have been provided during Third World conflicts. It highlights the propensity of the superpowers to become involved in these conflicts through their vast command and control capabilities, including those provided by space-based assets.

Finally, Chapter 6 summarizes the major policy implications and key points that must be considered by senior officials -- in the military, other branches of government, and industry -- in setting future policy. The effectiveness of transfer policies will vary among suppliers and recipients based on the importance that they attach to their specific goals -- political, economic, and military.

Purposes

This report is intended for officials in the military, government, and industry who are engaged in arms transfers to Third World countries and efforts to improve their military capabilities. During the 1980s and 1990s, they will face several important questions concerning the transfer of command and control capabilities. The influence of command and control capabilities on Third World military effectiveness and regional balances of power will play a major role in how they evaluate proposed transfers and security assistance programs. Consequently, the purposes of this report are to:

- . Provide a basic understanding of the importance of command and control capabilities to Third World military forces.
- . Discuss the transfer of these capabilities within the overall context of Third World security assistance and arms transfers.
- . Outline the major developments concerning the acquisition and use of advanced command and control systems by Third World countries.
- . Examine how the outcome of Third World conflicts may be affected by enhanced command and control capabilities.



COMMAND AND CONTROL

Information is a resource that broadly touches on all business and government activities, including military organizations. The Program on Information Resources Policy at Harvard University describes it as a resource in the same context that economists describe materials or energy and notes it is being substituted increasingly for these other resources.¹ For the armed forces, information translates into power, security, and frequently a decided military advantage.

The Duel of Commanders

As Lieutenant General John H. Cushman, U.S. Army, has described, "The fight, the duel of commanders and their forces that is battle, is also a fight for information and accurate perception."² Information is critical in all stages of combat.

Avraham Bar-David, President, Tamuz Control Systems Ltd., of Israel and an Israeli reserve general, outlines it this way: The first stage is a constant collection of information about an adversary's strength, size, and operations before hostilities have begun. The second stage involves the collection of information about intentions, organization for battle, and strength as military action appears imminent. The third and most critical stage occurs during the actual conduct of operations and is directed toward the collection of information to determine changes in the enemy's military forces.³

Information resources are routinely used by military forces. In fact, the nervous system for military operations is an information system better known as command and control. The technological explosion taking place in the field of information resources has contributed

greatly to the precision, speed, information transfer, data manipulation, and memory capacities of command and control systems.

The Central Nervous System

The function of command and control (C²) is the exercise of authority and direction over military forces. Command and control and its derivatives* have been subject to widely varying interpretations, including almost everything from leadership to military computers.

Following World War II, the term "command and control" gained acceptance to describe the new equipment, capabilities, and tasks being developed to direct military forces. In the 1960s, the identifier "C³" appeared when "communications" was added. In addition, "computers" (C⁴) has also been added. The derivative "C³I" has been used since the 1970s as a shorthand for the terms "command, control, communications, and intelligence."⁴ The use of these identifiers has grown as the importance of the capabilities which they represent has been recognized.

Command and control capabilities are provided by a complex arrangement of doctrine, procedures, and systems which provide information for making decisions and the tools for implementing them. The term "command and control" represents the equipment, programs, systems, facilities, and concepts that provide the central nervous system for a commander's operations.⁵ They give the necessary warning and intelligence needed in crisis and war and permit the timely and skillful control of military units to achieve established objectives.⁶

As General Cushman described in his book Command and Control of Theater Forces: Adequacy, command and control includes:

not only command centers, computers, radars, communications links and other such material components, but also the

*Command, control, and communications (C³); command, control, communications, and computers (C⁴); and command, control, communications, and intelligence (C³I) -- each may be inferred when command and control is used.

people -- the commanders, staffs, and others -- who use these means, as well as the doctrines, procedures and organizational arrangements for their use.

Major General Jasper A. Welch, Jr., when Assistant Chief of Staff, Studies and Analyses, for the U.S. Air Force, noted that "controlling combat"⁸ is the purpose of C³I. To do that, C³I capabilities are used to bring diverse information together, process and disseminate it, and act on it in a timely manner. They help maintain cohesion against "the forces of chaos that are at work in the real-world at all times -- these forces of chaos are manifestly intensified by combat."⁹

In the words of John Gorton, marketing manager for the command and control division of Hughes Aircraft Company's Ground Systems Group, C³I is "the glue that holds everything together. It's no use having a first-class fighting machine if you don't have the eyes and ears to keep it working."¹⁰

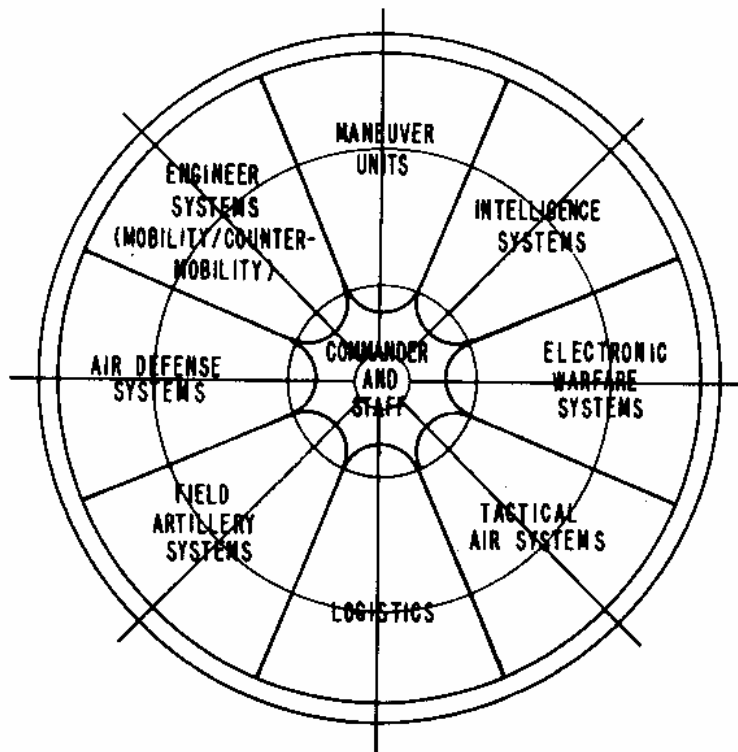
Command and control systems have been described as being designed to make the full use of resources and to "achieve extra efficiency, improved accuracy, higher reliability, and a faster system reaction."¹¹ But as Robert E. Conley, formerly U.S. Navy Chief Scientist for Command and Control Programs and later Deputy Assistant Secretary for Advanced Technology and Analysis with the U.S. Department of the Treasury, has clarified, "The C² system is not designed to increase the capability of the resource [in military terms, the forces assigned], but to concentrate it at the appropriate time and place."¹²

Web of Systems

The term "command and control system" can be viewed in two ways. The broader view, and the one used in this paper, is the full mechanism through which forces are directed and controlled. In General Cushman's words, it is "the vibrant, living web of systems for perceiving and

understanding challenge and for fashioning and producing response."¹³

His view of this web is seen in Figure 1-1.



Source: Cushman, John H. Command and Control of Theater Forces: Adequacy. Washington, D.C.: AFCEA International Press, 1985, p. 21. Copyright © 1985 by the Center for Information Policy Research.

Figure 1-1

The Web of Command and Control

Elements of this system are imbedded in the weapons and material systems themselves which leads to the second and more limited view of a command and control system. This view considers it to be a procurable item such as a target acquisition, information transfer, or other system. Each is a special purpose system which would be considered an identifiable component or subsystem of the web of systems.

The command and control infrastructure extends throughout the range of military activities from general war, conventional conflicts, and

low-intensity crises to routine peacetime operations. Many of the improvements in command and control systems and procedures have been made by the United States and other developed countries for their contribution to strategic capabilities. However, improvements applicable defense-wide as well as those targeted to tactical capabilities have also created capabilities that are transferable to the Third World.

Developments in Command and Control

Martin van Creveld, in his book Command in War, which investigates the historical evolution of command and control, states that the problem of command and control is anything but new, but that its dimensions have grown greatly in recent years, particularly since 1939, because of several factors which include:

- . The increased demands on command and control made by modern warfare's enhanced complexity, speed, range, mobility, and dispersion of weapons and troops;
- . The development of communications and data processing technology which has expanded the means for command and control;
- . Changes in the command and control process, including the size and sophistication of systems developed to interpret and use effectively the increased quantity of data available;
- . The vulnerabilities of command and control systems to precision-guided weapons, electronic warfare, and other arms of modern warfare; and
- . The dramatic increase in costs for modern command and control systems.¹⁴

Lieutenant General C. E. McKnight, Jr., Director for Command, Control, and Communications Systems in the U.S. Organization of the

Joint Chiefs of Staff, pointed out how command and control support for combat operations has advanced when he noted that information once was limited to what could be obtained in the immediate area of military units, and voice radio was the primary means to exercise command and control.

By contrast, the military commander today has sources of information immediately available from a number of different systems using sensors, satellites, mobile platforms, and relies on not only voice radio but data systems.¹⁵

Technological Advances

Developments in the command and control infrastructure have been stimulated by several factors, particularly technology. Technological advances have produced changes in command and control systems which, in turn, have changed the conduct of war. Historical examples include the telegraph, telephone, and radio. Although military requirements did not drive their development, their military application was realized and had a major effect on command and control organization and procedures.¹⁶ Other improvements have been spurred by crises when command and control capabilities were deficient.

By World War I, the most significant change was the addition of the telegraph and telephone to improve communications. World War II saw several new developments. These included the extensive use of the radio, particularly to control mobile forces over large areas as well as the use of radar and sonar. In addition, tactics were developed to interfere electronically with the enemy's command and control systems by jamming them, and methods were improved to intercept and decipher enemy signals.

Furthermore, as pointed out by Oswald and Gladys Ganley in their book To Inform or Control? The New Communications Networks:

While radio communications and signal intelligence played an important role in World War I, the use of radar during World

War II's Battle of Britain marked the real beginning of today's sophisticated communications and information-based defense systems.¹⁷

The significance of these changes is further explained by analyst Kenneth L. Moll:

In the Battle of Britain, a rapid synthesis of long-range radar for decisionmaking at last became possible. Radar and ground-air radio had been put together with RAF [Royal Air Force] air-defense control centers; as soon as a Luftwaffe raid was picked up, fighters were directed to meet it. . . . This new ability directed or controlled, in immediate or "real-time" fashion, forces that were engaged in combat far beyond the commander's visual range.¹⁸

Progress in electronics and the growing sophistication of computers have pushed many of the important advances in command and control, according to Robert R. Everett, president and chief executive officer of The MITRE Corporation. The first computer-based command and control system was designed in the early 1950s. Known as the Semi-Automatic Ground Environment (SAGE), it became operational in the United States around 1960.¹⁹

The 1960s saw other advances in command and control such as satellites, airborne command posts, and improved communications systems. Major powers began using satellites to perform command and control functions. The first airborne command post was sent aloft on February 3, 1961, by the Strategic Air Command of the U.S. Air Force, and one has been airborne continuously since then.²⁰ New systems were developed to "receive warning and intelligence information, apply military resources, assign missions, and provide direction to military commands."²¹ Chief among these was the U.S. Worldwide Military Command and Control System (WWMCCS) that was established in 1963.

The Soviets: A Revolution in Military Affairs

Similarly, the Soviets believe that the nature of warfare began to be changed in the 1950s by the introduction of the computer and have

noted a "revolution in military affairs" brought about by computer technology to automate command and control.²² As the application of automated command and control systems became evident, Moscow established the Scientific Council on Cybernetics in 1959 under Rear Admiral Berg. In 1961, Khrushchev announced at the Twenty-Second Party Congress that "highly perfected systems of automatic control would be accelerated" for military affairs and that electronic computers and control devices would be widely applied. Missile and air defense forces were among the first Soviet military units targeted to receive advanced command and control systems using computer technology because they were viewed as having a "predisposition" to computerized command and control.²³

As stated in 1962 by Soviet Marshal V. D. Sokolovskiy in Military Strategy, a new factor had emerged which would influence the nature of war, that being

the use of electronic gear, in particular, electronic computers and various other types of equipment, by the armed forces, and other devices for automatizing and mechanizing control and command over weapons and troops as a whole.²⁴

In a later edition in 1968, Marshal Sokolovskiy wrote:

Military radioelectronics assures not only the use of missiles, antimissiles, and other technical means of combat, but also reconnaissance, the control of troops, forces, and weapons as a whole. It is the basis of the solution of the problem of complex automation of the processes of staff activity. Without complex automation, effective command of the armed forces and consequently their successful use in a modern war will be impossible.²⁵

The Soviets have promoted three characteristics of automated command and control systems -- accuracy, speed, and flexibility -- in extending their application in military affairs. Soviet military journals have highlighted their use "to select within a matter of minutes the best methods of conducting combat operations and to immediately make the operational or battle plan available to subordinates."²⁶ As discussed

in Marxism-Leninism on War and Army, the Soviets have emphasized "the automatic control of equipment and the combat actions of troops, the intensive introduction of scientific knowledge into the military field, notably for the control of the troops."²⁷

Increased Emphasis

In recognition of its critical role in modern security strategy, command and control has received a higher priority by many countries. In the United States the Carter administration issued a series of Presidential Directives (PD) designed to enhance command and control capabilities, including PD-53, entitled "National Security Telecommunications Policy," in 1979.²⁸ In October 1981 President Reagan, in a major address on strategic policy, stated that he was personally involved with the effort to improve command and control systems and said that improvements could be made only by elevating their resource allocation priority to that of the weapons that they would support.²⁹ In noting the new focus in policy, Senator John G. Tower, then Chairman of the U.S. Senate Armed Services Committee, claimed:

For the first time, the central nervous system that is essential to the effective wartime operation of the U.S. strategic deterrent is being accorded equal value with weapon systems in the competition for dollars and the attention of senior Defense Department management.³⁰

Strategic command and control programs designed to support nuclear weapons have received much of the attention, particularly since President Reagan stated that improved command and control capabilities are the most important part of the total U.S. strategic modernization program. However, tactical command and control systems -- the ones more appropriate for Third World forces -- "equally are essential to theater and tactical military commanders for planning, directing, controlling and operating their forces."³¹ For example, the U.S. Defense Depart-

ment's annual report to Congress in 1986 highlighted deficiencies in command, control, and communications for conducting U.S. military operations in Southwest Asia and the Middle East. Having a secure, mobile, and survivable command and control network was stated as one of the highest U.S. priorities for that region.³²

Momentum

Because of the increased emphasis on improving command and control capabilities, U.S. defense funding for new programs has been growing approximately 12 to 16% per year.³³ Donald C. Latham, U.S. Assistant Secretary of Defense for Command, Control, Communications, and Intelligence, said in 1985 that C³I had fared better than the defense budget as a whole over the last five years because "it has the priority, and it has the momentum."³⁴

This momentum has expanded dramatically the market for command and control systems. Published estimates of the value of the overall market range up to \$40 billion annually.³⁵ Firms working on command and control projects are showing significant gains over previous years. In particular, several U.S. commercial electronics companies have turned to military product lines to expand sales and profits.³⁶ (Table 1-1 lists the top U.S. defense electronics firms.) Many of these firms -- and those of other industrial nations -- are finding the Third World to be a market for their expanding line of military command and control systems.

Table 1-1

Top 10 U.S. Defense Electronics Firms in 1985

Rank	Company	Defense Electronics Sales (\$ Million)
1	Hughes Aircraft	4410
2	Lockheed	3100
3	Raytheon	2715
4	Sperry	2270
5	Litton Industries	1962
6	General Electric	1900
7	TRW	1818
8	Boeing Company	1720
9	Honeywell	1608
10	Ford	1500

Source: Schultz, James B. "A Breathing Spell for the Defense Industry." Defense Electronics, November 1985, p. 46.

Improving Command and Control Capabilities

According to R. R. Fossum, former director of the U.S. Defense Advanced Research Projects Agency, basic technology developed by these firms and available now will provide "the base for not only solving today's problems but for providing substantially higher leverage in battle management through advanced command and control concepts."³⁷ However, as he pointed out, "Many historical examples have recently come to light in which lack of attention to C³ fundamentals contributed substantially to the loss of significant battles."³⁸

Focusing on these basic fundamentals has helped to sharpen the efforts to improve command and control. In the words of General McKnight, "The user and his philosophy should drive the evolution of the [command and control] system."³⁹ There have been several agents for improvements in command and control capabilities. The major ones, according to General McKnight, are technology, the threat, architecture, alliances, and concerns for interoperability.⁴⁰

Interoperability -- the ability of command and control components to connect and work together -- should be a primary stimulus for improvement efforts. Not all interoperability disconnects have been purely technical. Organizational structure, tactics, and doctrine have helped to contribute to interoperability problems. However, concerns about interoperability have increased because of the extensive technological changes taking place and the new components being developed. Some elements have been built before the architectural hierarchy has been created in which they must operate and before their functions have been adequately defined.⁴¹ Command and control elements must be integrated to improve the utility of the individual weapons. As noted by Dov Tamari, an Israeli reserve general, "The command and control system must therefore be an integrated part of the battlefield and not an independent part of the weapon system."⁴²

Survivability is another key feature, particularly as advances are made in electronic combat -- the use of electronic systems to listen, locate, deceive, disrupt, or destroy command and control systems. In 1985 at a seminar on command, control, communications, and intelligence at Harvard University, Donald C. Latham said that the command and control system must be "as survivable and as enduring as the forces it supports."⁴³ In the 1970s demands were made to improve the survivability of the U.S. command and control infrastructure, particularly those elements supporting strategic nuclear capabilities. These concerns were not new, since over 20 years earlier, Herman Kahn, the strategic theorist, had cautioned in On Thermonuclear War:

We should become much more conscious of the central role that command and control is likely to play in the future as a possible Achilles heel of otherwise invulnerable systems.⁴⁴

The Multiplying Effect: Concentrating Resources

Improvements in command and control systems "can certainly resolve a great deal of the uncertainty that currently exists in battle."⁴⁵ As a result, command and control capabilities increasingly are being called a force multiplier, although it is difficult to quantify the multiplying effect. Superior command and control may serve as a multiplier by compensating for deficiencies in other areas, such as quantitative inferiority. It may enable a numerically inferior force to win by concentrating its resources and directing its weapons more effectively. Effective command and control can play a critical role in modern warfare and in determining the outcome of conflicts. It can lead to a quicker understanding of the military situation and a more effective allocation of resources.⁴⁶

Recognition of this role has caused the Third World to seek significant improvements in command and control capabilities. To examine how these improvements are being made, it is first important to understand the environment of arms trade with the Third World -- the focus of Chapter 2.

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ARMS TRANSFERS AND THE THIRD WORLD

Military forces have been used in literally hundreds of incidents in the Third World, involving both Third World forces and those of external powers which have sought to influence the outcome of events. This chapter will look at that group of nations called the Third World, how arms transfers to the Third World have expanded to become a major element in international relations, and why the transfer of command and control capabilities is becoming a significant element of arms trade.

The Third World

The term "Third World" has become a convenient term to group those nations not formally belonging to the "First" and "Second" worlds of the capitalist West and the socialist East. The Third World countries share no common language, culture, religion, or race. Their primary characteristic is economic underdevelopment, but the term "Third World" rather than "underdeveloped" or "developing" is used by many to change the focus from primarily an economic one to one also including major political, social, and military aspects.

Some analysts prefer the terms "developed" and "less-developed countries" (LDC) and distinguish between the two by using an economic criterion such as per capita national income or gross national product. If an economic measure alone were used, some oil exporters such as Kuwait with their vast income would be misleadingly considered as developed. Thus, in addition to economic factors, others must be considered.

In its documents, the U.S. State Department has included in the Third World all nations except the members of the North Atlantic Treaty Organization (NATO) and the Warsaw Pact; other European nations not

belonging to either alliance; and Australia, New Zealand and Japan.¹ This report also uses this definition to define the Third World or the LDC group.*

Studying Third World Arms Trade

There are several difficulties in studying arms transfers with the Third World. One is that there are varying definitions of the Third World. For example, the U.S. Central Intelligence Agency (CIA) has included Greece and Turkey, members of NATO, in its grouping of Third World countries but has excluded Hong Kong.² In addition, the U.S. Arms Control and Disarmament Agency (ACDA) has included Spain but not South Africa.³

Another involves the term "arms transfers" itself. Some military sales transactions have little to do with the actual transfer of arms. These programs include training, management services, and construction of facilities. Even with an agreed definition, there is much variation in the openness of countries to their arms trade data.

Other difficulties include how to quantify arms trade. Comparisons of arms transfers are frequently stated in physical units. However, physical comparisons (such as tanks and fighter aircraft) do not take into account differences in quality and effectiveness of the items.

The most commonly used denominator is price, although price also does not necessarily reflect the quality of the arms being provided or portray the military capabilities being transferred. Price also can be

*Israel is considered in the literature of arms transfers and strategic studies (for example, see publications of the Stockholm International Peace Research Institute and the U.S. Arms Control and Disarmament Agency) as a Third World country, although it shares many similarities such as its high per capita income with developed nations. Israel also has a very capable arms industry.

affected by quantities ordered, concessions made, and currency exchange rates. In addition, cost comparisons frequently are inadequate because of incomplete information, inconsistencies between suppliers in establishing prices, insufficient information on development and production costs, and discounted prices.

Perspectives

To gain a full appreciation for the transfer of advanced command and control capabilities to developing countries, the broad context of the environment within which this transfer takes place must be considered. Arms trade with the Third World is guided by both geopolitical considerations and regional security concerns. A geopolitical perspective is needed to consider the East-West competition and the implications that it has for developing countries. A regional security orientation takes into account local sources of conflict, power relations, and competition involving economic, political, and social factors as well as military. Both outlooks are important in analyzing arms trade issues involving developing countries. If both are not considered, one is susceptible to the pitfalls of oversimplification or exaggeration. For example, to examine the Arab-Israeli conflict, both perspectives are needed -- the geopolitical to consider the superpower rivalry in the Middle East and the regional security to include the religious, ethnic, national, and other local struggles.

Arms Transfers: An Instrument of Policy

The international transfers of military weapons and systems are not a new phenomenon. They have long been used as an instrument of diplomatic, military, and economic policy. Arms transfers to the Third World

have been used to achieve several, and often complementary, objectives* including the following:

- . To provide a basis for closer military and political cooperation between the nations involved;
- . To assist the recipients in improving the capability to defend themselves;
- . To supplement economic assistance, particularly when the recipient lacked the means to provide for its own defense or when the diversion of resources to military expenditures would be counterproductive to other development efforts;
- . To demonstrate interest in a region and tangible support for specific nations;
- . To deter aggressive moves by other nations, particularly when coupled with the deployment of forces or the commitment to use military power;
- . To contain an adversary or prevent its access or expansion in a region;
- . To provide a basis, often a quid pro quo, for access to military facilities in strategic locations or for intelligence-gathering rights;
- . To obtain indirect military benefits such as encouraging Third World countries to base their security on having sufficient strength in conventional arms rather than pursuing nuclear weapons; and
- . To achieve indirect economic benefits by lowering unit costs, improving international trade balances, reducing unemployment in defense industries, and obtaining other resources (for example, "weapons for oil").

*This list is a composite list of objectives that have been achieved by several nations through arms transfers to the Third World since World War II.

The use of arms transfers as an instrument of diplomatic policy has become more prominent in the last decade. As Andrew J. Pierre has noted, "Arms transfer policies have, in fact, become central to the process of negotiating peace in the Middle East."⁴ They are also becoming more politically oriented and less security related. The increased linkage between arms transfers and the negotiating process is seen in the position taken by Egyptian President Anwar Sadat in the late 1970s to ask for "every armament" that the United States had shipped to Israel to give Egypt "equivalent bargaining power."⁵

However, developing and implementing effective arms transfers policies have not been simple. Reports by the U.S. Congressional Research Office have cautioned that "arms transfers are an unwieldy instrument of foreign policy and they do not always provide the results expected."⁶ In addition, after Paul C. Warnke had served as ACDA director and as U.S. Assistant Secretary of Defense for International Security Affairs, he wrote, "Arms exports have proved to be neither a necessary nor an effective factor in gaining influence over the policies and actions of foreign countries."⁷

The limits to exercising political influence were apparent when the United States reduced arms shipments to Turkey in the 1970s, and that country responded by restricting American use of its facilities. Another example was the decision taken by President Sadat to deprive the Soviets of base rights when Moscow attempted to influence Egyptian policy excessively.⁸

Another concern, even more critical, to the supplier is how the weapons would be used once they have been delivered to the Third World country. Once a supplier has transferred arms, it frequently has lost control over their ultimate disposition. For example, in 1973 Libya

provided Egypt with Mirage aircraft it had purchased from France. In a more striking example, American weapons were provided by third parties to both sides involved in the 1977-1978 crisis in the Horn of Africa -- Iran provided U.S. arms to Somalia and Israel sent U.S. equipment to Ethiopia.⁹ It is particularly ironic that the British government contributed one-sixth of the cost of developing the Exocet missile, which was used against its fleet by Argentina in the 1982 Falklands/Malvinas* conflict.¹⁰

Arms transfers to developing states have increased their ability to influence regional affairs. With improvements in their military capabilities, many Third World countries have become significant actors in several international security roles. These include (1) granting or blocking access to facilities, bases, and airspace; (2) providing weapons to other nations from their own inventories or indigenous industries; (3) intervening directly with military forces on their own or as a surrogate; and (4) providing economic assistance to improve the defense capabilities of other developing countries.¹¹

In particular, as Edward Kolodziej and Robert Harkavy have observed, arms transfers have been useful in "penetrating politically and intervening militarily in the affairs of other states . . . to shape political events and security policies abroad."¹² Examples include Vietnam's influence in Southeast Asia, particularly in Laos and Kampuchea; Cuban intervention in Latin America and Africa; and Libya's use of force in North African affairs, including those involving Sudan

*The Falkland/Malvinas Islands in the South Atlantic Ocean have double English and Spanish names reflecting the conflicting British and Argentine claims. They are an archipelago of about 200 small and two large islands -- East Falkland/Isla Soledad and West Falkland/Gran Malvina. Both names are used in this report.

and Chad. The increasing capacity of some Third World countries to intervene to such an extent is based primarily on ground combat forces and equipment, such as tanks and other armor. However, recently entering on the scene are advanced command and control capabilities being acquired by several developing countries to improve the effectiveness of their armed forces and to guard against shifts in regional balances of power.

Third World Military Modernization

Virtually every developed industrial state exports arms, and the foreign policies of many toward the Third World focus on the transfers of weapons which have helped push the military expenditures of developing countries to over \$160 billion annually.¹³ Many Third World nations, particularly those in the Middle East, have undergone a wave of military modernization in the last decade, although arms transfer programs and policies have received harsh review by critics such as David K. Whynes, who has asserted that both domestic defense spending "and international military assistance represent a net economic cost to the Third World, in spite of the variety of potential benefits which might accrue" in terms of economic, political, industrial, and other development.¹⁴

Despite efforts to restrain the flow of conventional arms, more sophisticated weapons are being purchased by the Third World. According to The Military Balance 1985/86, published by The International Institute for Strategic Studies in London, the combat aircraft inventory of Third World states in the Middle East includes the front-line fighters of the superpowers such as the F-14, F-15, F-16, MiG-23, and MiG-25.¹⁵ In addition, the Soviet Union is encouraging Syria (as well as Libya) to buy its new generation fighter, the MiG-29 Fulcrum. (The Soviets also have sold it with a license production agreement to India

before making it available to other Warsaw Treaty Organization members.)¹⁶

The trend in sophisticated technology is not limited to combat aircraft. Many items including armored vehicles, rocket launchers, and naval craft are being purchased with advanced technology. This trend is particularly noticeable in defense electronics where many Third World nations are obtaining advanced radar, communications equipment, and other command and control systems.

Some countries will continue to resist the temptation to purchase high-technology weapons because of their high cost, operating expenses, the lack of indigenous skilled manpower, and other absorption problems. However, equipment now being obtained indicates an emphasis on command and control capabilities and their use to increase the effectiveness of military forces.

The military modernization efforts of many developing countries caused several changes in the Third World arms market beginning in the mid-1960s. Evidence of the following trends can be seen also in the efforts by developing countries to improve their command and control capabilities. These changes include:

- . Larger amounts of money being spent by developing countries on arms (although the peak* set in 1982 has yet to be surpassed);
- . Higher technology weapons and systems being wanted by and sold to Third World countries;

*Arms imported by the Third World fell sharply in 1983 to \$27.5 billion from the 1982 peak of \$32.1 billion and then declined slightly further in 1984 to \$27.2 billion (in constant 1982 dollars). Further declines are uncertain because agreements for arms transfers to developing countries showed a slight increase in 1984.¹⁷

- . An increased desire in the Third World for multiple, rather than single, arms suppliers.

- . More indigenous arms production, both for internal use and for export.¹⁸

Focus on the Third World

Arms transfers to the Third World began receiving more attention from the developed countries in the mid-1960s. For example, until 1965, most U.S. arms went to its NATO allies. Since then the focus of American arms transfers has shifted, first to Indochina and currently to the Middle East.

After World War II and until the mid-1960s, arms transfers were based primarily on the immediate defense needs of the recipient, including its level of military sophistication and absorption capacity. Most of the newer U.S. and Soviet weapons were provided to European nations that had the most advanced military forces. During these years, developing countries received less sophisticated equipment. For example, U.S. military assistance to them was primarily spare parts, support equipment, and training services.¹⁹

By the mid-1960s, with the rebuilding of Europe completed, several other conditions led to more world attention to Third World security problems and proposals to provide more military assistance. Old colonial relationships outside of Europe were changing, causing instability in several regions. In addition, events such as the Korean war, the Vietnam conflict, the Cuban missile crisis, and Cuban influence in Latin American affairs prompted policymakers to view the Third World as the scene for continuing East-West conflict and to believe that such competition would be carried out through economic and military assistance.

With the outbreak of hostilities in the Middle East in 1967, the United States began to transfer more sophisticated weapons to help Israel maintain a military balance with Arab nations. The Nixon Doctrine pronounced in 1969 also led to more advanced military capabilities -- including command and control -- for some developing countries. Under his concept, President Nixon proposed that Third World countries assume more responsibility for maintaining regional security. For Third World states to share the burden of keeping regional peace, improvements in their defense capabilities were needed. The U.S. security assistance program to Iran was based on the Shah's protecting the Persian Gulf interests of the West with limited American military involvement.²⁰

The focus of arms transfers has continued to shift from the traditional, developed allies of the United States and the Soviet Union to the Third World. Most of the arms transferred by the two superpowers and the other leading exporters are to the Third World. For many, transfers to the Third World are more than 90%. (See Table 2-1.) Arms deliveries to the Third World have increased steadily until they peaked in 1982 at \$32.1 billion. Since then arms imported by the Third World nations have declined (in constant 1982 dollars), reflecting, in part, the effects of the world recession and the foreign debt positions and declining gross national products of many developing countries. However, arms imported by the Third World still account for more than three-fourths of the weapons transferred worldwide.

During 1980-1983, the Middle East and Latin America were the only two regions that did not have declining arms import trends. The Middle East continues to be the major recipient of arms transfers. In 1983 its share of the world total reached 43%. Iraq, Saudi Arabia, Libya, Egypt,

Syria, and Jordan have been among the world's leading arms importers. These six nations accounted for over 50% of the weapons imported by the Third World in 1983. (See Table 2-2.) In fact, Iraq set a new record for one year's imports by acquiring more than \$5 billion in weapons in 1983.²¹

Table 2-1

Percentage of Value of Arms Transfers by Major Suppliers to the Developing Countries (1979-1983)

Country	Percentage
France	98
Italy	97
Soviet Union	91
West Germany	83
United Kingdom	81
United States	60

Source: U.S. Arms Control and Disarmament Agency. World Military Expenditures and Arms Transfers 1985. Washington, D.C., 1985, p. 131.

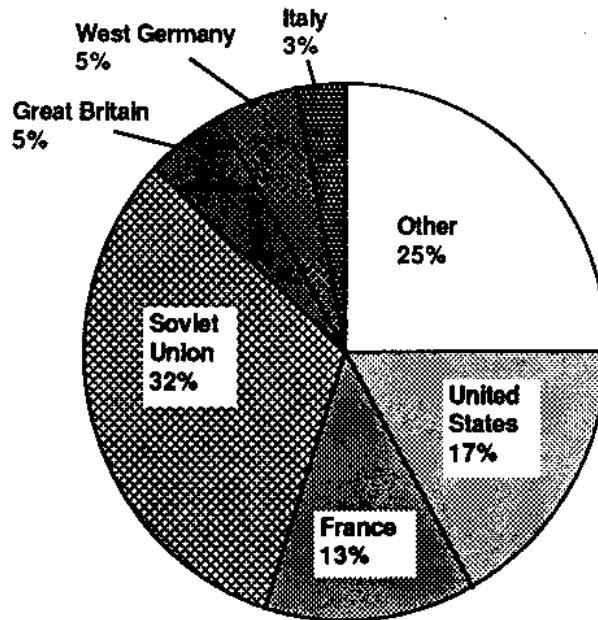
Table 2-2

Ten Largest Third World Weapons Importers in 1983

Country	Arms Imports (\$ Billion)	Percentage of Total Third World Imports
Iraq	5.10	17.8
Saudi Arabia	3.30	11.5
Libya	1.90	6.6
Egypt	1.70	5.9
Syria	1.70	5.9
Jordan	1.10	3.8
Argentina	1.00	3.5
India	0.95	3.3
Vietnam	0.78	2.7
Iran	0.75	2.6

Source: U.S. Arms Control and Disarmament Agency. World Military Expenditures and Arms Transfers 1985. Washington, D.C., 1985, pp. 89-130.

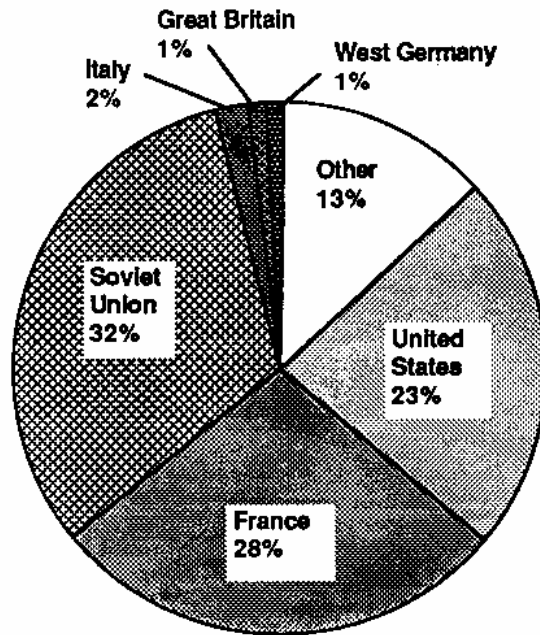
The Soviet Union and the United States have been the predominant suppliers of arms to the Third World; however, in 1984, for the first time, their combined transfers were less than one-half of the total imported by developing countries. Other major suppliers have been West European nations -- France, Great Britain, West Germany, and Italy. Because of an increase of agreements in 1984, France's role in arms trade may become more significant, even to challenging the position of the United States as the second leading exporter to the Third World.²² (See Figures 2-1 and 2-2.)



Source: U.S. Arms Control and Disarmament Agency. World Military Expenditures and Arms Transfers 1985. Washington, D.C., 1985, p. 43.

Figure 2-1

Shares of Arms Transfer Deliveries During 1981-1984 to the Third World



Source: U.S. Arms Control and Disarmament Agency. World Military Expenditures and Arms Transfers 1985. Washington, D.C., 1985, p. 42.

Figure 2-2

Shares of Arms Transfer Agreements in 1984 with the Third World

Command and Control Capabilities

In reviewing military capabilities, analysts for the Stockholm International Peace Research Institute (SIPRI)^{*} stated in 1983 that "an often neglected aspect of the force structures is that of C³I (command, control, communications and intelligence)."²³ However, related to the trend of increasing sophistication of weapons in the Third World is the increase in modern command and control systems being sold, support being given, and new capabilities being provided.

Soviet weapons deliveries to the Third World have exceeded those of the United States in many categories such as ordnance and land

^{*}SIPRI is an independent institute, financed by the Swedish Parliament, that researches arms trade and other military topics.

armaments. But in transferring command and control capabilities, the United States has played a larger role. As the U.S. CIA has reported, developing countries have received more communications equipment and radar from the United States than from the Soviet Union.²⁴ For example, in the mid-1970s, U.S. sales of military communications equipment and radar systems to developing countries were more than twice those of the Soviet Union.²⁵

This trend represents not only Soviet reluctance to provide such technology (as discussed in Chapter 3), but also early and continuing U.S. superiority in developing command and control technologies. According to the U.S. Joint Chiefs of Staff (JCS), the United States leads the Soviet Union in telecommunications technology. In addition, the basic area of computers and software is the only one of 20 critical military technologies monitored by the JCS in which the United States not only has a qualitative superiority, but its leadership is significantly increasing relative to the position of the Soviet Union.²⁶

In addition to the two superpowers, France and Great Britain also play a leading role in exporting new command and control capabilities to the Third World. New systems are important, but doctrine and concepts concerning command and control procedures are also vital, as several studies on recent patterns in Third World conflicts indicate.

Patterns in Third World Conflicts

Since 1945, approximately 125 to 150 conflicts have occurred, with over 90% of them being fought in the Third World. War in the Third World ranges from guerrilla conflicts to "modern" conventional war involving forces and equipment provided by the developed nations. With few exceptions, wars in the Third World have been won or lost by ground troops. However, conflicts in the Middle East have seen a major role

played by air units and are unique in that respect. Most other Third World air forces have not played such a major role. Another pattern noted in recent Third World conflicts is the involvement of external powers. More than a third of these conflicts have been fought with foreign participation.²⁷

In an analysis of wars fought in the Third World, Stephanie G. Neuman, director of the Comparative Defense Studies Program at Columbia University, concluded that without exception, "a preponderance in numbers and military equipment has not ensured victory."²⁸ In all cases, other factors were decisive. These included strategy, tactics, training, and command and control. Superior command and control has been decisive in determining the outcomes of several recent wars in the Third World. An illustrative case is a comparison of the Israeli experiences in two consecutive Middle East wars.

Comparative Israeli Experiences

In the 1967 war the Israeli Army needed an effective command and control structure given its style of mobile warfare and the large degree of independence granted to subordinate commanders. Only the first day of that campaign had been planned by the Israelis in any detail. The others were conducted on an improvised basis with boundaries being assigned and action taken to support the detailed tactical planning of division commanders.²⁹ General Yashayahu Gavish, the commanding general of the Israeli forces concentrated at the front against the Egyptian Army, spoke to each of the divisional commanders once every 30 minutes.³⁰ The Israeli commanding general of the Southern Front noted that "command, control, and communications were well nigh perfect"³¹ and were instrumental in the Israeli military success.

The 1973 Middle East war saw a different situation from the Israeli viewpoint. Organization changes -- more emphasis on armor units and a reduction of infantry components -- led to less self-contained subordinate units up to brigade level. According to Martin Van Creveld, "Two-way communications, from the bottom up and from the top down, became more important than they had been" in 1967, and the geographical expansion of Israeli territory resulting from the 1967 war had required an "expanding network of signal services."³²

Bad personal relations among Israeli senior commanders led to a reverse of the maximum independence that had been granted to subordinate commanders in the 1967 war. In the Israeli counterattack on October 8, 1973, General Elazar, the chief of staff, insisted on personally approving company-sized moves.³³ In addition to problems in the chain of command, other breakdowns in command and control included the inability of the Israelis to keep themselves informed of Egyptian locations. Israeli tactical intelligence barely functioned during the first days of the war. Radio communications were disrupted by Egyptian jamming, and the constant and lengthy use by various Israeli headquarters led to mutual interference. As evidence of the poor communications, according to Van Creveld, General Adan in the northern sector of the front "by his own admission had no idea of what was happening."³⁴

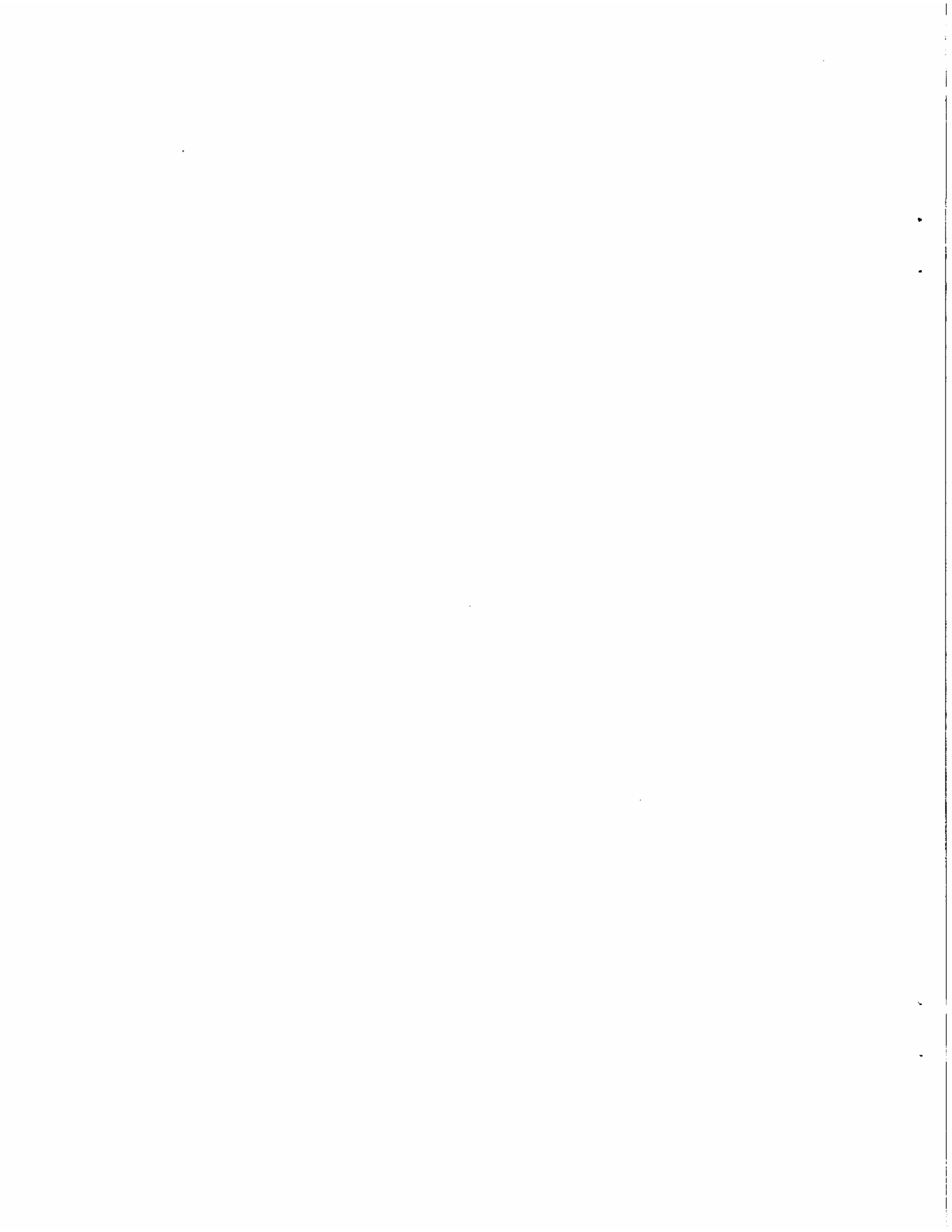
The Israeli command and control failure in 1973 was not due primarily to technological inadequacy. The problems stemmed from poor organization, weak procedures, inadequate doctrine, and mistrust among senior officers. However, advanced technology -- now being introduced in the Israeli and other armies -- could have solved some problems such as locating Israeli subordinate units, knowing Egyptian positions, and communicating between Israeli commanders.³⁵

The abilities of Third World countries to use command and control capabilities vary greatly because of differences in leadership, organization, technical skills, and experience. However, Third World nations are recognizing the importance of this element of military power and have taken steps to improve their capabilities. The increased willingness and abilities of some Western suppliers to provide command and control systems and the growing interest by the Third World in their capabilities have been significant. To obtain these capabilities, most must rely on transfers from the developed countries, although a few Third World members have begun indigenous production of command and control equipment. Chapter 3 looks at this new development.

CHAPTER 2 NOTES

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INDIGENOUS THIRD WORLD PRODUCTION
OF COMMAND AND CONTROL CAPABILITIES

Studies of weapons production in the Third World are usually limited to major categories such as aircraft, engines, missiles, vehicles, naval vessels, and small arms. They seldom include command and control systems or even the more generic category of communications equipment or electronics; as a SIPRI analysis has stated, "Electronics can vary from relatively simple types of equipment such as compasses or radios, to very sophisticated types of avionics."¹ However, this chapter will examine the background and recent developments concerning the production of command and control systems in the Third World. It will begin by first portraying the environment in which these developments are taking place.

Weapons Production in the Third World

Third World arms industries have achieved limited success in developing and producing command and control systems. In those few Third World countries that do produce command and control equipment, the defense industries had been established earlier for the manufacture of other simpler and more traditional types of military equipment. For the most part, however, the arms industries in the Third World target simple, cheap, and reliable systems such as transport planes, light tanks, armored personnel carriers, and other vehicles.²

Weapons production in the Third World grew in the 1960s when several countries began producing arms for their own forces, although the origins of some national industries predate World War II. For example, Brazil attempted several times to set up an aircraft industry between

1910 and 1940. The Argentine and Indian aircraft industries date to 1927 and 1940 respectively.³

However, the most common production of weapons in the Third World has been and is still small arms and ammunition. Arms industries in several countries have expanded to include production of armored vehicles, naval vessels, and missiles and rockets. In addition, by the 1970s several Third World countries, including Argentina, Brazil, India, Iran, Israel, North Korea, South Africa, and Taiwan, had produced combat aircraft.⁴ Efforts to establish aircraft production show more sophisticated capability than the manufacture of small arms and munitions.

By the 1980s aircraft, missiles, warships, armored vehicles, and other systems produced by several developing countries had become sufficiently advanced that they could compete with those marketed in the Third World by the established arms suppliers. In addition, the emerging group of newly industrializing countries has also entered the competition with smaller arms.⁵ As SIPRI analysts reported in 1985,

Most countries with a growing industrial base -- particularly the so-called newly industrialized countries (NICs) such as Singapore, South Korea, Taiwan, and others on the threshold to industrialization such as Argentina, Brazil, Egypt, India, Indonesia, Israel, the Philippines, and South Africa -- are engaged in major-arms production.⁶

According to the 1985 SIPRI yearbook, "Israel has established the most sophisticated arms production capacity of all the developing countries."⁷ The Israeli arms industry manufactures "a wide range of weapons including the Shafrir air-to-air missile, the Gabriel sea-launched missile, and most notably the Kfir fighter; 40 percent of Israel's weapons are made at home; arms exports are estimated to have increased eight-fold since 1973 to \$500 million per annum."⁸

The increasing indigenous weapons production capability in the Third World has caused its share of world arms exports to rise sharply from

2.3% in 1973 to over 11% in 1983. The most prominent exporters in the Third World in 1983 were China, South Korea, North Korea, Pakistan, Israel, and Brazil.⁹

Motivations

Third World weapons production is motivated by a variety of political, security, and economic factors. An overriding concern is the desire to eliminate or greatly reduce the dependence on developed countries for weapons, and particularly the country's susceptibility to military or political coercion during crises.

The level and frequency of regional conflict can prompt domestic arms production. For example, Third World arms producers such as Israel and South Africa reside in areas of recurring regional conflict and, because of previous arms embargoes, perceive a need for a guaranteed supply of weapons that is best ensured from domestic sources.¹⁰

In addition, when a receiving nation is dependent on the supplier for more than initial support, the supplier can exercise considerable leverage. For example, the war between India and Pakistan in 1965 was quickly terminated when Great Britain and the United States imposed an arms embargo on both sides. Again in 1971, when the United States refused to resupply ammunition and other basic items, the war between El Salvador and Honduras ended in one week. In 1973 the resupply policies of the United States and the Soviet Union greatly influenced the duration and course of the Yom Kippur War in the Middle East.

In assessing Iranian military capabilities in the early 1980s, William O. Staudenmaier, Director of Strategy for the U.S. Army War College's Center for Land Warfare, noted that it is difficult to win a conflict without an indigenous production base or guaranteed supplies. Iran grounded most of its air force, and a major part of its armor force

did not see action in the early phases of the Iran-Iraq war because it could not obtain supplies from the West and its maintenance personnel did not have the skills needed to keep the equipment operational. The lesson, he observed, is that a nation without indigenous support, "including stockpiles of arms and ammunition, is at the mercy of its international arms suppliers."¹¹

In the words of Geoffrey Kemp:

It is difficult to think of an example of protracted, high-intensity war in less industrialized regions that has not ultimately been dependent upon the industrial powers to sustain it, and such dependencies may be growing.¹²

Indigenous Arms Production

Regardless of the motives, the ability of Third World countries to develop indigenous arms production depends on several factors. These factors include financial resources, the level of industrial development, and scientific and educational facilities. In addition, to compensate for the high costs of production when domestic requirements are low, access to export markets is also important.

Countries that have reached self-sufficiency in production still may depend on foreign design and development. Research and development costs are generally too prohibitive for Third World countries to undertake such a project. High technology systems usually require long production runs to lower costs. This permits greater economies of scale inherent in increased production and the allocation of research and development costs over more units. If no export market is available, the unit price would be significantly higher than that of a system purchased abroad.

Third World countries have great difficulty avoiding some dependency on the advanced technology of the major arms suppliers. The most sophisticated systems will continue to require technology available only

in developed countries which subjects their use and export to outside veto. A related example is the Carter administration's refusal to allow the sale of the Israeli Kfir fighter, equipped with the General Electric engine made for the U.S. F-4 Phantom, to Ecuador.¹³

Even when a Third World country is able to produce advanced weapons, it may not be able to build the next more technologically complex weapons without external assistance. As SIPRI analysts have stated, "Advances in weapon technology create continuing difficulties for reaching self-sufficiency."¹⁴

Even joint ventures involving sophisticated systems are difficult to carry out. In 1975 the Arab Military Industrial Organization, later renamed the Arab Organization for Industrialization (AOI), was set up in Egypt. Other participating Third World members included Saudi Arabia, Qatar, and the United Arab Emirates (UAE). Its goal was to manufacture weapons for Arab countries through coproduction arrangements with France and Great Britain. Technical and financial difficulties prevented this venture from successfully producing advanced systems, such as the French Mirage F-1.¹⁵ The efforts of the AOI were disrupted when it was moved to the UAE in 1979 because of disputes with Egypt over its peace negotiations with Israel.

In some cases, state support for defense industries (particularly aeronautical firms) has improved their vitality and spurred their growth in sophisticated technology. Examples include Hindustan Aeronautics in India, Israel Aircraft Industries, Atlas Aircraft Corporation in South Africa, and Empresa Brasileira de Aeronautica (Embraer) in Brazil.¹⁶

Command and Control

Indigenous arms industries in the Third World have been unable to compete in developing and producing advanced command and control

systems. Most Third World countries do not have the diversified production base and technical resources for developing such systems. They also lack a reasonable output capacity needed for exporting military command and control systems. In addition, most also lack the technical programs for educating scientists and must rely on the assistance of foreign technicians and engineers for their indigenous arms industries.¹⁷

Although David Whynes noted that indigenous production in Third World countries taken over by the defense establishments were beginning to provide many of the military requirements as well as "expanding into the civil market with the supply of radio components, transmitters and receivers, as well as navigational aids for shipping,"¹⁸ such expansion has been limited to commercial equipment with export potential and military items that are less technically advanced.

One reason, according to Oswald H. Ganley, former U.S. Deputy Assistant Secretary of State for Science and Technology and now Director of International and Allied Arenas at the Harvard University Program on Information Resources Policy, is that

communications and information technologies are among the most sensitive of all technologies to be singled out by the U.S. government for strategic and foreign policy export control reasons.¹⁹

In addition, the Soviet Union's scientific and military research community seems to be reluctant to provide such technology through transfer agreements with Third World countries to avoid disclosing existing state-of-the-art capabilities.²⁰

Further, most command and control systems are dominated by software. They must respond to a wide variety of combat situations and depend on elaborate computer programs to direct them on the procedures they must

use and the operations they must carry out.²¹ The magazine Defense Electronics recently reported:

Writing, debugging and maintaining software is [sic] proving to be the biggest stumbling block in C³I system development. Programs used to be paced by hardware development, but now software problems account for most of the glitches in C³I programs.²²

The technical expertise of most Third World members is insufficient to develop the software packages for command and control systems.

Although most Third World weapons production is limited to ammunition and general military equipment, several countries have negotiated special licenses with Western suppliers to manufacture electronics needed for command and control systems. According to the U.S. Arms Control and Disarmament Agency, these agreements include such systems as aircraft avionics, electronic countermeasures, computerized instrumentation for target acquisition, and microcircuits for military application.²³ For example, Egypt has signed a coproduction agreement for the AN/TPS-63 radar with Westinghouse.²⁴

As a result, although a few Third World countries are expanding into the production of components for command and control systems, most still must rely on imports for their requirements. For example, although Brazil's arms industries have achieved rapid growth, they still must import command and control components for advanced weapons being produced under foreign license.²⁵ As a SIPRI study has observed, for military electronic equipment, "indigenous production is considerably more expensive than importing."²⁶

India, which has more than 20 defense plants in operation,²⁷ has established several firms to produce military electronics equipment. As early as 1964 Bharat Electronics Limited was set up to manufacture transmitters, radars, and other components that could be used for

command and control. Later in the late 1960s electronics factories at Hyderabad were established with Soviet assistance to make avionics for the Indian-assembled MiG-21 aircraft.²⁸

In 1978 the AOI agreed with several American firms to establish a joint company to manufacture military electronic equipment in Saudia Arabia.²⁹ This facility was designed to build aircraft electronic systems, ground defense equipment, and communications systems.³⁰

Most arms production in the Third World is limited to those items that can be exported, thus taking advantage of a larger market than that provided strictly by internal requirements. However, Third World countries are not in a favorable competitive position to develop and market command and control systems because of the broader technological base and technological superiority of the developed countries.

Israel: The Unique Case

The one Third World nation with indigenous arms industries able to develop and produce advanced command and control systems seems to be Israel. After having developed expertise in manufacturing systems for aircraft, missiles, rockets, and other military equipment, Israel is now producing advanced "electronics and avionics, and a comprehensive range of tactical communications equipment."³¹ The Israeli defense industry has developed to such an extent that there are now ". . . multiple suppliers for virtually every area of technology. Even specialized electronics companies are finding themselves in unhealthy competition with each other."³²

The Israel Aircraft Industries, set up in 1953, has expanded its operations to include electronics and other communications equipment designed and produced by its subsidiary, Elta Electronics Industries. Elta is developing the communications systems, radar, and electronic

warfare suite for the Lavi project, an advanced fighter-attack aircraft to replace Israel's Kfir fighter in the 1990s. Further, the Israeli Ministry of Defense has established Raphael, the largest research and development facility in the country. One of its four divisions is responsible for electronics and develops computing systems, communications, radar, and electronic warfare systems.³³

Many Israeli defense electronics companies are focusing their attention toward the export market. Elta Electronics Industries is a \$130 million-per-year company that earns about 50% of its revenue from exports. Elisra Electronic Systems Limited, which advertises itself as the "Electronic Warfare House of Israel," is another "good example of the [Israeli] trend to look toward foreign markets for continued growth," according to David M. Russell, editor of Defense Electronics.³⁴ Because Israel has used its indigenously produced equipment successfully in combat (particularly in the 1982 clash with Syria as Chapter 4 discusses), it has achieved some success in marketing its military command and control systems to other Third World countries. The most prominent example, reported in Newsweek September 1985, is Israel's agreement to sell

an advanced AWACS-type aircraft to Argentina. The plane, a modified Boeing 707, comes equipped with highly sophisticated Israeli intelligence-gathering equipment capable of pinpointing land-based missile sites and radar installations, tracking ships at sea and monitoring air battles.³⁵

Current Status

In his report on the evolution and growth of arms production in the developing world, Michael Moodie highlighted Israel as being the only Third World "country to make strides in electronics with India achieving some success as well. Otherwise, progress in this realm has been limited throughout the Third World."³⁶

Although many Third World countries manufacture commercial electronic products for export, most lack the technological base to design military command and control systems other than some radios and communications equipment. Since this capability is limited, the Third World relies on transfers to provide it with advanced command and control capabilities. The next chapter examines these transfers and the issues surrounding them.

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TRANSFERS OF COMMAND AND CONTROL SYSTEMS

With such limited indigenous development of command and control systems in the Third World, developing countries must turn to the industrialized nations to improve their command and control capabilities. However, even countries such as France are reported to have difficulties in developing these systems. According to SIPRI analysts, the arms industry in France, the world's third largest supplier of weapons to the Third World, does not have the ability to produce the full range of command and control systems needed by the French armed forces.

Because successive French governments have viewed an autonomous capacity to produce arms as being indispensable to France's political independence and national security, its arms industry has expanded broadly to provide the French military most of its weapons and related equipment ranging from light arms to supersonic aircraft and including nuclear weapons and their delivery systems. However, the French defense manufacturers are limited in their ability to meet all of France's requirements for command and control systems such as advanced air defense and battlefield control equipment.¹ Even with its limitations, France has increased its export of command and control systems to the Third World.

In 1983 a SIPRI analysis contended that French exports of command and control capabilities had not been as significant to its arms industry as its deliveries of aircraft, missiles, and ground equipment to the Third World, but it noted that equipment for "communications and control looms increasingly important in the future as a source of sales, as developing states increase [their] demand for these items to modernize their armed forces."² The prediction was right on target

because in January 1984 France received an order from Saudi Arabia worth 34-40 billion francs (over \$4 billion) -- the largest arms contract ever received by France, surpassing the total value of French arms ordered during 1983. The contract included ground command and control systems to provide a low-level air defense network for the Saudis.³

Export Sales of Command and Control Systems

Export sales are critical to France's arms industry, and they are becoming more important in the area of defense electronics. For example, Thomson-CSF, France's primary military electronics company, depends on exports for over half of its arms sales. In addition, other manufacturers, including the electronics firm of Dassault, export over 50% of their military products.⁴

A major reason has been the contribution that export sales have made to achieving cost savings, as discussed in Chapter 2 and proven in past production of aircraft, missiles, and other weapons. Unit costs can be reduced significantly if export sales can absorb overhead and non-recurring costs, facilitate production flow by eliminating gaps, and exploit production learning curves. In particular, potential cost savings can be significant for command and control systems such as communications equipment, according to Edward R. Fried, formerly the U.S. Deputy Assistant Secretary of State for Economic Affairs.⁵

The momentum in marketing command and control systems (see Chapter 1) has been assisted by several international exhibits held to demonstrate new products. In addition to the annual exhibition conducted by the U.S. Armed Forces Communications and Electronics Association (AFCEA), an international exhibition of command and control systems has been conducted in Belgium since 1976. The display, known as "Electronics for National Security," is held twice a year and features

many of the world's leading manufacturers of command and control components. It had been conducted previously in West Germany as the Military Defense Electronics Exposition/International Defense Electronics Exposition.⁶

The British also have begun to promote their arms sales more actively. In 1985 Prime Minister Thatcher appealed personally to King Fahd of Saudi Arabia and Prime Minister Gandhi of India to sign contracts with the British defense industry,⁷ which has developed several advanced command and control systems. It has regained a strong technological position and, according to a SIPRI analysis, "has a lead among European companies in military electronics."⁸

For example, Britain has just sold its Blindfire radar to Indonesia⁹ and other command and control systems to China. In addition, in September 1985, Prime Minister Thatcher signed a \$360 million contract to supply Jordan with military items, including electronic warfare and communications equipment.¹⁰ Later that year GEC Avionics Limited announced that it would supply the command and control systems in a proposed joint venture with U.S.-based Lockheed to produce an airborne warning and control system (AWACS) aircraft to compete with the E-3A Sentry and the E-2C Hawkeye.¹¹

Other European firms are also benefitting by the momentum in sales of command and control systems. In addition, U.S. companies are providing the products required by an intensified U.S. security assistance policy of enhancing command and control capabilities in the Third World. The most prominent program -- and controversial (it was approved narrowly by the U.S. Senate in 1981 by a 52-48 vote) -- is the sale to Saudi Arabia of five E-3A AWACS aircraft with deliveries that began in mid-1986, but other U.S. programs to the Third World also are increasingly featuring command and control capabilities.

command and control capabilities, but they are not the only ones. As Michael Moodie has observed, "The development of an electronic-defense environment is already well underway in the Middle East; the American-Saudi AWACS deal [in 1981] is only the latest step."²³

The GCC countries have begun a long-range effort to improve their command and control capabilities. The International Institute for Strategic Studies (IISS) in London noted in 1985 that the Persian Gulf states have continued to build their defense capabilities, "especially in the sector of C³I."²⁴ The U.S. AWACS sale, for example, is part of a Saudi program projected at \$4 billion to link its armed forces with those of Bahrain, Kuwait, Oman, Qatar, and the UAE in a command and control network to improve their air defense of the Persian Gulf.²⁵ The Saudi contract with France for ground command and control systems will provide a low-level air defense network which will be used with the high-altitude capabilities that will be provided by the U.S. AWACS fleet.²⁶ Other recent agreements include the purchase of a sophisticated radar air defense system by Kuwait from France²⁷ and the Marconi S-713 radar from Britain by Oman.²⁸

Similar efforts begun in late 1980 include a Saudi project to modernize the command and control systems for the Royal Saudi Naval Forces (RSNF). Science Applications Incorporated, a U.S. high technology firm, was selected as the systems integrator and prime contractor. Within a year, the project had provided a manual command and control system in existing RSNF facilities and an automated information handling system to supplement the manual system. In addition, an automated command and control system for three new RSNF centers was being added as a second stage of the project.²⁹

. Saudi Arabia: "Increase air and ground defense through . . . command and control, and high technology equipment."¹⁷

In addition to these programs, other Third World countries are expected in fiscal year 1987 to participate in U.S. cash sales programs or commercial military exports aimed at upgrading their command and control capabilities. They include:

. Saudi Arabia, where "efforts to enhance command, control, and communications capabilities will continue, as will a program to better integrate the air defense systems of the Kingdom,"¹⁸

. Kuwait, which will be purchasing "an upgrade of its air defense command and control system,"¹⁹

. United Arab Emirates, which "is considering upgrading its early warning systems through the purchase of E-2C early warning aircraft [see subsequent section in this chapter on the use of E-2C aircraft in the 1982 Israeli-Syrian conflict],"²⁰

. Bahrain, which is considering the "acquisition of early warning radar systems, possibly as part of a Gulf Cooperation Council* (GCC)-sponsored regional integrated air defense system,"²¹ and

. Singapore, which also is expected to buy E-2C aircraft and receive training in communications.²²

Middle East and Persian Gulf

U.S. programs for enhancing command and control capabilities in the Third World are not limited to the Middle East, as the previous discussion shows, but the focus of providing the more advanced systems appears to be that region. U.S. programs are a major component of the efforts by several Third World nations in that area to upgrade their

*The GCC was formed in 1981; members include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE.

Major Element of Security Assistance

The shift in emphasis toward enhancing these capabilities is best shown in the U.S. Defense Department documents that are prepared for congressional review of proposed security assistance programs. These documents now identify command, control, and communications as a major element of U.S. security assistance provided through funded programs such as Foreign Military Sales (FMS) credits or Military Assistance Program (MAP) grant credits. Improving command, control, and communications is an element of the U.S. security assistance programs proposed for fiscal year 1987 for a significant number of Third World countries, including Bolivia, Botswana, Columbia, Dominican Republic, Ecuador, Egypt, Gabon, Honduras, Israel, Malawi, Malaysia, Morocco, Niger, Pakistan, Peru, Philippines, Somalia, South Korea, Sudan, Thailand, Tunisia, and Zaire.¹²

Although the portion of these programs for command and control is not a major share (less than 20% for each one) of the anticipated funding, the 1987 proposal does show the pervasiveness of command and control assistance in U.S. arms transfers. In particular, program objectives have been established for several countries, specifically aimed at improving their command and control capabilities. These include:

- . Egypt: "Improve integration of nationwide air defense force";¹³
- . Malawi: "Continue implementation of a multi-year tactical communications system";¹⁴
- . Philippines: "Improve tactical communications";¹⁵
- . Somalia: "Implement a command and control systems";¹⁶ and

*Other elements include new systems, systems upgrade, infrastructure, spares and support sustainability, and economic support.

There have been several other improvements in command and control capabilities in the Middle East. In 1985 Egypt signed an arms agreement to purchase the Italian Skyguard air defense system.³⁰ In 1984 Jordan, after being denied advanced weapons by the United States, signed a contract with the Soviet Union for air defense radars.³¹ The following year it agreed to buy British electronic warfare and communications equipment.³² In addition, the Soviet Union also has upgraded Syrian air defense equipment.³³

Further, Kuwait is modernizing its air defense systems. The interesting aspect of this case is that "Soviet and U.S. advisers will in the future work side by side"³⁴ in this effort. The United States agreed in 1984 to upgrade Kuwaiti surface-to-air missile systems, but denied a Kuwaiti request for other military equipment. Later that year Kuwait turned to the Soviet Union for the items that it wanted to buy and signed an agreement worth over \$300 million.³⁵

Balancing the Superpowers

The Kuwaiti and the earlier Jordanian cases are not the first times that Third World countries have been able to play one superpower off against the other in negotiating new transfers of command and control systems. After the 1973 Middle East war, Jordan indicated to the United States that it wanted to purchase an air defense system. Because Congress was reluctant to support this proposal, King Hussein visited Moscow in mid-1976 and discussed such a purchase from the Soviet Union. U.S. concerns about Soviet military ties with Jordan overcame the earlier objections, and 14 batteries of Hawk anti-aircraft missiles were transferred to Jordan.³⁶

Loss of potential sales can be a major concern, particularly for those suppliers dependent on an export market to sustain their arms

industries. A more critical issue militarily, however, is the risk of what can happen to advanced systems once they have been transferred to a Third World country as seen in the U.S. sale of the F-14 Tomcat to Iran.

Use of Systems

When the Shah was toppled, Iran had 80 F-14 fighters that had been bought for \$3 billion and several hundred Phoenix missiles, each costing about \$250,000. Not only is the F-14 one of the most advanced combat aircraft, but the Phoenix missile is considered the best of its kind. The Phoenix missile relies on advanced technology, particularly the Hughes weapons control system. With the transition of government in Iran, there was grave concern in the United States that the secrets of the Phoenix could be compromised, particularly since the Soviet Union did not have such advanced missiles or command and control systems.³⁷

Similar concerns have been expressed over the U.S. agreement to sell the E-3A AWACS aircraft to Saudi Arabia. However, this sale is not the first one proposed to transfer command and control aircraft to the Third World. In the 1970s the Iranian air force was scheduled to receive seven AWACS planes. These aircraft would have been the first U.S. AWACS planes sold outside of NATO. This agreement took place when the U.S. arms sales to Iran were the largest in the world and included 224 F-4, 41 F-5, 80 F-14, and 160 F-16 fighters. In addition, Iran was buying a modern air defense system with surface-to-air missiles.³⁸

The AWACS order amounted to \$1.3 billion but was never delivered. Because of the unusually long interval between the placement of the order and its delivery, the planes had not been delivered when the revolutionary Iranian government took power and cancelled most of the undelivered systems. The AWACS planes were part of the \$12 billion of

U.S. weapons and systems that had been in the pipeline awaiting delivery.³⁹

The military significance of having the command and control capabilities provided by an AWACS aircraft is indicated by the early view of the U.S. Air Force in the mid-1970s. Brigadier General John E. Ralph, when responsible for Air Force doctrine and concepts, stated in 1974 that:

AWACS will provide local and theater commanders with an increased capability for planning, directing, coordinating, and controlling combat operations. These systems can also be the nucleus for close cooperation and compatibility among all Service and allied control systems.⁴⁰

As discussed in Chapter 2, a supplier frequently loses control over how military weapons will be used once they have been delivered. The question of how the AWACS will be used by the Saudis has greatly concerned Israel. The Saudis have already used the AWACS capability to monitor the Iran-Iraq war and in the mid-1980s shot down an intruding Iranian fighter with a Saudi F-15. Israel has expressed concern that the Saudi AWACS capability could be used to direct a sophisticated Arab attack against Israel, although the radios and radar of Soviet aircraft flown by countries such as Syria are incompatible with the AWACS.⁴¹ It was because of these concerns that the United States reached an early agreement with the Saudis concerning employment of the AWACS that included the guarantee that the planes would remain dependent on American technicians and logistics support.⁴²

When President Reagan certified to Congress on June 18, 1986, that security requirements for transferring the five E-3A aircraft to Saudi Arabia had been met, he said that U.S. assistance would include 450 Boeing employees and 21 U.S. Air Force personnel. In addition, the

provisions for guaranteeing the security of the AWACS equipment, technology, and information included the U.S. government's:

- . Maintaining ownership of computer software;
- . Retaining approval authority over any operations outside of Saudi boundaries or for offensive purposes;
- . Retaining the right to prevent any third country from performing any maintenance actions or modifications to the AWACS aircraft or equipment;
- . Receiving information acquired from AWACS operations; and
- . Being able to inspect security arrangements of the aircraft throughout their useful life.⁴³

Technology Absorption

Another problem, which is very critical to command and control transfers, is the ability of the recipient to maintain, operate, and use effectively the command and control systems. Many Third World countries do not have the technical, educational, and industrial base for supporting these systems. There are few people with the skills needed in handling the technology associated with sophisticated command and control systems. Because of technology absorption problems, recipients may become dependent on large numbers of foreigners to maintain and operate advanced systems or on sending large numbers of its personnel to the exporting nation for training.

Because of the difficulties in assimilating the systems they were buying, Iranians had to have in their country a substantial number of Americans -- up to 40,000 by 1978 -- and a smaller number of West Europeans.⁴⁴ According to Andrew J. Pierre, Iranian officials were not "adequately informed by their American counterparts of the full extent of the training, logistics, and maintenance implications of the systems

they were being sold, a matter that later led to serious problems."⁴⁵ More recently, the New York Times reported in 1986 that Egypt was having difficulty absorbing advanced U.S. military technology "because of illiteracy, low technological standards, cultural differences and an inelastic command system."⁴⁶ According to Egyptian officers, 75% of their enlisted personnel that are drafted are illiterate when they enter military service.⁴⁷ As U.S. Air Force officials have discovered, many Third World countries like Egypt lack "a career force of highly skilled NCOs [non-commissioned officers]"⁴⁸ that is necessary to supervise maintenance and other logistics activities to keep advanced systems operational.

Difficulties brought about by technology absorption problems in employing command and control systems effectively are compounded in combat by the new threats of advanced electronic warfare. As discussed in Chapter 1, survivability is a key driver for improvements in command and control capabilities.

Vulnerability

Vulnerability of command and control systems is another major concern because of new advances in electronic warfare. How command and control networks for air defense were disrupted in the 1973 Middle East War has already been discussed in Chapter 2. A more recent example is the brief conflict in mid-June 1982 between Syria and Israel in the Bekaa Valley of Lebanon. Despite the limited fighting that took place, the role that command and control systems played was significant.

During the 13 months preceding the conflict, Israel flew surveillance missions using drones and reconnaissance aircraft over Syrian missile batteries to learn "about Syrian radar characteristics, communications equipment and procedures, command-and-control structure, weapons

capabilities, and air defense tactics."⁴⁹ At the start of the attack, Israeli drones were launched so the Syrians would activate their radar control systems, making them vulnerable to antiradiation missiles. The prior knowledge of Syrian command and control systems enabled Israel to destroy the Syrian air defense system, including 20 missile batteries.

Israel's success in using drones against command and control systems is unique. Even major powers, including the U.S. Air Force which pioneered such systems, do not use drones in as many different functions as demonstrated by the Israelis.⁵⁰

Airborne Platform

The Israelis were influenced by the U.S. tactics of disrupting an opponent's command and control network. Tactical concepts being taught by the U.S. Air Force to its fighter pilots in combat training exercises at Nellis Air Force Base, Nevada, include "'rolling back the umbrella' of enemy air defenses by jamming radars and attacking the most lethal SAMs [surface-to-air missiles] first."⁵¹

Airborne platforms have been developed to deny enemy radar coverage of friendly activities and to degrade enemy command and control systems. The Soviets have developed several aircraft with electronic counter-measures (ECM) systems. These include the An-12, Il-20, and Yak-28.⁵² The newest and most sophisticated U.S. platform, the EF-111 Raven, has seen action against a Third World nation.

As early as 1974 General Ralph said that the EF-111 would be used for "concentrated jamming in a small airspace to permit unhampered air support of a surface operation, such as resupply, rescue, or strike."⁵³ Twelve years later in early 1986, EF-111s operating from Great Britain performed this mission in the U.S. raid on Libya, and they were

effective in disrupting Libyan radars and other command and control systems.

Similar systems have been developed to interfere with command and control systems at sea. The Soviets have been particularly adept in this aspect, according to U.S. Vice Admiral David C. Richardson, former commander of the U.S. Sixth Fleet in the Mediterranean and deputy commander of the U.S. Pacific Fleet. Admiral Richardson has stated that the Soviets have determined that Western navies are dependent on a high degree of electronic command and control activities and that they have "designed standoff weapons that could exploit, through their sensor systems and their terminal guidance systems, our great dependence on electronics."⁵⁴

A Decisive Factor

These advanced ECM capabilities further exploit the vulnerabilities of command and control systems. Yet even with these vulnerabilities and other problems in transferring command and control equipment to Third World countries, efforts to upgrade their systems have continued. These capabilities are a decisive factor in the outcome of Third World conflicts. The 1982 Syrian-Israeli clash is again illustrative.

Crucial to Israel's success in the conflict were its four E-2C Hawkeye airborne early-warning aircraft, which were equipped with communications equipment to transmit tactical intelligence to ground command-and-control stations. The E-2Cs were used to detect Syrian aircraft, track them into Lebanese airspace, and direct Israeli fighters to intercept them. Armed with sophisticated air-to-air missiles, Israeli aircraft were vectored by the command and control system against Syrian pilots, who often had been fired at without even

seeing their attackers and who had little or no information about the location of the Israeli planes.⁵⁵

The Israeli command and control structure proved to be effective. No Israeli plane was lost in air-to-air combat as its air force downed 85 Syrian aircraft. (Two Israeli fighters were lost, however, to ground fire.) As W. S. Carus, a military analyst, has written,

The most important feature of the aerial battles that took place in Lebanon, however, had nothing directly to do with the aircraft or weapons employed. More significant was Israel's innovative use of highly sophisticated battle management techniques to control the operations of its fighter aircraft. In the modern electronic battlefield, success in air-to-air combat is likely to require such a system to provide extensive coordination between fighters and an integrated command-and-control net that can pass real-time information to pilots.⁵⁶

In assessing the impact of the E-2C on regional military balances, Steven Rosen has written,

Its greatest appeal is the possibility to act as a force multiplier for the defender, providing oversight of the entire area of the enemy's potential attack and, based on the "big picture" of the enemy's deployments, allowing allocation of scarce defensive resources earlier and far more effectively than was formerly possible with piecemeal intelligence and without downward-looking radars and real-time communications.⁵⁷

According to the U.S. Defense Department reports, the E-2C Hawkeye can perform a variety of command and control functions. In addition to detecting enemy aircraft and vectoring interceptors into attack positions, it can provide assistance for "surveillance coordination, strike force and air traffic control, communications relay, and search and rescue."⁵⁸

Apparently these lessons have been learned. For example, according to the IISS, five E-2C aircraft have been ordered by Egypt.⁵⁹ Singapore has purchased four.⁶⁰ Other Third World countries such as the UAE also

have expressed an interest in obtaining the E-2C's capabilities (see earlier section in this chapter).

To vie in the expanding market for airborne command and control systems with the Grumman E-2C and the Boeing E-3A, Lockheed announced in October 1985 plans to modify the C-130 with command and control systems to provide it with AWACS capabilities. According to Lockheed officials, "the Middle East and the Far East" are potential customers, but Lockheed must obtain a minimum of 10 sales before it commits itself to the project.⁶¹

These systems are expanding significantly the command and control effectiveness of Third World countries and have a great potential for being a decisive factor in future wars. A country without these capabilities can be handicapped greatly as the following case points out. In the early 1980s in the first phase of the Iran-Iraq war, Iran used its F-14 Tomcats only for their radar capabilities and limited their role to guiding other planes, such as its F-4s and F-5s, to their targets.⁶² Although the limited role for the F-14 was attributable also to operational and logistical problems, it does show that because some Third World countries have lacked effective command and control systems, they have had to rely on the inefficient use of other equipment to provide the needed capabilities.

Lack of Effective Command and Control Capabilities

The lack of effective command and control capabilities has also handicapped several Third World countries from successfully pursuing military campaigns as the 1979 Sino-Vietnamese conflict illustrates. On February 17, 1979, the People's Republic of China (PRC) invaded Vietnam in what the PRC called a "lesson" for the Vietnamese. The invasion lasted less than a month, and on March 5, the PRC announced that its

troops were withdrawing to Chinese territory. The invasion was limited not only in time; naval and air forces were conspicuous by their absence from the battle.

To some analysts, the 1979 Sino-Vietnamese conflict was unique in that it was "the first invasion of a communist country by another without any pretense of an ideological justification or any 'invitation' by that country's people."⁶³ It was also unique in that although it was begun to teach Vietnam a lesson, it appears that the Chinese learned more lessons than their opponents did. According to Harlan W. Jencks, an adjunct professor of national security affairs at the U.S. Naval Postgraduate School, a primary military lesson learned by the Chinese was their shortcomings:

in command, control, communications, and intelligence (C³I), especially at the front and corps levels. At lower levels of command, it appears that coordination, particularly between maneuver elements and fire-support elements, was very poor.⁶⁴

Much of China's military equipment is badly out of date. The PRC's lack of modern weapons and systems with newer technology, including advanced communications equipment, has been cited for the difficulties that the Chinese army had during 1979 in dealing with the better-equipped Vietnamese.⁶⁵ As a result, current efforts by the PRC to modernize its armed forces include procuring more advanced command and control systems. China has obtained computers and radars, and it is negotiating to purchase a wide range of command and control systems from several countries. France has sold it radar, and Great Britain has sold fire-control equipment and other systems.⁶⁶

In mid-1986 the Reagan administration announced an arms sale package to the PRC, which included, not only \$550 million of advanced avionics, including radar, navigation and computer equipment to upgrade Chinese

interceptor aircraft, but also the possibility of future sales of command and control equipment to help China modernize in the area of battlefield management.⁶⁷

The next chapter continues the theme of transfers of command and control capabilities but focuses more on assistance provided to Third World nations rather than the sale of equipment.

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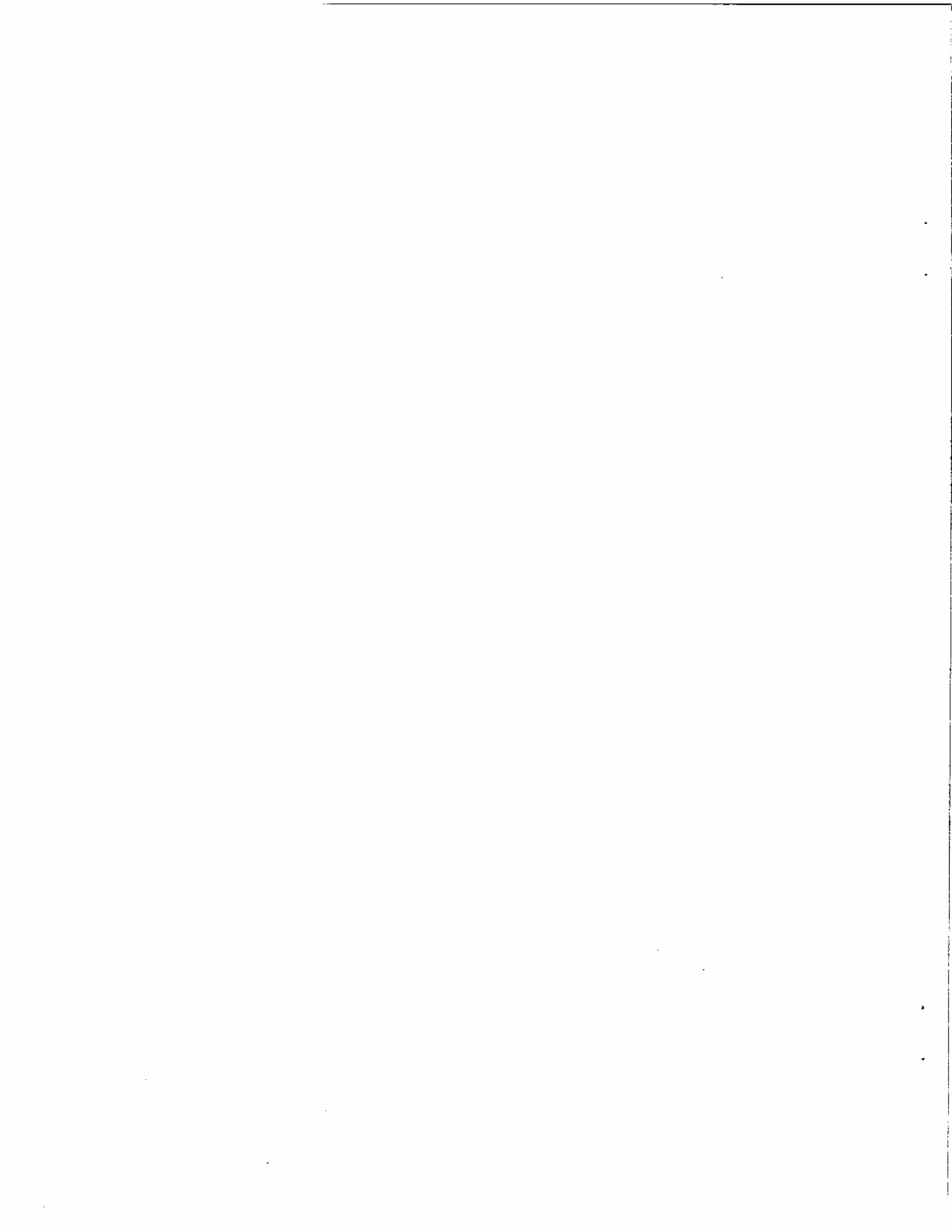
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COMMAND AND CONTROL ASSISTANCE

Arms trade issues generally focus on items such as tanks, missiles, planes, and other pieces of equipment. For command and control capabilities, the transfer includes more than just the hardware. Assistance can also be provided through software, concepts, procedures, and intelligence.

Superpower Involvement

Chapter 2 outlined the patterns in recent Third World conflicts, including the involvement of external powers. Command and control assistance has become a primary means of foreign participation. The propensity of one or both superpowers to be drawn into conflicts by providing command and control support to a Third World member has increased. Even though some developing nations have acquired advanced command and control capabilities for their forces, their growing capabilities are still meager when compared to those of the United States and the Soviet Union. Particularly important are the contributions now being made by each superpower's satellites.

The move to space for command and control systems is seen in the words of Lieutenant General Richard C. Henry of the U.S. Air Force Space Division, "The global movement of information seems to be one thing we can use space for that we have not learned how to do on earth."¹ U.S. space-based systems have been used extensively for command and control functions, and the Joint Chiefs of Staff have stated that "U.S. military forces depend heavily upon space systems in peacetime, crisis, and conflict."² Of the two superpowers, the United States is more dependent

on command and control satellites, with 70-80% of all U.S. long-haul military communications transmitted via satellites.³

Space assets play a major role in Soviet command and control operations, and their reliance on these systems is growing,⁴ although as Colin S. Gray has reported, the Soviet Union has invested significantly in redundant ground-, sea-, and air-based command and control facilities to prevent an overwhelming dependence on space-based assets. However, as Soviet forces deploy further from the Soviet heartland, the benefits of space-based command and control systems increase.⁵ Command and control support provided by the Soviet space program includes real-time communication and information assistance to the Soviet tactical commander, since "the Soviets perceive that future combat will place great stress on existing command, control, communications and intelligence systems."⁶

Assistance from Satellites

Command and control assistance has been provided in several Third World conflicts by the superpowers using their space-based assets. One of the first uses occurred during the 1973 Arab-Israeli War when "Soviet advisers used space assets to inform Egyptian planners of Israeli intentions and unit dispositions."⁷ During this war, Soviet satellites -- which then had a life span of about two weeks -- were launched at the rate of about one a day.⁸

Given the time that launch preparations take, some analysts have suggested that the Soviets had to have been aware at least a week in advance of the exact date and place that fighting would occur. For example, the reconnaissance satellite Kosmos 596 was said to have been launched three days before the war began on October 6, 1973, and its tracks on that day passed directly over the Sinai and Golan Heights

battle fronts. In addition, "within an hour of the actual outbreak of fighting, Kosmos 597, a high-resolution, maneuverable satellite, had been launched already, suitably positioned to survey both battle areas."⁹

Falklands/Malvinas Conflict

The Falklands/Malvinas conflict between Great Britain and Argentina in 1982 provides another prime example.¹⁰ How much command and control assistance from the Soviets, particularly through their satellite systems, was provided to Argentina is still a matter of speculation. The news media stated that the Soviets, alerted to Argentine preparations for invasion through their existing command and control satellite network, launched two satellites to monitor military activity in the area two days before Argentina invaded the Falklands/Malvinas on April 2, 1982. Six others with orbits that took them over the South Atlantic were sent up later to watch both Argentine and British military movements. These satellites were programmed to intercept communications, pick up radar transmissions (particularly from ships), and photograph objects on the earth's surface.¹¹

Similarly, the United States provided command and control assistance to Great Britain, which is by no means to be considered a developing country, but the case does illustrate the propensity of superpower involvement in Third World crises by providing such support. For example, Newsweek reported that the Royal Navy used "an American satellite for its communications link with its submarines in the South Atlantic."¹² In addition, Time magazine noted that U.S. command and control capabilities were used to enable "British naval commanders to receive copies of orders transmitted by the Argentine Defense Ministry" almost as soon as they were issued.¹³ It also reported that routine

information from U.S. meteorological satellites was available to Great Britain, which as a NATO ally also had regular access to the U.S. Defense Satellite Communications System to relay encrypted messages.¹⁴

After the conflict had ended, the British government published a white paper on the Falklands/Malvinas campaign which reviewed the lessons of the conflict and proposed new military equipment to correct the deficiencies that had been observed. Of particular importance was the assessment that "satellite communication proved vital [and] . . . that Britain now plans to acquire a new military satellite and to provide a terminal in all major surface warships."¹⁵

Space-based systems have enhanced greatly command and control capabilities. New systems coming into the inventory will provide more opportunities to assist the Third World in this area. For example, Donald C. Latham has stated command and control capabilities provided by the U.S. Global Positioning System (GPS), an 18-satellite constellation that provides location information in real time, will be made available not only to U.S. allies but to other friendly countries, "but we will selectively determine who that will be."¹⁶

Commercial Satellites

Civilian reconnaissance satellites have created for the Third World (and other nations) a new source for command and control support. Spot I, the world's first commercial remote-sensing satellite, was launched on February 21, 1986. The Spot satellite can obtain pictures of the ground with a resolution of 10 meters. Its services are available through Spot Image, a commercial venture to sell pictures from space, that is owned by the French, Swedish, and Belgian governments and businesses.¹⁷ For example, information about a 60 kilometer-square area can be bought for \$1400.

This new service has been met with mixed reactions. Some nations have expressed concern that sensitive information of military significance about their territories and force posture could be sold irresponsibly. There is no international law restricting commercial satellite remote-sensing capabilities. However, Admiral Stansfield Turner, past U.S. CIA director, has said, "The activities of Spot Image are a good thing." With more information available from space photographs, "no general in the world will be able to get away with a surprise attack."¹⁸

Other Command and Control Assistance

The Falklands/Malvinas battle is also illustrative of other command and control assistance -- support not provided by space-based assets -- given during Third World conflicts. According to British officials, the British fleet was shadowed by the Soviets on its approach to the South Atlantic, which has suggested to some analysts that the Soviets may have provided positioning information to the Argentines.¹⁹ There were also reports that the Soviets had diverted two submarines to the South Atlantic and had also placed 35 merchant ships in the area to collect information.²⁰

In addition, Argentine officials said that the Soviets provided a cadre of technicians to link Argentina's radar systems into a nationwide net to guard against surprise British air attacks. The New York Times reported that Soviet radar equipment was being shipped to Argentina, but because the project was directed by a secret agreement between the two countries, little was known about the extent of the equipment or the capabilities of the system. The agreement, which was reached after the British task force had sailed from Britain on April 5, 1982, provided more than 20 Soviet technicians who arrived approximately a month after the Falklands/Malvinas invasion had begun.²¹

Other command and control assistance was provided to Argentina from the Third World. Throughout the campaign Israel "continued to help Argentina with secure, on-line encryption" which was so effective that the British were never able to decipher the communications link from the Argentine mainland to the commander of its forces on the islands, according to British Army officers.²²

Argentina's limited command and control capabilities compelled it to seek such assistance and also to develop alternatives for providing command and control support. For example, because it lacked adequate radar coverage, it had to conscript civilian light planes and helicopters "to fly night and day over the southern half of the country to intercept any enemy air intruders and search for commando squads."²³

Britain also had similar problems with radar coverage. On December 14, 1982, the British government published its white paper, The Falklands Campaign: The Lesson, which reviewed the military operations and lessons of the conflict. According to the white paper, one of Britain's greatest handicaps was "the total lack of any airborne early warning system."²⁴ Britain had requested several U.S. AWACS aircraft to protect its naval task force from surprise air attack. The United States refused the request to avoid direct involvement of American military personnel in the clash.²⁵

Deployment of AWACS Aircraft

Although the United States refused to provide AWACS aircraft in the Falklands/Malvinas conflict, it earlier had deployed these aircraft to the Third World and more recently has used both the E-3A and the E-2C to provide command and control assistance to developing countries. On September 22, 1980, Iraq invaded Iran, beginning a war that has continued through the mid-1980s. Eight days after the Iraqi invasion,

the United States sent four E-3A aircraft to Saudi Arabia at Saudi request. Almost a year later the United States agreed to sell five AWACS planes to the Saudis.

The four E-3A aircraft that were quickly deployed in 1980 have been used continually since then in assisting Saudi command and control efforts. Intelligence collected by the AWACS is relayed to ground facilities built and operated by the United States where it is analyzed and then transmitted, not only to U.S. regional commands, but to Saudi and Kuwaiti forces as well.²⁶

A year later the E-3A saw duty in Egypt after the assassination of President Sadat. It returned to Egypt in February 1983 in what U.S. Defense Department officials termed "training exercises," but the deployment of four AWACS aircraft then occurred when Libya had threatened several of its neighbors, including Chad, Sudan, Egypt, and Tunisia. As the Wall Street Journal explained, Egyptian capabilities "would be greatly enhanced if American-operated AWACS planes were directing Egypt's fighters to Libyan planes and providing information of Libyan movements."²⁷

More recently, the United States has made available the command and control capabilities of the E-2C. U.S. defense officials confirmed that the United States provided command and control "technical support" in November 1985 to Egypt when Egyptian commandos rescued a hijacked Boeing 737 in Malta. In addition, E-2C planes of the U.S. Navy aboard the aircraft carrier Coral Sea had been ordered to prepare for action in case the Egyptian government needed them.²⁸ The command and control infrastructure spans the spectrum of military activities, including low-intensity conflict and terrorism, as this incident demonstrates.

Soviet Assistance

The increasing trend to provide assistance to developing countries by using advanced command and control systems did not begin in the 1980s with the Iraq-Iran war and is not limited to the United States. The Soviets have deployed the Moss, one of their AWACS aircraft, in Third World conflicts. In one of the earliest examples, it was loaned to India during the Indo-Pakistani war in December 1971. It was said to have been used to detect aircraft entering Indian airspace and also to direct Indian attack aircraft flying low-level night missions in identifying and attacking targets up to 160 kilometers into Pakistan.²⁹ The Moss, which is less capable than the U.S. E-2C Hawkeye or E-3A Sentry, is being replaced by a version of the Il-76 transport aircraft that will be equipped with command and control systems. Known by the NATO code name "Mainstay," it "will improve substantially Soviet capabilities for early warning and air combat command and control."³⁰

In addition to using their AWACS aircraft, the Soviets have sent specialists and given other technical support to Third World countries. The Six-Day War of 1967 was disastrous for Syria, which lost not only territory but also a significant amount of military equipment, including two-thirds of its aircraft. Within a year the Soviets had replaced most of the losses, and they also sent 1000 additional advisory personnel. These personnel provided command and control assistance and advised the Syrian military during the 1973 war. They were present in command posts and also supervised operations of air defense systems.³¹

In the 1979 Sino-Vietnamese conflict, it was said that the Soviet Union provided command and control support to Vietnam in the form of signals intelligence assistance. Much of the support, however, was

countered by Chinese communications security which directed frequent changes in call signs, frequencies, and procedures.³²

Soviet activities in providing command and control assistance to Third World countries have continued through the 1980s. Following the terrorist attacks in Vienna and Rome in December 1985, the Soviet Union provided command and control assistance to Libya to help it keep track of U.S. military movements, since Libya was concerned about possible American retaliatory actions. In January 1986 the Soviets developed an extensive "electronic eavesdropping and warning net" in the Mediterranean off the Libyan coast "to intercept and record U.S. military communications and to keep command centers [in Libya and the Soviet Union] informed of American ship and aircraft activity."³³ Of the Soviet support, Secretary of Defense Weinberger said:

The Soviets are helping the Libyans, I think, in every way they can, by furnishing intelligence and keeping perhaps an even closer eye on our naval movements than they normally do. And I think they're passing all that on to the Libyans.³⁴

Improving Concepts

Command and control assistance to the Third World can also be provided through improved concepts, because deficiencies in doctrine, tactics, and organizational structure can weaken Third World command and control capabilities. For example, in the 1982 Falklands/Malvinas conflict, Argentina showed significant command and control weaknesses. As a result of the competition between service staffs and headquarters in Buenos Aires to control operations, command was not effectively centralized anywhere. The Argentine commander on the islands was subjected to divided authority, and because he did not have sufficient command authority, he could not use effectively the forces that should have been under his control.³⁵

Following the 1979 Sino-Vietnamese conflict, the command and control structure of the People's Army of Vietnam (PAVN) was changed because of problems Vietnam had in deploying its forces from the south to the battlefield. In mid-1979 the PAVN introduced the concept of "theater of operations" and established four military theaters, the most important one comprising the tier of provinces along the Chinese border. The concept molds together the armies of Vietnam, Laos, and Kampuchea under the command of the senior Vietnamese officer in each theater.

It is intended to facilitate the defense of all communist Indochina against outside attack from any direction and particularly to facilitate defense against one or more outside attacks by defensive theaters operating more or less independently of each other.³⁶

In mid-1986 following the U.S. attack on Libya, in attempting to improve Libyan military effectiveness, the Soviet Union emphasized improvements to its command and control structure rather than shipments of new military weapons. It was said that these efforts included reviewing tactics and procedures used by Libya on April 15, 1986, when it could shoot down only one of the 25 U.S. aircraft that conducted the night bombing raid. Soviet technicians were also studying U.S. electronic warfare tactics employed against the Soviet-supplied command and control systems to determine what equipment improvements could be made.³⁷

As Roger E. Kanet has stated,

In almost all cases where Soviet military equipment was supplied to developing countries, Soviet military technicians arrived along with the equipment to instruct the local military in its use.³⁸

For example, 21,000 Soviet advisory personnel -- one of the largest training groups that Moscow ever sent to the Third World -- were in Egypt when they were expelled by President Sadat in 1972.³⁹

Soviet technicians, in advising and training Third World military forces, are guided by Soviet concepts concerning command and control. The Soviets take an integrated and comprehensive approach to command and control. They take strong measures to preserve their means of command and control and make them an integral part of their operational concept. General Cushman has evaluated their emphasis this way:

They have developed and they practice a comprehensive doctrine which uses all means (including radio electronic combat, air and artillery attack, surprise, deep airborne and helicopter assault) to disrupt not only their enemy's means of command and control but the opposing commanders' grasp of the situation.⁴⁰

Because command and control systems are important to Soviet operational concepts, their survivability is a major concern. Soviet approaches to survivability include redundancy, hardening, concealment, dispersal, deception, and training to operate during the loss of command and control systems. A major feature is redundancy to avoid having a single indispensable component. For some situations, "two or three alternative centers, commanders, and communication channels are available, each designed to be complementary."⁴¹

However, in contrast to Soviet doctrine, Syria was equipped by Moscow with very few early warning radars for command and control of its surface-to-air missile units prior to its 1982 conflict with Israel. Only two such radars -- only one-fourth of the number required by Soviet tactics -- supported the Syrian missile batteries that had been built in the Bekaa region of Lebanon. In comparison, a similar force of Soviet surface-to-air missile units would have had eight to ten early warning radars attached to it. Because of the 1982 experience, the number of radars supporting Syrian missile batteries has been increased significantly.⁴²

U.S. and other Western command and control literature seems to emphasize hardware, procedures, and staff coordination. In contrast, Soviet command and control thought gives central importance to the military commander's reaching a decision and communicating that decision to subordinates. Technological aspects or system components are emphasized less. Soviet Marshal A. A. Grechko has written that the commander plays "a central, dominant role in command and control of forces."⁴³ He also added,

Quality of command and control is above all the ability of a commander-in-chief or commander to confidently orient himself in a situation, make an expedient decision for an operation or battle, assign combat missions opportunely and competently, disseminate the decisions to units and subunits, organize interaction, render total support to troop operations and put the decision which has been made into effect firmly and resolutely.⁴⁴

Another dominant feature of Soviet command and control concepts is the absolute centralization of control. The Soviet military structure is designed for centralized control and its past employment emphasizes control from the top.⁴⁵ Soviet writings have emphasized the centralized approach to command and control and have noted that "the principle of centralism is becoming increasingly important in guiding and directing troop combat activities in modern warfare."⁴⁶

In the Iran-Iraq war of the 1980s, Iraq has shown a highly centralized command and control system. Analyzing the early phases of that war, William O. Staudenmaier, director of strategy for the Center for Land Warfare, U.S. Army War College, has called attention to the "secretive, centralized defense decision-making apparatus in Iraq" that, although known for its loyalty to Saddam Hussein, has resulted in "delay and indecision on the battlefield."⁴⁷ The Soviets have influenced this

structure; as he noted, most Iraqi operations are patterned after Soviet doctrine.⁴⁸

Finally, Soviet advisory personnel providing assistance in the Third World may emphasize two related concepts for tactical planning -- "maskirovka" and "radioelectronic combat." "Maskirovka," which includes cover and deception, is designed to confuse the enemy concerning battlefield operations and military capabilities. "Radioelectronic combat," similar to the Western concept of electronic warfare, is considered a critical link in Soviet command and control; its goal is the "suppression or destruction of enemy control systems and the protection of one's own."⁴⁹

Concepts are important to the command and control structure. With intelligence, deployments of command and control systems, and other assistance, they are being used to improve the command and control capabilities of Third World countries.

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POLICY PERSPECTIVES

Wars have changed, as noted by Moshe Dayan, from the "good old days of the simple wars, when, as the hour of battle approached, the commander got on his white horse, someone blew the trumpet, and off he charged towards the enemy!"¹

The nature of warfare has changed with the introduction of sophisticated weapons and other advances in projecting military power. Accompanying the advances in weaponry have been improvements in command and control capabilities brought about by new systems, innovative tactics, improved procedures, better training, organizational changes, and skilled personnel. These improvements have had a catalytic effect on efforts to enhance military capabilities in the Third World. By concentrating resources and directing weapons and troops more effectively, they have become a decisive factor in determining the outcome of Third World conflicts.

Many Third World nations have been modernizing their armed forces by acquiring newer technology and advanced weapons from the major arms-producing states. The transfer of command and control capabilities has included not only hardware but also software, concepts, procedures, and intelligence. It has become a primary element of security assistance programs and arms exports to the Third World. Having seen how advanced command and control systems have been used to enhance military capabilities in recent conflicts, more Third World nations are seeking these systems. As a result, the market for new systems in the Third World is expanding. This expansion has created a considerable impetus for the defense industries of the leading exporters to produce and market these systems. It has also created several risks for Third World countries.

Balance of Power

A primary danger is the failure to respond to changes in a region's balance of power. One option for a Third World country is to modernize the elements of its command and control structure. Another is to obtain weapons to disrupt or destroy a potential adversary's command and control network. A third option is to seek to control the level of modernization efforts in a region to avoid escalatory actions and responses in a continuous force buildup.

Command and control systems play a vital role in determining the balance of power in a region. They have been used to project power and exploit military weaknesses of adversaries. The lack of an effective command and control infrastructure creates several risks for a Third World nation. For example, it affects how a country perceives its ability to take military action. As Michael Moodie put it, "In the early 1970s, Egypt did not feel it could successfully initiate any military action against Israel until it had adequate air-defense capabilities"² which were provided later by the Soviets. Command and control weaknesses may also invite a preemptive attack before improvement efforts are completed.

Because the infusion of advanced technology may alter regional balances of power, suppliers and recipients may seek programs that do not lead to destabilizing conditions. In evaluating the implications of transferring command and control systems, the affected countries need to know how the capabilities can be used. When used defensively, they usually are not as destabilizing as improvements to offensive force projection. To promote regional stability, suppliers have the option of providing command and control systems that are primarily defensively oriented.

However, some command and control systems that seem to be benign because their primary mission is defense can also enhance offensive capabilities by locating targets in an adversary's territory. For example, the E-2C Hawkeye can identify tank and artillery concentrations over a wide area and locate surface-to-air missile radars at great distances.³ It is the offensive capability of the U.S. AWACS planes that has Israeli supporters concerned about their sale to Saudi Arabia. They argue that the E-3A Sentry could be used as a command and control center to direct an Arab attack against Israel, although Syria, the most likely Arab opponent, uses Soviet aircraft with communications and radar components that are not fully compatible with the AWACS.⁴

By addressing all the capabilities being provided and their effects on the regional balance of power, the affected countries have a more accurate perspective for evaluating policy options. If providing command and control capabilities can be a means of reducing the instability caused by the introduction of new offensive weapons, then the transfer is a stabilizing option. Failure to do so may be as destabilizing as the sale of advanced arms.

Objectives

The transfer of command and control capabilities has been used to support the major political, economic, foreign policy, and national security objectives of the supplier countries. In particular, there is a strong link between major international developments and security assistance programs that are improving Third World command and control capabilities. In combination with other types of assistance, these programs have been used as a quid pro quo to gain base rights, settle disputes, and obtain the cooperation of other nations across the spectrum of military and political affairs. It appears likely that

security assistance will continue to be used in this manner, particularly for the United States. As Lieutenant General Ernest Graves, former director of the Defense Security Assistance Agency, said, "Security assistance has been, is today, and is likely to be for the foreseeable future a major instrument of U.S. foreign policy."⁵ The transfer of command and control capabilities is an integral component of this assistance.

Factors that influence the transfer of command and control capabilities include those that govern arms trade in general to developing countries. They include the recipient's size, natural resources, population, political character, threats to survival, and the strategic value of the region. Location is important, particularly when it is an area of superpower competition. In addition, location is also important for defining the nature and level of regional security threats which the command and control capabilities would be designed to counter.

The supplying nations, however, incur several risks in providing command and control systems through security assistance programs or other export sales. One risk is losing control over the weapons once they have been delivered. Suppliers have seen their weapons used by both sides in Third World conflicts. However, for a supplier, a greater risk is having to face its own systems in combat or fight in the Third World against a country who, after having received the supplier's systems, has been able to develop countermeasures to interfere with its command and control effectiveness. To guard against such dangers and to retain authority over how systems are used once they have been delivered, the supplier has several policy options. One is to modify the equipment before it is delivered by replacing some subsystems with less capable ones. Others include agreements on

- . Keeping personnel in country to operate and maintain sensitive equipment,
- . Retaining possession of critical elements,
- . Limiting access to software or critical components,
- . Preventing or restricting modifications to the equipment,
- . Defining explicitly the operational rules by which the system can operate,
- . Retaining the right to inspect how the system is being used and maintained,
- . Restricting the persons permitted to work on the equipment,
- . Controlling the distribution of the information or intelligence obtained,
- . Retaining a veto on any transfer to third parties, and
- . Setting up organizations and procedures to make sure commitments and security precautions are observed.

Supplier-Recipient Relationships

The necessity for long-term external support to operate and maintain command and control systems has implications for both the supplier and recipient. The transfer of sophisticated command and control systems may tend to make supplier-recipient relationships more lasting.

Unsophisticated weapons can be maintained without extensive external support and are relatively easy to replace with equivalent systems from other sources. However, as more advanced command and control systems are transferred, recipients may have to continue their relationships with their suppliers, since it may be more difficult to turn to a new supplier.

In addition, because the effective assimilation of advanced command and control systems will require much more time than less sophisticated

systems, suppliers may have more opportunities to apply political influence or leverage over importing nations. These opportunities could continue if the Third World recipient is dependent on the supplier for recurring operations and maintenance activities. Further, if survivability of these systems is limited in a "high-technology/high-attrition" war, the recipient might be less willing to take a risky unilateral action without a guarantee of resupply if the systems might need to be replaced.

Long-term relationships in the transfer of command and control capabilities which bind the supplier and recipient closer together may lead to other developments. Supplier nations that are providing technical assistance and other continuing support may find themselves involuntarily involved in regional disputes that could escalate into power crises. Recipients may find that victory or defeat in Third World conflicts could be affected by actions taken by third-party supplier nations not directly participating in the confrontation. The successful exercise of military power by a Third World nation may depend on the willingness of a foreign power to support it.

Changes in the Command and Control Network

How successfully advanced command and control technologies are used depends on factors involving the political, economic, and social characteristics of the recipients. The transfer of a command and control system by itself does not necessarily indicate that the military capabilities of the recipient have been improved. As the case of the Israeli command and control structure in the 1973 Middle East war shows, technology is not the only factor that must be considered.

Effective training, concepts, procedures, and organization are needed to exploit the potential of advanced systems. Improvements

through technological advances in hardware to the command and control network may require concurrent changes in other areas. The implications for the supplier and recipient are to determine the changes needed in training, organization, tactics, and procedures as system changes are made. Outmoded procedures may hinder the effective use of the new command and control systems. For these systems to act as a "force multiplier," they need to be integrated with the other elements of the command and control network.

Vulnerability

The lessons of recent Third World conflicts point to the increasing importance of command and control systems as integral parts of the modern battlefield. Their contribution to force effectiveness is now being included in many studies assessing military capabilities. As command and control systems are recognized for the vital role they play in executing military operations, they may become a higher priority target -- as important as the destruction of offensive weapons and traditional operational elements. Further advances in electronic warfare are likely to continue to offset gains being made by command and control systems in enhancing force effectiveness. As a result, survivability of command and control systems can be a problem for Third World countries.

Options for Third World countries include seeking measures to counter the disruption through electronic interference of their command and control systems or their destruction by antiradiation weapons. Redundancy, hardening, concealment, dispersal, and deception offer additional protective features. Further, communications security programs can guard against insecure procedures and provide additional protection for elements of the command and control network.

Future Conflicts

The impact that the transfer of advanced command and control capabilities will have on future Third World conflicts is difficult to assess. However, Third World countries can err in expecting technology or superior weapons to determine outcomes or how future wars will be fought. The advanced capabilities they are obtaining do not dictate "high technology" wars. For example, the Iran-Iraq conflict, involving two nations possessing some of the most advanced weapons in the Persian Gulf, has been drawn out with indecisive engagements.

Use of sophisticated as well as simple weapons may be applicable for future conflicts. But the transfer of command and control capabilities is likely to intensify the ability to obtain firepower through machinery rather than manpower. Still, for most developing countries, ground forces are likely to continue as the primary determinant of strength and sustaining power. Advanced systems may become more important, but they are unlikely to supplant the traditional elements of military power in the Third World.

There is no technological determinism to guide Third World countries in how they will develop their command and control structure or how they will employ their military forces. The presumed technological consequences can be invalidated by other factors, particularly when the interactions of people affect how effectively systems are used. As noted earlier, the duration, intensity, and outcome of conflicts have been shaped by other factors. No single technology will dictate what courses of action should be selected or determine what the results will be in conflict.

In addition, newer command and control systems will not necessarily guarantee success or produce greater certainty in combat than their

predecessors. Third World nations risk failing to understand not only what technology can do but also what it cannot do. Advances in command and control have been achieved by the elements of the web of systems working together rather than simply by dependence on technologically advanced equipment.

Implications of Trends

Analysis of the transfer of command and control capabilities to the Third World suggests three major trends. These are that there has been a quantitative increase in command and control transfers, a qualitative improvement of command and control capabilities, and a major effort in the Third World to establish indigenous production capabilities. The quest for improved capabilities is manifested most evidently in the new systems being acquired from the leading arms exporters. These systems are a primary element of Third World military modernization programs. The implications of these trends is that many Third World nations are improving substantially their ability to use force effectively, and nations without similar programs are being placed at a distinct military disadvantage.

In addition, a more subtle trend is the propensity of the super-powers to become involved in Third World conflicts by providing command and control assistance. This support places their forces in danger and risks their entrapment in the conflict. However, such involvement may deter the Third World participants from taking any escalatory move.

Further, deployments of command and control systems such as AWACS aircraft are being used as a policy option during crises. These deployments provide an alternative to the intervention of combat forces. However, without the escort of military units to protect them, they depend on the Third World country for their security. The deployment of

command and control systems and personnel can demonstrate political resolve without creating provocative reactions that could be triggered by the movement of fighter aircraft or other offensive weapons into the area. But deployment of command and control systems, by providing a presence in the crisis area, "strengthens the credibility of the commitments which the 'political' use of military force is designed to signal."⁶

For transfers to be effective, the command and control capabilities provided must be appropriate for the combat operations and the types of forces they support. Effective military operations depend on reliable, secure, rapid, and survivable command and control systems for making decisions and implementing them. Efforts by Third World countries to improve their command and control capabilities are likely to continue regardless of the obstacles involved because of the potential gains they make to force improvement. As Soviet military analysts have written, "Whatever the difficulties in setting up an automated command and control system, there is no question but that it has a future."⁷

Critical Policy Questions for Decision Makers

The perspectives discussed in this paper are only an initial assessment. Problems will continue to exist, and new ones will arise that will require resolution. Policymakers will have to deal with a variety of issues that differ significantly in political, economic, foreign policy, and military context. A large set of questions, therefore, must be seriously considered by both the suppliers of command and control capabilities and the recipients in the Third World.

The following are just some of them:

. What factors are critical for improvements in Third World command and control capabilities? For example, are the command and control

capabilities being transferred to Third World countries critical to their military requirements?

. To what extent are Third World countries capable of absorbing new command and control technologies? To what extent can they avoid excessive dependency on the more developed nations for improving their command and control capabilities?

. How do the major powers with elaborate command and control systems reconcile difficulties of having a direct role in Third World conflicts? How does the involvement through command and control assistance of a foreign power in a Third World conflict place that nation at risk compared to other measures of involvement? How can major powers limit their risks when providing direct command and control assistance to Third World nations?

. How can a supplier control the disposition and use of its command and control systems when they have been transferred to the Third World? To what extent are its systems, concepts, and procedures compromised? What safeguards are necessary to prevent such a loss?

. To what extent can interoperability problems be solved through changes in organizational structure, tactics, and doctrine? What pre-conflict measures to improve command and control doctrine, tactics, and organizational structure enhance the military readiness of a Third World country? To what extent are the tactics and doctrine concerning command and control developed by the major powers directly transferrable to the Third World?

. How are new command and control systems being used to influence regional affairs? To what extent are transfers of command and control capabilities "benign" actions?

. How can the Third World respond to demands for improved command and control capabilities and other demands for military modernization? How do the costs for modern command and control systems relate to the military benefits they provide?

. How can Third World countries resolve difficulties of high cost, high operating expenses, limited skilled manpower, and other absorption problems? How can the Third World reconcile the demands for indigenous production of command and control systems with demands to produce other defense items as well as commercial products competing for the limited resources and production base? Given their limited resources, how do Third World countries reconcile the demands for other military modernization with programs to improve command and control capabilities?

. What assistance must suppliers provide to the Third World to compensate for differences in leadership, organization, technical skills, and experience? How can the Third World overcome its limited technical, educational, and industrial base in developing the support structure for operating and maintaining advanced command and control systems?

. Are regional command and control networks in the Third World feasible? What are the barriers to developing such a network in the Persian Gulf? What capabilities in early warning systems and counter-systems are beneficial for regions in the Third World?

. How does the deployment of AWACS aircraft by major powers to the Third World affect regional stability? What are the risks involved in deploying AWACS aircraft to the Third World as a policy option to demonstrate resolve? Are airborne command and control systems suitable for transfer to and use independently by Third World countries?

. Can safeguards for guaranteeing the security of AWACS equipment, technology, and information be effectively enforced? What are the damages if they are compromised?

. How can the Third World use joint venture projects to develop and produce advanced command and control systems? How can Third World industries become competitive in producing command and control systems?

. How can the Third World use to its advantage the momentum in marketing command and control systems by the major suppliers? What are the opportunities to market command and control systems in the Third World?

. Are command and control systems an effective element of security assistance programs? How do command and control systems relate to other weapons and systems in achieving the objectives of security assistance programs? Can the transfer of command and control capabilities be an effective instrument of foreign policy?

. To what extent does the potential assistance of a superpower using its space-based command and control assets deter Third World nations from aggressive action?

. How do the new commercial activities that provide reconnaissance and other military information using space-based systems affect Third World policies? Do they deter or promote military responses in the Third World? Are new international agreements needed to restrict commercial satellite remote-sensing capabilities?

. Are new tactics and organizational changes necessary to respond to the new systems being obtained by Third World countries?

. What battle management techniques are necessary for the Third World to use advanced command and control systems effectively? How is

it possible to deal with existing or potential problems of system vulnerability without compromising military effectiveness?

. What are the opportunities for the Third World to make use of space for command and control capabilities? For space-based assets, is the Third World limited only to those of the superpowers?

. How does command and control in a "high-technology/high-attrition war" differ from that in a "low-technology/low-attrition war"?

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GLOSSARY

ACDA	Arms Control and Disarmament Agency
AFCEA	Armed Forces Communications and Electronics Association
An	Antonov
AOI	Arab Organization for Industrialization
AWACS	Airborne Warning and Control System
C ²	Command and Control
C ³	Command, Control, and Communications
C ³ I	Command, Control, Communications, and Intelligence
C ⁴	Command, Control, Communications, and Computers
CIA	Central Intelligence Agency
ECM	Electronic Countermeasures
FMS	Foreign Military Sales
GCC	Gulf Cooperation Council
GPS	Global Positioning System
IISS	International Institute for Strategic Studies
Il	Ilyushin
JCS	Joint Chiefs of Staff
LDC	Less-Developed Country
MAP	Military Assistance Program
MiG	Mikoyan-Gurevich
NATO	North Atlantic Treaty Organization
NCO	Non-Commissioned Officer
NIC	Newly Industrialized Countries
PAVN	People's Army of Vietnam
PD	Presidential Directive
PIRP	Program on Information Resources Policy
PRC	People's Republic of China

RAF	Royal Air Force
RSNF	Royal Saudi Naval Forces
SAGE	Semi-Automatic Ground Environment
SAM	Surface-to-Air Missile
SIPRI	Stockholm International Peace Research Institute
UAE	United Arab Emirates
US	United States
USSR	Union of Soviet Socialist Republics
WWMCCS	Worldwide Military Command and Control System
Yak	Yakovlev