



**STRATEGY
RESEARCH
PROJECT**

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**CREATING INFORMATION KNOWLEDGEABLE LEADERS
THROUGH INFORMATION OPERATIONS EDUCATION**

BY

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ABSTRACT

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To be effective on tomorrow's battlefield, we must become masters of the "infosphere." To accomplish this task, we must develop information knowledgeable leaders. The Army needs leaders who have a deep understanding of warfare in the context of the information age. Despite this need, students at USAWC--future senior leaders--are not being sufficiently instructed in this key joint warfighting mission area to become masters of the infosphere. This study defines the information operations (IO) conceptual knowledge required in senior leaders to be successful in warfare in the information age. Then it reviews the status of IO education at USAWC. This review then leads to recommendations for changes to the course curriculum based on the curriculum of the School of Information Warfare and Strategy's two-year pilot program. These changes are the catalyst for transforming industrial-age thinkers into information knowledgeable leaders.

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INTRODUCTION

If war was ever too important to be left to the generals, it is now too important to be left to the ignorant.¹

To be effective on tomorrow's battlefield, we must become masters of the "infosphere." To accomplish this task, we must develop what Dr. John Alger, Dean of the National Defense University's School of Information Warfare and Strategy, calls information knowledgeable leaders:

Leaders who have had the opportunity to think about and internalize the significant capabilities and vulnerabilities associated with the current and future role of information (from both the technological and human perspective).²

The Army needs leaders who have a deep understanding of warfare in the context of the information age. Despite this need, students at the USAWC--future senior leaders--are not being sufficiently instructed in this key joint warfighting mission area to become masters of the infosphere.

The rapid growth in the speed, volume, and interdependency of information systems is changing not just the way battlespace is viewed and understood, but the way in which battlespace itself is being radically altered. The very nature of warfare is being altered by this revolution in technology. The importance of information in the 21st Century has best been expressed by the

Chairman of the Joint Chiefs of Staff (CJCS), General John M. Shalikashvili, "we must have information superiority: the ability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same."³ Information Operations is addressed in Joint Vision 2010's operational concepts of Dominant Maneuver, Precision Engagement, Full Dimensional Protection, and Focused Logistics.⁴ These concepts cannot be realized for success on the battlefield without Information Superiority. In Army Vision 2010, the Army's companion document to Joint Vision 2010, General Dennis J. Reimer, the Chief of Staff of the Army (CSA), asserts that gaining "Information Dominance is fundamental to each of the other five Army patterns of operation as well as each of the operational concepts in Joint Vision 2010."⁵

In War and Anti-War, Alvin and Heidi Toffler describe the evolution of our country from a Second Wave (industrial) society to a Third Wave (information) society. They emphasize the importance of developing information knowledgeable leaders. If senior leaders are not exposed to a deeper understanding of the inherent capabilities and vulnerabilities of today's information systems, America is blindly exposing herself to potential

adversaries. As GEN Shalikashvili states: "Our reliance on technology creates dependency and vulnerabilities throughout our global basing and information support networks and generates requirements for defensive Information Warfare (IW) capabilities. However, the same technologies also create vulnerabilities for our adversaries that can be exploited using offensive IW capabilities."⁶

The magnitude of the importance of this type education prompted the CSA, GEN Reimer, to release an "All Army" message on 3 September 1996, Subject: Information Operations (IO) Intent and Strategy. In this message, Gen Reimer charges the Army Training and Doctrine Command (TRADOC), in coordination with the Army's Deputy Chief of Staff for Operations (DCSOPS), with the responsibility of developing the Army's vision for IO. Additionally, the CSA stated that:

We will develop an IO campaign plan to incorporate, synchronize and conduct IO throughout the force and to institutionalize IO through requirements definition, education and training at our schools and centers.⁷

GEN Reimer has established the end objective. The path to achieve that goal has not yet been charted.

This study defines the IO conceptual knowledge that senior leaders require to be successful in information age warfare. Then it reviews the status of IO education at USAWC. This review then leads to recommendations for changes to the course curriculum to transform industrial-age thinkers into information knowledgeable leaders and chart the path for GEN Reimer's IO campaign plan.

EDUCATIONAL REQUIREMENTS FOR INFORMATION KNOWLEDGEABLE LEADERS

To codify the requirement for IO education, we must first understand the basic forms that comprise the functions of information warfare. Martin Libicki, a Senior Fellow of the Institute for National Strategic Studies, concludes that seven forms govern the functions of information operations:

command-and-control warfare (C2W), intelligence-based warfare (IBW), electronic warfare (EW), psychological warfare (PSYW), hacker warfare, economic information warfare (EIW), and cyberwarfare.⁸

Not all the forms of IO are equally important to senior commanders. The five forms of IO that senior leaders must be most knowledgeable about are command and control warfare (C2W), intelligence-based warfare (IBW), electronic warfare (EW),

psychological warfare (PSYW) and economic information warfare (EIW).

Command and Control Warfare (C2W)

Command and control warfare is not new, but its execution in the information age takes on a whole new dimension. During Operation DESERT STORM, the tremendous success of the C2W campaign left Saddam Hussein's army without direction from the top. The Iraq army, trained in the Soviet style of command and control, was paralyzed by the loss of direct contact with higher headquarters. Subordinate units could not and would not act independently.

Libicki refers to two types of C2W attacks: anti-head and anti-neck.⁹ Senior leaders must be aware of the capabilities associated with both methods. The anti-head (decapitation) method of attack deprives the enemy leader of his ability to communicate with his subordinates. Decapitation usually involves the destruction of a hard target, a command post (CP) or command and control center. Decapitating attacks can quickly cut off an

opponent leader from subordinates, leaving them without direction.

The anti-neck (network) attack, concentrates on communications networks. Network attacks separate the other parts of the body (troop units) from the brain (CPs) by severing their connection to the central nervous system (communications nodes). Network attacks are used to surgically separate parts or whole sub-networks from a nation's information infrastructure. Senior leaders may want to influence the battlespace by denying the enemy the use of communications in a certain area or avenue of approach. Senior leaders may also want specific communications networks disabled, thereby forcing the enemy to rely on less effective, more vulnerable networks.

Intelligence-Based Warfare (IBW)

Intelligence-based warfare is equally important to senior leaders. Historically, intelligence gave senior leaders a broad brush insight into the disposition and intentions of their enemy. IBW is now transforming intelligence to fine-line clarity,

thereby, changing situational awareness into battlespace

knowledge. As Libicki states:

The side that can see the other side's tank column coming can dispose itself more favorably for the encounter. The side that can see each tank and pinpoint its location to within the effective radius of an incoming warhead can avoid engaging the other side directly but can fire munitions to a known, continually updated set of points from stand-off position--shifting intelligence from preparing a battlefield, to mastering a battlefield.¹⁰

Information-based warfare provides the linkage between Joint Vision 2010's concepts of Dominant Maneuver and Precision Engagement by shaping the battlespace. Senior leaders must understand the process of shaping the battlespace to effectively decide, detect, and deliver. In short, a senior leader must:

Decide on those high-value targets that will facilitate his scheme of maneuver, prioritize and sequence collection assets to **Detect** and track those targets, and assign the appropriate weapon system to **Deliver** the munitions to destroy those targets.¹¹

Senior leaders must be cognizant of the level of fidelity IBW brings to the battlespace. Previously, intelligence activities--imagery intelligence (IMINT), signals intelligence (SIGINT), and tactical intelligence systems--reported sensor findings to their respective disciplines. Intelligence was collected, transmitted, processed, analyzed, and disseminated over separate distinct compartmentalized channels. When all of

this varied data reached the end user, they had to be manually correlated to provide situational awareness. Today, our ability to coordinate, synchronize, and fuse the activities of the intelligence community have been becoming greatly enhanced. As the information age continues to unfold, this capability will increase dramatically.

Compartmentalized, stovepipe systems of the past are currently giving way to open architectures that enable the free flow of intelligence information across systems. Future systems will minimize the distinction and constraints imposed by multiple levels of security. Operating as a grid network, data from one system will be able to activate other systems, verify data, prioritize threats, notify decision makers, alert and allocate weapon systems and report damage assessment. For example, if a SIGINT sensor detects the illumination of a SA-6 radar, it could cue an overhead IMINT satellite to verify and fix the target. Simultaneously it could alert F-16 crews and the aircraft of both the danger and target, and provide the senior leader with a fused intelligence image of the target. The system could also divert a UAV to the area to track the target and provide immediate

feedback to the commander on the effectiveness of the F-16 strike.

Through such a real-time integrated system, battlefield knowledge is realized through:

a system of systems that enables joint forces to locate the objective or target, provide responsive command and control, generate the desired effect, assess the level of success, and retain the flexibility to re-engage with precision when required.¹²

The advances of open, SECRET-HIGH (classification-level) and automatically correlated and fused grid networks now directs bombs on target. Intelligence--information directly leads to action.

Electronic Warfare (EW)

Another form of information warfare is electronic warfare. We are becoming more reliant on communications and computer systems. Everything from our most mundane transactions of toilet paper re-supply to our most critical time-sensitive transactions of target acquisition and fire control are all computer and communications dependent. These systems can all be undermined by the oldest form of information warfare, Electronic Warfare. As

GEN Shalikashvili stated earlier, "Our reliance on technology creates dependency and vulnerabilities that can be exploited by others."¹³

The following scenario effectively illustrates the issue: A sortie of B-2 stealth bombers is dispatched to execute a decapitation attack against a critical command center deep within an opponent's heartland. Relying on the global positioning system (GPS) to precisely vector the target, the bombers are thwarted when, ten miles out their "heads-up display's" directional heading goes blank. Unable to determine their precise location, the sortie returns to base. Their mission is scrubbed for fear of collateral damage due to an inability to precisely engage their target.

The attackers' GPS is disabled not by a sophisticated EW system, but by a crude jammer made from parts from "Radio Shack" for less than fifty dollars. Potential adversaries do not need a sophisticated weaponry system to bring a technological giant to its knees. "The basic GPS signal weakness problem is in the amplitude at the receiver. A device the size and power of a cellular phone can jam this signal. GPS jammers can be used to

wipe out all GPS receiver signals within a 10-kilometer radius."¹⁴

Psychological Warfare (PSYW)

Psychological warfare is another form of information operations. Libicki divides PSYW into four categories: operations against the national will, operations against opposing commanders, operations against troops, and cultural conflict. Discussion of the last form should come first, since it is somewhat new and a more passive way to conduct PSYW.

"Cultural warfare is something the United States is more likely to do to others. Cultural products are one of the only categories in which the United States enjoys a consistent export surplus."¹⁵ From Coca-Cola to rock music and everything in between, the United States bombards other countries with "in your face" cultural Americana. The French are so sensitive to this intrusion that they have enacted laws requiring all advertisement to be in the French language. American products are constantly invading others with the "American" view of the world. Over the long-haul this form of PSYW may induce "foreigners" to begin

thinking with an "American" perspective, thus subconsciously shaping tomorrow's battlespace.

Although senior leaders are more familiar with operations against the national will, they may not be aware of the technological exploitation possible in the information age. For example, what would be the impact on an opponent nation if the message its leader was about to give was superimposed by a counter message that the United States communicated? The implications of such actions could be devastating--for the opposition.

In the information age, this is a distinct possibility. John Wayne, Fred Astair and other deceased actors are presently staring in current commercials. The ability to digitally create an image of the leader of an opponent nation is just another application of the same technology. Once the image is ready, American Intelligence could place him on the opponent's national television, inform his nation to lay down its arms--to capitulate. This type of technology can be employed in all aspects of PSYW with enormous effect.

Economic Information Warfare (EIW)

The fifth form, economic information warfare (EIW), would most likely be used in the same context as a traditional physical blockade--in this instance, as a pre-conflict sanction. For example, if a country did not comply with certain UN mandates, EIW could be targeted to electronically sever a nation's access to the world banking system. Since physical money is not exchanged and all financial transactions take the form of ones and zeroes (electronic data exchange between banking computers), a country's inability to conduct monetary commerce with the outside world would quickly leave its economy in ruins.

Senior leaders must develop the ability explore the limits of information operations. Some forms of IO are familiar, but they may have new applications or dimension. Others are totally new. All must be mastered, or senior leaders will find themselves victim to that nation, group, or individuals who have become information knowledgeable leaders. In light of these senior leader IO requirements, we should examine USAWC's curriculum to determine how well it is preparing our senior leaders for this vital challenge.

CURRICULA EXAMINATION

The "benchmark" for this endeavor is the School of Information Warfare and Strategy's (SIWS) two-year pilot program. This Program provides its students with the most in-depth and comprehensive insight into the realm of information operations. SIWS began as an initiative of the then-President of the National Defense University from 1992-1994, LTG Paul Cerjan.

School of Information Warfare

LTG Cerjan believed that new ideas of competition and conflict in the Information Age required a new approach to thinking about warfare. Hence, he proposed and received approval to establish a 10-month senior-level joint professional military education school focusing on the information component of national power. The pilot program ran for two years between 1994-1996. At the conclusion of the pilot program, Lt Gen Ervin Rokke, LTG Cerjan's successor, recommended terminating the program based on the following factors:¹⁶

First and most importantly, the implications of the material covered in the SIWS program are too important to confine to a single curriculum and a limited number of students.

Second, I do not believe that the current climate of downsizing supports the creation of another senior level college with its attendant overhead. The SIWS Pilot has provided valuable insights into the complexities of information warfare and its faculty has developed a first rate curriculum. My intent is to use the SIWS faculty as a resource to assist the Industrial College of the Armed Forces (ICAF) and the National War College (NWC) in updating their core curricula and to develop and teach an elective regime that focuses exclusively on the nuances of information warfare.¹⁷

Before examining USAWC curricula, we must analyze the key components of our benchmark. The SIWS Pilot's core program was comprised of five courses:

- The National Strategy Policy: The Information Dimension course focuses on the formulation of national security policy, national strategy, and military strategy in the information age.
- The Military Strategy and Joint Warfare: The Information Advantage course examines the theoretical foundation of military thought on information-based warfare and continues with an examination of joint and coalition warfare focused on the national command authority and the operational level of war.
- The Employing Information Technology course provides background in technologies used to gather, transmit and process information.
- The Defense Processes: Leveraging Information Systems course examines the policies, processes, and methodologies as a means to increase operational readiness and effectiveness through joint, information age, operation and support systems.
- The Acquiring Information Systems course discusses the process of transforming operational needs into information age systems.¹⁸

The core portion of SIWS instruction is also supplemented by an elective course program and a culminating exercise. The elective courses allow students to specialize in an information area of interest, while the culminating exercise requires students to apply all lessons learned to solve multi-faceted problems in a joint operational environment in the information age.

The curriculum of SIWS pilot program satisfies all the skills required of an information knowledgeable leader. But, as Lt Gen Rokke observed, the course work provided in the pilot is too important to be restricted to a limited audience. The implications of warfare in the information age must be inculcated and interwoven into the entire Senior Service College curriculum to prepare senior leaders for the next century.

U.S. ARMY WAR COLLEGE (USAWC)

The U.S. Army War College is a stellar institution. It has produced superior senior leaders who have fought and won the Cold War and the Gulf War. However, those wars were based on

technology in warfare; they were not warfare in the information age. Today, the core curriculum at USAWC directly reflects the orientation of an industrial-age institution. USAWC must break the industrial-age paradigm to prepare graduates for senior leadership in the information age.

Presently, USAWC's core curriculum is devoid of any substantive information operations component. USAWC does offer one information operations related course as an elective: Course 567cj, Information Warfare: National Policy Issues. The course is available during both of the advanced course semesters. While this course provides students with an introductory look into the realm of information operations, it does not provide the depth and broad understanding of information operations required of an information knowledgeable leader. Just as the School of Information Warfare and Strategy Pilot program, the course has a limited audience.

In the current state of information operations education, USAWC does not stand alone. The core curricula of the other Senior Service Colleges do not reflect the level of instruction required to produce information knowledgeable leaders.¹⁹

Senior Service Colleges (SSC)

Each service college, as well as the national level colleges produces graduates that meet the needs of the Armed Services and the nation. Although the implementation of information operations may differ from service to service, the basic understanding to produce information knowledgeable leaders does not differ.

In a research paper written for the Assistant Secretary of Defense, Command, Control, Communication, and Intelligence, (Teaching Information Warfare: A Review of Programs at Senior and Specialized Schools with Recommendations for Improvements), Capt Robert Ehlers states:

Although interested parties within the Department of Defense (DoD) understand the importance of teaching IW concepts to senior military officers, some school faculties are doing more than others to develop effective curricula and teaching methodologies. The level of interest in IW education--as well as the level of activity within schools--tends to be high. This activity, however, is often poorly coordinated and redundant.²⁰

As reported by Capt Ehlers in July 1995, all senior-level colleges require improvement in curricula to produce graduates who are information knowledgeable leaders.

Capt Ehlers was not alone in his evaluation of the state of information operations education at the senior service colleges. In a memorandum for the Chairman of the Joint Chiefs of Staff, dated 5 September 1995, VADM Arthur Cebrowski, then Director for Command, Control, Communications, and Computer Systems (J6), The Joint Staff, discussed the level of information operations education, training and awareness throughout the services. His memorandum to the Chairman provides a judgment similar to Capt Ehler's assessment. More telling of the dissatisfaction with the current state of information operations education is the handwritten comment from ADM Owens, then Vice-Chairman Joint Chiefs of Staff, to the Chairman, on the routing cover sheet to the memorandum:

Shali (GEN Shalikashvili), 9/7 (7 September 1995)

I don't think this is sufficient, if IW means what we were discussing w/SD (with the Secretary of Defense) this AM (morning).

V/R (Very Respectfully)

Bill (ADM Owens)²¹

All of this evidence indicates that, much must be done to achieve the level of education required to produce information knowledgeable leaders.

RECOMMENDATIONS

The current state of information operation education at USAWC is inadequate to provide graduates who are information knowledgeable leaders. USAWC can take affirmative steps to produce senior leaders who are ready to take their place in the next century. With the right mix of courses, USAWC can transform the mind set of industrial-based students to information-based leaders. Specific recommendation for change to USAWC curriculum is illustrated in the chart on the following page.

RECOMMENDED CHANGES TO USAWC CURRICULUM

CURRENT USAWC CURRICULUM	RECOMMENDED CHANGES
TERM ONE, COURSE ONE	
LESSON 10: THE FUTURES	• READ WAR & ANTI-WAR
LESSON 15: NEGOTIATIONS	• INCLUDE ECONOMIC INFORMATION WARFARE
TERM ONE, COURSE TWO	
LESSON 6: NATIONAL INSTRUMENTS OF POWER	• SIWS' COURSE 1, LESSON 1A020: THE ELEMENTS OF NATIONAL POWER • SIWS' COURSE 2, LESSON 2E050: THE SHIFTING PARADIGM
LESSON 30: NATIONAL MILITARY STRATEGY EXERCISE	• SIWS' COURSE 1, LESSON 2B040: THE NATIONAL MILITARY STRATEGY
LESSON 31: DEFENSE ISSUES	• SIWS' COURSE 3, LESSON 3A010: THE ROLE OF INFORMATION TECHNOLOGY IN INFO WARFARE
LESSON 32: THE STRATEGIC FUTURE	• SIWS' COURSE 1, LESSON 1B070: INFORMATION, TECHNOLOGY, & THE THIRD WAVE
TERM ONE, COURSE THREE	• SIWS' COURSE 4, LESSON 4A030: INTEGRATION AND INTEROPERABILITY • SIWS' COURSE 5, LESSON 5A040: INFORMATION TECHNOLOGY
TERM ONE, COURSE FOUR	
LESSON 5: THEATER STRATEGY AND CAMPAIGN PLANNING	• SIWS' COURSE 2, LESSON 2C010: ORGANIZING A THEATER • SIWS' COURSE 3, LESSON 3C040: EMPLOYING INFORMATION TECHNOLOGY
LESSON 11: FUTURE JOINT LAND WARFARE	• SIWS' COURSE 3, LESSON 3A010: THE ROLE OF INFORMATION TECHNOLOGY IN INFO WARFARE
LESSON 13, 14, 16, 18: FORCE EMPLOYMENT	• SIWS' COURSE 3, LESSON 3A010: THE ROLE OF INFORMATION TECHNOLOGY IN INFO WARFARE
LESSON 25: MOOTW	• SIWS' COURSE 2, LESSON 2D060: SPECIAL OPERATIONS
LESSON 26 & 27: EXERCISES	• SIWS' COURSE 2, LESSON 2D060: SPECIAL OPERATIONS • SIWS' COURSE 2, LESSON 2C080: CAMPAIGN EXERCISE I • SIWS' COURSE 2, LESSON 2E030: CAMPAIGN EXERCISE II • SIWS' COURSE 3, LESSON 3C040: EW TECHNOLOGIES AND CAPABILITIES
TERM TWO & THREE	
STRATEGIC CRISIS EXERCISE	• INCLUDE THE DAY AFTER EXERCISE
ADVANCED COURSES	• SIWS' COURSE 5900: FOUNDATIONS OF INFO WARFARE • SIWS' COURSE 5905: STRATEGIC ASPECTS OF INFO WARFARE • SIWS' COURSE 5915: DEFENSIVE INFO WARFARE • SIWS' COURSE 5920: SYSTEM OF SYSTEMS AND BEYOND

An in-depth account of the recommended change is now presented. Dr. Alger provides the overarching philosophy for an information-based education:

At the senior-level schools or war colleges, information war instruction is required to be focused at the national strategic level. Students should be conversant with national technical means and methods, and they should understand the process by which information is an asset, a tool, a vulnerability, and an opportunity.²²

There are several ways to accomplish this task. One approach would be to add an information operations course at the beginning of Term One to act as an introduction to the information age. Another option would be the inclusion of IO throughout the entire framework of courses offered in Term One. And yet another possibility would be the inclusion of additional advanced courses. A combination of all of the above options could be the key to supplying the nation with information knowledgeable leaders.

To fully develop their philosophy of warfare in the Information Age, students must be totally immersed in the process from the outset of Term One. Transforming ingrained industrial age thought patterns and habits to an information age perspective requires a paradigm shift. Paradigm shifts are not easily

accomplished. Students must be constantly challenged to step out of the confines of their industrial age box and into the seemingly borderless realm of the information age. To accomplish this task, students must receive a constant and reinforcing stream of information age theory and practice.

Term One, Core Curriculum

COURSE ONE: STRATEGIC LEADERSHIP

Information operations theory and philosophy must be introduced early in the curriculum to facilitate the students' transition from an industrial age mind set to an information age reality. The students' introduction to information operations is best facilitated during Course 1: Strategic Leadership. It is during this course that students receive insight into new concepts that build the foundation for subsequent learning at USAWC. Additionally, students acquire skills necessary for their development as strategic leaders.

During Course 1, two lessons are specifically designed for the introduction of information operations theory and

application. They are Lesson 10: The Futures--The Rate and Magnitude of Change and Its Implications for Strategic Leaders, and Lesson 15: Negotiations.

Lesson 10: The Futures--The Rate and Magnitude of Change and Its Implications for Strategic Leaders

Lesson 10 challenges students to grasp change and its effect on strategic leadership in the future. The current futuristic focus of this lesson must be enhanced with information operations theory. In addition to the lesson's reading requirement of John Peterson's The Road to 2015: Profiles of the Future, the requirement must be expanded.

- Lesson 10 must include chapters 3, 8, 9, and 15 of Alvin and Heidi Toffler's War and Anti-War.

In fact, students should read War and Anti-War in its entirety prior to arriving at the USAWC. The Tofflers are acknowledged as the preeminent authors of the future in the information age. War and Anti-War provides students with the theoretical foundation for creative and critical thinking about warfare in the information age.

Lesson 15: Negotiation

Once the foundation is laid in lesson 10, students must place the knowledge gained into action. Lesson 15: Negotiation offers a key opportunity to input information operations into motion. The current lesson is an exercise in negotiation, using an industrial age scenario. The theme of the exercise centers around the negotiation process that transpires between two countries entering into negotiation over oil-pricing; students look for a "win-win" outcome.

- Lesson 15 must include aspects of economic information warfare.

Economic information warfare, as described earlier in this report, could replace or supplement the oil-pricing exercise. Students could seek a favorable outcome or propose retaliation to negotiation gone sour. In any case, students would appreciate the impact of information operations; they would be exposed to the versatility of IO.

COURSE TWO: WAR, NATIONAL POLICY & STRATEGY

The focus of Course Two is the strategic art. The course includes:

the study of war, national security policy, and national security and national military strategies. The course also examines international and domestic political, economic, and social environments, forces and trends.²³

In addition, the course explores the instruments of national power, the "Revolution in Military Affairs (RMA)," and the strategic future. This course also includes a national military strategy exercise.

The purpose of Course Two is to develop strategic thinkers who can analyze, evaluate, and apply national security and national military policy. Course Two is incomplete without the inclusion of information operations as a part of national power and a major contributor or inhibitor to the other elements of national power.

Lesson 6: National Instruments of Power (Economic and Informational)

Lesson 6 could service as an excellent point to introduce the subject of information operations. The lesson actually

focuses on the economy as an element of national power and makes only a brief mention of information operations. Specifically, the objectives to: "understand the effect of information technology on the instruments of national power, and understand what is meant by information warfare,"²⁴ are not achieved. The assigned reading for this lesson looks at information through industrial age lenses: information = technology, rather than information = power.

Even the task of this lesson is skewed by an industrial age orientation. "Understand the important effect that information technology will not only have on the military instruments of power, but the economic and diplomatic as well."²⁵ The task should be restated to read: understand the effects of national instruments of power: military, economic, and diplomatic in the information age; and understand how information, in itself, is an asset and an instrument of national power.

The previously mentioned National Defense University, School for Information Warfare and Strategy's (SIWS) two-year pilot program provides a viable benchmark for information operation

education. The lessons learned during those two years can be applied here.

- Lesson 6 must incorporate portions of SIWS' Course 1, National Security Policy: The Information Dimension, Lesson 1A020: The Elements of National Power,
- and Course 2, Military Strategy and Joint Warfare: The Information Advantage, Lesson 2E050: The Shifting Paradigm--The Information Component of National Power.

Directly infused material from these SIWS lessons provides a information age perspective to the subject.

Lesson 30: National Military Strategy Exercise (NMS Formulation)

The purpose of this exercise is to develop a new National Military Strategy that provides overarching guidance from now to the dawn of the 21st Century. This capstone exercise challenges students to translate the knowledge gained throughout the course into action. The dimension of information must be included in the process of strategy formulation. Once again, this lesson avoids any contact with the existence of information as an element of national power.

- SIWS' Course 2, Military Strategy and Joint Warfare: The Information Advantage, Lesson 2B040: The National Military Strategy will fill this deficit.

Lesson 31: Defense Issues

Lesson 31 is yet another lesson in Course 2 that misses the mark by confusing technology instead of information as the major driver for change. This lesson focuses on the "Revolution in Military Affairs (RMA)," the movement of military thought and action from the industrial age to the information age. Technology in warfare gives you: the computer-aided gunnery system for the M-1A2 Tank; information in warfare is the catalyst for the RMA.

Again, the SIWS' pilot program is the source for the information age thinking needed for Lesson 31.

- SIWS' Course 3, Employing Information Technology, Lesson 3A010: The Role of Information Technology in Information Warfare examines technology as a conduit for information rather than as the means to achieve information dominance required for a RMA.

Information dominance is fundamental to the RMA, to the operational concepts of Joint Vision 2010, as well as to the patterns of operations in Army Vision 2010.

Lesson 32: The Strategic Future

This lesson is completely void of any reference to the dimension of information in the future. For strategic leaders to think comprehensively about the trends that will shape the 21st century, their analysis must include the role of information in that equation.

- SIWS' Course 1, Lesson 1B070: Information, Technology, and the Third Wave can fill this void.

COURSE 3: JOINT SYSTEMS AND PROCESSING

The goal of Course 3 seeks to develop the student's understanding of the framework behind the process "that makes the Army run." A critical assessment of this process can not be complete without the inclusion of information systems. Unfortunately, information systems and processes are not examined during this analysis. To complete this study, Course 3 must

focus not only on the nation's Industrial Base, but also on the nation's Information Base.

- SIWS' Course 4, Defense Processes: Leveraging Information Technologies, Lesson 4A030: Integration and Interoperability,
- and Course 5, Acquiring Information Systems, Lesson 5A040: Information Technology--An Executive Perspective are a good source of material to achieve this end.

These lessons offer an in-depth examination of process and support systems that aid joint operational needs. They present a method to convert joint operational needs into information systems.

COURSE 4: IMPLEMENTING NATIONAL MILITARY STRATEGY

Course 4, the final portion of the core curriculum, builds on the collective base of knowledge gained throughout previous courses. The course centers around developing short-term and long-term plans in support of the combatant commander's execution of theater strategic warfare.

The course flows from the National Command Authorities and the Unified Command Plan, to the joint planning process, campaign planning and design, organizing the theater of war,

the contributions of the services and other functional organizations, and two end-of-course exercises.²⁶

The cumulative relationship between Course 4 and the preceding courses cannot be totally achieved without discussing information as an instrument of national power.

Lesson 5: Theater Strategy and Campaign Planning

This lesson focuses on the principles of campaign planning that enable a combatant commander to translate national policy into joint operations. This lesson would be incomplete without the addition of the information advantage in the strategic planning process. Lesson 5 is the keystone lesson for Course 4. The principles and methodologies gained in this lesson provide students with the foundation to plan, synchronize, and employ theater assets across a wide range of military operations. Information operations must be specifically included as a part of this process.

Lesson 5 sets the stage for one of the end-of-course exercises, specifically Lesson 27: Campaign Planning Exercise a campaign in North Africa against the North African Republic (NAR), a coalition of rouge states bent on gaining regional

hegemony. The significance of this lesson can not be understated. Currently, Lesson 5 is void of any mention of IO.

- SIWS' Course 2, Military Strategy and Joint Warfare: The Information Advantage, Lesson 2C010: Organizing a Theater--Peace and War,
- and Course 3, Employing Information Technology, Lesson 3C040: Electronic Warfare Technology and Capabilities can fill the information void in lesson 5.

This lesson focuses on theater campaign planning, emphasizing the impact of information operations on the process.

Lesson 11: Future Joint Land Warfare

This lesson explores joint land warfare in the future. The lesson currently stresses technology, warning of a potential high-tech pitfall. Rather than pro-actively expressing confidence in information technology as an enabler to fulfill the tenets of Joint Vision 2010 and Army Vision 2010, it provides a negative impression of technology in the information age. Again, this lesson is embued with industrial age "think."

To revise this lesson toward an information age perspective, it must project information technology as an enabler, not as an inhibitor.

- SIWS' Course 3, Employing Information Technology, Lesson 3A010: The Role of Information Technology in Information Warfare provides a good start.

This lesson provides insight into how technology is used to enhance the flow of information to achieve the tenets of Joint Vision 2010 and Army Vision 2010.

Lesson 13, 14, 16, and 18: Force Employment

These lessons provide insight and understanding into how each service approaches warfighting. Missing from this line up is the employment of information in joint operations.

- SIWS' Course 3, Lesson 3A010: The Role of Information Technology in Information Warfare,
- and Lesson 3C040: Electronic Warfare Technologies and Capabilities could be the basis for an additional course, Information Employment.

Lesson 25: Military Operations Other Than War

Among the wide range of options to employ during Military Operations Other Than War (MOOTW), information operations become an attractive alternative to "boots on the ground," the deployment of military forces. Although the introduction to Lesson 25 suggests the involvement of information in MOOTW, the reality on the lesson denies this option. As an instrument of national power, information can be successfully applied in MOOTW. This lesson, as in Lesson 5, establishes the base for the second end-of-course exercise, Lesson 26, Military Operations Other Than War (MOOTW) Exercise.

Lesson 25 establishes the groundwork and provides the point of departure for the MOOTW exercise. The exercise is set in a post-Castro-Cuba scenario; it provides students with the opportunity to apply various instruments of national power to achieve a desired end-state.

- SIWS' Course 2, Lesson 2D060: Special Operations--A Seminar War Game will enrich the exercise.

The SIWS lesson provides an in-depth exercise for employing information in operations other than war. It expands the

student's knowledge of available options which can be implemented to achieve a successful outcome.

Lesson 26 and 27 Exercises

As mentioned previously, IO must be integrated into the end-of-course exercises to offer a lasting impression of the importance of information as an instrument of national power. The MOOTW and Campaign Planning Exercises could be excellent vehicles to enable students to exercise their knowledge of employing IO.

- SIWS' Course 2, Lesson 2D060: Special Operations--A Seminar War Game,
- Course 2, Lesson 2C080 Campaign Exercise I,
- Course 2, Lesson 2E030 Campaign Exercise II,
- and Course 3, Lesson 3C040: Electronic Warfare Technologies and Capabilities provide the necessary elements to effectively execute IO in support of a combatant commander's theater objectives.

Terms Two & Three, Advanced Courses

ADVANCED COURSES

Terms Two & Three provide an excellent opportunity for students to expand their knowledge base in areas in which they wish to concentrate their studies. Unfortunately, USAWC only offers one information operations advanced course: Course 567cj, Information Warfare: National Policy Issues. Although a very informative course, it does not begin to provide students with the depth of knowledge that the subject requires. To the maximum extent possible, more advanced courses should be made available to enable larger numbers of better prepared students to pursue deeper examination of the information element of national power.

Currently, the National Defense University offers a host of elective courses in the arena of information operations. These courses are transportable and could serve as the foundation of additional elective courses for USAWC's Terms Two & Three.

Consider the following examples:

- Course 5900: Foundations of Information Warfare
- Course 5905 Strategic Aspects of Information Warfare

- Course 5915: Defensive Information Warfare, Protecting Cyberspace
- Course 5920: Systems of Systems and Beyond.

Each of these courses would complement the information operations improvements suggested for the Core Curriculum.

Classroom learning is best reinforced when it is followed by action. Term Two is no exception to this axiom. As in Term One, information operations must be an integral part of Term Two's end-of-term exercise. Term Two's Strategic Crisis Exercise must include extensive information operations play to reinforce the lessons learned during the term.

In addition to, or in concert with, an end-of-course exercise, the RAND Corporation's The Day After . . . In Cyberspace exercise offers an attractive vehicle to expand students' knowledge of information operations. The exercise "explores a range of emerging post-Cold War international security problems, with special emphasis on new types of strategic warfare and the implications of strategic information warfare."²⁷ National Defense University's Center for Advanced Concepts & Technology found the RAND exercise an effective way of educating students

about the growing importance of information operations in future strategic warfare.

CONCLUSION

Information superiority will give the United States the advantage in the 21st Century. Senior leaders must broaden their horizons in the area of information operations. Those who do not understand the capabilities and vulnerabilities of information systems will lose battles in the information age. The current curriculum at USAWC does not produce information knowledgeable leaders. To accomplish this task, courses must be developed or expanded to cultivate leaders who understand the significance of all aspects of the information instrument of national power.

The Army requires leaders with a deep understanding of warfare in the information age. This understanding is fundamental to the success of the Revolution In Military Affairs, Joint Vision 2010, and Army Vision 2010. Future leaders need an understanding of the basic forms of information warfare: command-and-control warfare (C2W), intelligence-based warfare (IBW),

electronic warfare (EW), psychological warfare (PSYW), hacker warfare, economic information warfare (EIW), and cyberwarfare.

To provide the education required to produce information knowledgeable leaders, this study recommends additions to the Core and Advanced Course Curricula of USAWC. In addition to the information garnered from these lessons, emerging knowledge must be reinforced through application. All USAWC exercises must include information operations play to solidify the lessons learned in class.

The National Defense University's School of Information Warfare Strategy two-year pilot program offers an excellent source of information operations material to enhance USAWC curriculum. The thoughtful integration of this material into USAWC curriculum will help transform USAWC from an industrial-age institution into an information-age institution. This paradigm shift will facilitate the education of information knowledgeable leaders.

ENDNOTES

¹ Alvin & Heidi Toffler, War and Anti-War (Boston, MA: Little, Brown and Company, 1993), 13.

² Dr. John Alger, Dean School of Information Warfare, National Defense University, <algerj@ndu.ed>, "Information Knowledgeable Leaders," electronic mail message to Philip La Perla, <laperlap@carlisle-emh2.army.mil>, February 1997.

³ Gen. John M. Shalikashvili, Joint Vision 2010 (Washington: Joint Chiefs of Staff, 1996), 16.

⁴ Ibid., 19.

⁵ Gen. Dennis J Reimer, Army Vision 2010 (Washington: Dept. of the Army, 1996), 10.

⁶ Lt Gen Peter Pace and VADM Arthur K. Cebrowski, Information Warfare: A Strategy for Peace...The Decisive Edge in War (Washington: The Joint Staff, n.d.), i.

⁷ Gen. Dennis J Reimer, Information Operations (IO) Intent and Strategy,..(Washington: MSG, 031948Z SEP 96), 5.

⁸ Martin C. Libicki, What is Information Warfare? (Washington: National Defense University Press, August 1995), 7.

⁹ Ibid., 10 - 15.

¹⁰ Ibid., 21.

¹¹ Reimer, Army Vision 2010. 13.

¹² Ibid., 13.

¹³ Shalikashvili, 16.

¹⁴ Clarence A. Robinson, Jr., "Key Position Navigation Signal Demands Jamming Suppression" Signal (August 1996): 32.

¹⁵ Libicki, 46.

¹⁶ School of Information Warfare and Strategy, History of the School of Information Warfare and Strategy. (Washington: National Defense University, n.d.), 1-4.

¹⁷ Ibid., 4-5.

¹⁸ School of Information Warfare and Strategy, AY 95-96 IWS Program. (Washington: National Defense University, n.d.), 1.

¹⁹ Lt Col Richard Casey, Executive Officer School of Information Warfare, telephone interview by author, 28 February 1997.

²⁰ Capt Robert Ehlers, Assistant Professor of History U.S. Air Force Academy, "Teaching Information Warfare: A Review of Programs at Senior and Specialized Schools with Recommendations for Improvement," research paper for Assistant Secretary of Defense, Command, Control, Communications, and Intelligence, USAF Academy CO, 27 July 1995.

²¹ VADM Arthur Cebrowski Director Command, Control, Communications, and Computer Systems, The Joint Staff, "Information Warfare Education, Training and Awareness," memorandum for Chairman Joint Chiefs of Staff, Washington, 5 September 1995.

²² Dr. John Alger, "Declaring Information War, Early Training Crucial to Awareness," Jane's International Defense Review Volume No. 29 (July 1996): 55.

²³ U.S. Army War College, War, National Policy & Strategy, Core Curriculum, Course 2, (Carlisle Barracks, 1996), 1.

²⁴ Ibid. 28.

²⁵ Ibid.

²⁶ U.S. Army War College, Implementing Nation Military Strategy, Core Curriculum, Course 2, (Carlisle Barracks, 1996), 1.

²⁷ Center for Advanced Concepts & Technology "National Defense University, Report of an Educational Experiment "Tutorial on Information Warfare," (Washington, n.d.), 6.

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