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THE WARFIGHTERS' COUNTERSPACE THREAT ANALYSIS (WCTA): A FRAMEWORK FOR EVALUATING COUNTERSPACE THREATS

by

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September 2000

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The authors present an evolutionary approach to evaluating the counterspace threat in support of Department of Defense (DoD) decision-makers. The goal is to present a process that decision-makers can readily utilize to accurately assess the level of the counterspace threat originating within their Area of Responsibility (AOR). It is particularly useful as the state of affairs change within the AOR. The authors examine the necessity to utilize space to achieve information dominance, strengths and weaknesses of present Counterspace Threat Models, DoD's increasing dependence on space assets, DoD's reliance on commercial space systems to meet future requirements, and potential adversaries' awareness of the dependence of U.S. forces on space systems.

Conclusions stress that the threat is comprised of two essential elements an opponent's willingness to employ a counterspace tactic (their intent) and the opponent's ability to develop the necessary tools to employ a counterspace tactic (their capability). The authors believe that the *"intent"* component of the threat changes more rapidly than the present models can easily accommodate. Therefore, a process, such as the one presented in this thesis, will enable DoD decision-makers that experience many of the changes of *"intent"* first hand to rapidly and accurately assess the threat as the condition changes within the AOR.

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I. INTRODUCTION

A. JOINT VISION (JV) 2020

The goal of JV 2020 is to create a joint force capable of achieving full spectrum dominance against the diverse challenges it will confront in the future. JV 2020 describes full spectrum dominance as the ability of the United States (U.S.) Forces, operating unilaterally or in combination with multinational and interagency partners, to defeat any adversary and control any situation across the full range of military operations. Full spectrum dominance will permit U.S. Forces to access and freely operate in space, sea, land, air, and information. JV 2020 resolutely pronounces that full spectrum dominance will be obtained through the employment of dominant maneuver, precision engagement, focused logistics, and full dimensional protection. JV 2020 definitions are provided:

- **Dominant Maneuver** – the ability of joint forces to gain positional advantage with decisive speed and overwhelming operational tempo in the achievement of assigned military tasks. Widely dispersed joint air, land, sea, amphibious, special operations and space forces, capable of scaling and massing force or forces and the effects of fires as required for either combat or noncombat operations, will secure advantage across the range of military operations through the application of information, deception, engagement, mobility and counter-mobility capabilities.

- **Precision Engagement** – the ability of joint forces to locate, surveil, discern, and track objectives or targets; select, organize, and use the correct systems; generate desired effects; assess results; and reengage with decisive speed and overwhelming operational tempo as required, throughout the full range of military operations.

- **Focused Logistics** – the ability to provide the joint force the right personnel, equipment, and supplies in the right place, at the right time, and in the right quantity, across the full range of military operations.

- **Full Dimensional Protection** – the ability of the joint force to protect its personnel, and other assets required to decisively execute assigned tasks. It is achieved through the tailored selection and application of multilayered active and passive measures, within the domains of air, land, sea, space, and information across the range of military operations with an acceptable level of risk.

In addition, JV 2020 recognizes that the ability to employ dominant maneuver, precision engagement, focused logistics, and full dimensional protection in order to obtain full spectrum dominance firmly depends upon our ability to capitalize on the information revolution. JV 2020 makes clear the necessity to gain and maintain information superiority. Information superiority is the ability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same. This capability is important because it creates the opportunity for U.S. forces to achieve decision superiority. Decision superiority bestows U.S. forces the huge advantage of being within an opponents decision making cycle.

B. PROMINENT ROLE OF SPACE

In this age of network centric warfare, the dependence on space by U.S. forces has grown exponentially. Space has infiltrated all aspects of military existence. U.S. forces utilize space systems to advance information in support of myriad tasks such as meteorology, remote sensing, navigation, and communication. Space systems have become essential in completing operations ranging in complexity from directing smart bombs to ordering supplies.

Space systems have become critical nodes. The ability of U.S. forces to achieve information superiority and to ultimately gain decision superiority depends firmly upon space. If the transformation of U.S. forces into a force capable of achieving full spectrum dominance, as described in JV 2020, is to come to fruition, the need to protect space systems from being negatively effected by potential adversaries in crucial. U.S. forces must have sufficient access and complete confidence in the information provided by space systems to operate at maximum efficiency. The initial stage in protecting space systems is to identify the capabilities of potential adversaries and assess the threat those capabilities pose to U.S. space systems.

C. EXISTING COUNTERSPACE THREAT MODELS

In an effort to assess threats to U.S. space systems, several organizations within the Department of Defense (DOD) have developed Counterspace Threat Models (CSTMs). These models provide an intelligence community based assessment of the ability of potential adversaries to negatively impact U.S. space systems.

Existing models do an admirable job of delineating current and forecasting viable future capabilities of potential adversaries. The models provide a solid evaluation of conceivable threats. The information provided by existing CSTMs validate the threat and provide critical feedback to research and development (R&D) organizations within DOD. Existing CSTMs provide the insight necessary

to ensure that measures and capabilities needed by U.S. forces, to prevail over current and predicted capabilities of possible adversaries, are developed. Although existing CSTMs do an excellent job in support of R&D, the authors of this thesis believe that existing CSTMs have inherent problems that limit its utility to DOD decision-makers.

The first problem is timeliness. The results that are provided by present CSTMs are based on information and considerations of the past. Developing current CSTMs takes considerable time. From initiation to completion of a CSTM, a great deal of time has passed and many factors may have changed. At some point, however, developers of the CSTM must cease all new inputs and release results. This approach is amenable within the realm of R&D, but may pose a problem to DOD decision makers in search of current, accurate, and timely information on which to base a precarious decision.

The next problem is rigidity of focus. CSTMs tend to be country oriented and not readily adaptable to other possibilities. These models normally explore capabilities of particular countries and do not easily adapt to analysis of smaller or larger entities. This problem is of particular importance to DOD decision-makers that may need to focus attention to an entire area of responsibility (AOR) or a single element of an opposing force. The slate of potential adversaries to U.S. space systems range from sovereign nations to terrorist groups. Future CSTMs must be able to accommodate all possibilities.

The final problem is passivity. The models are generated by intelligence organizations that disseminate results to customers. Models provide a matrix of country-focused threats ranked as high, medium, or low. The CSTM does not include DOD decision-makers in the evaluation process. This lack of involvement invites DOD decision-makers to examine only the end result (the matrix) and omit the supporting material. This approach does not foster an environment from which a greater understanding of space is obtained. Decision-makers will examine the final matrix without gaining a true regard for what it connotes or for how it will ultimately impact their AOR.

D. PURPOSE OF THESIS

The authors of this thesis have presented an evolutionary approach to evaluating the counterspace threat in support of DOD decision-makers. The primary goal of this thesis was to develop a framework capable of providing an accurate assessment of the counterspace threat within a given AOR. The framework is flexible in design and will readily adapt to all future rivals. The framework will encourage an improved understanding of space by providing the guide from which decision-makers evaluate the counterspace threat within their AOR.

The framework will enable U.S. forces to anticipate the impact of counterspace tactics on the battlespace and to develop plans to compensate. The framework provides decision-makers with the necessary tools and the

proper approach to accurately evaluate the ability of any foe to negatively impact space systems within an AOR.

E. OUTLINE OF CHAPTERS

1. Chapter II – Counterspace Issues

This chapter discusses the important issues related to counterspace. It provides a historical perspective on space policy. It outlines standing U.S. and DOD policy. It addresses DOD's increasing dependency on space and makes clear that this fact is not lost to potential adversaries. Finally the chapter explores the effect this dependency may have on counterspace tactics.

2. Chapter III – Counterspace Tactics

This chapter introduces the elements of a space system. It defines offensive counterspace tactics and delineates five major purposes of counterspace. The chapter provides explanation of primary counterspace tactics and presents the major strengths and weaknesses of each tactic.

3. Chapter IV – A Framework for Evaluating Counterspace Threats

This chapter presents an evolutionary approach to evaluate counterspace threats. The framework provides a top level step-by-step approach to determine the threat. Each step is further defined to provide the user with all necessary information to accomplish each step.

4. Chapter V – Research Methodology

This chapter outlines the major issues addressed within the thesis. It illuminates the scope of the study and the rationale for the composition of the framework. This chapter provides astute framework developmental information that will support the user in adapting their particular operational situation to the framework and achieve exceptional results.

5. Chapter VI – Conclusions and Recommendations

The summary and conclusion of this thesis are presented. Recommendations for further study are also provided in this chapter.

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II. COUNTERSPACE ISSUES

A. HISTORICAL PERSPECTIVE ON SPACE DOCTRINE

In an attempt to gauge the counterspace threat, users of this framework must discern that the threat is comprised of two essential elements. Those two elements are the adversary's willingness and ability to utilize and to produce a counterspace tactic. To gain improved insight on an adversary's willingness to utilize a counterspace tactic, it is important to have a regard for the prominent existing space doctrines. The four prominent doctrines regarding the utilization of space are space sanctuary, lack of survivability, high ground, and control.

1. Space Sanctuary

A basic tenet of the Space Sanctuary school is that the primary value of space forces is their ability to "see" within the boundaries of sovereign states.[1] Followers of this school of thought believe that space vehicles must continue to enjoy the legal right of overflight.

If space vehicles do not have legal overflight rights, the possibility of enforcing future treaties become murky. Countries will have essentially lost the capability to conduct non-intrusive technical treaty verification. This doctrine emphasizes that the ability to legally "see" within the borders of other countries is

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[1] *On Space Warfare*, p. 35, 1998.

crucial and the only way to protect this ability is to designate space as a sanctuary.

2. Lack of Survivability

The basic tenet of the Lack of Survivability school is that space systems are inherently less survivable than terrestrial forces.[2] Followers of this school of thought believe that space systems will be more vulnerable due to the effect of long-range weapons and the intrinsic belief that nuclear weapon use is more probable in space. It is also argued that the innate predictability of space system location makes it an apt target.

Advocates of this school believe that space should be utilized for a limited number of functions in support of U.S. Forces. These functions will be utilized for increased efficiency in peacetime, but should not be depended upon in a wartime situation because of susceptibility to loss.

3. High Ground

The basic tenet of the High Ground school is that domination of the high ground ensures domination of the lower lying areas.[3] This school of thought advocates development of a space-based ballistic missile defense (BMD). The development of a spaced-based BMD would offset the current preeminence of offensive weapons such as directed energy or high velocity impact. This would place defensive measures on even footing with offensive

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[2] *On Space Warfare*, p. 36, 1988.

[3] *On Space Warfare*, p. 36, 1988.

measures. The end-state would be to promote peace through the notion of assured survival vice destruction.

4. Control

The basic tenet of the Control school of thought is that whoever has the capacity to control space will likewise possess the capacity to exert control over the surface of the earth.[4] This belief is soundly founded in the historical analogies of air and sea power. Espousers of this school view control of space as the first objective in war. Control of space enables terrestrial forces to benefit from the use of space while denying adversaries of those very same benefits.

A fundamental understanding of these tenets is beneficial to the users of this framework. The ability to associate an adversary to a school of thought will provide crucial insight about the opponent's willingness to employ various counterspace tactics. As stated above, one aspect of evaluating the threat is gauging an opponent's will. This may be the more difficult task of the two because it is esoteric.

B. U.S. SPACE POLICY

An understanding of U.S. and DOD space policy is conducive to the proper use of this framework. The user must be cognizant of what actions

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[4] *On Space Warfare*, p. 37, 1988.

present space policy issues, as appropriate. The user must also have a comprehension of the purpose of present policy.

U.S. space policy is relatively straightforward. It espouses primarily the sentiment of the Control Doctrine; however, it implies that the need for control is only to ensure freedom of action, which is consistent with the Sanctuary Doctrine. The policy states that consistent with treaty obligations, the United States will develop, operate, and maintain space control capabilities to ensure freedom of action in space; and, if directed, deny such freedom of action to adversaries. These capabilities may also be enhanced by diplomatic, legal, or military measures to preclude an adversary's hostile use of space systems and services. The U.S. will maintain and modernize space surveillance and associated battle management command, control, communications, computers, and intelligence to effectively detect, track, categorize, monitor, and characterize threats to U.S. and friendly space systems and contribute to the protection of U.S. military activities.[5] The policy makes clear that any attempt to hamper or limit U.S. utilization of space is considered unacceptable.

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[5] PDD-NSC-49/NSTC-8, "National Space Policy (U)," p. 1, 14 September 1996.

C. DEPARTMENT OF DEFENSE SPACE POLICY

1. Purpose, Applicability, and Scope

DOD policy on space policy is outlined in DOD Directive number 3100.10. The purpose of this directive was to update policy from the 1987 revision that reflected the sentiments of the Cold War; to assign responsibility for space and space-related matter within DOD; and to authorize publication of additional DOD issuance.

It applies to the Office of the Secretary of Defense, the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Inspector General of the Department of Defense Agencies, and the DOD Field Activities.

The scope of this directive includes the policy, requirements generation, planning, financial management, research, development, testing, evaluation, acquisition, education, training, doctrine, exercise, operation, employment, and oversight of space and space-related activities within the DOD.[6]

2. Policy

Department of Defense Directive (DODD) 3100.10 is the requisite authority on all DOD space related matters. It encompasses all issues related to space from requirements generation to operation and employment. The following are pertinent sections from DODD 3100.10 that relate to space policy

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[6] Department of Defense Directive 3100.10, "Space Policy," pp. 5-6, 9 July 1999.

and counterspace tactics. These are themes the user must have cognizance to achieve optimum results with the presented counterspace framework.

- Space is a medium like the land, sea, and air within which military activities shall be conducted to achieve U.S. national security objectives. The ability to access and utilize space is a vital national interest because many of the activities conducted in the medium are critical to U.S. national security and economic well being.

- Ensuring the freedom of space and protecting U.S. national security interests in the medium are priorities for space and space-related activities. U.S. space systems are national property afforded the right of passage through and operations in space without interference.

- Purposeful interference with U.S. space systems will be viewed as an infringement on our sovereign rights. The U.S. may take all appropriate self-defense measures, including, if directed by the National Command Authorities (NCA), the use of force, to respond to such an infringement on U.S. rights.

- The primary DOD goal for space and space-related activities is to provide operational space force capabilities to ensure that the United States has the space power to achieve its national security objectives. Contributing goals include sustaining a robust U.S. space industry and a strong, forward-looking technology base.

- Space capabilities shall be operated and employed to: assure access to and use of space; deter and, if necessary, defend against hostile actions; ensure that hostile forces cannot prevent U.S. use of space; ensure the United States' ability to conduct military and intelligence space and space-related activities; enhance the operational effectiveness of U.S., allied, and friendly forces; and counter, when directed, space systems and services used for hostile purposes.

These sections from DODD 3100.10 will support the user of this framework to readily recognize what actions are and are not considered permissible in accordance with DOD policy. This will benefit the user in accurately assessing the counterspace threat.

D. THE INCREASING RELIANCE ON SPACE SYSTEMS

The reliance of U.S. forces on space to has grown substantially. Space has played and continues to play a vital role in every military endeavor since

Operation Desert Storm. The Long Range Plan presented by U.S. Space Command has recognized space as an enabler of military operations. It is inevitable that space will become even more important in the future. For the needs envisioned in the next decade, our already smaller military force will be much more effective because of the information available to it.[7]

This concept amplifies the need for information dominance. Because the size of U.S. forces continue to decline, information dominance becomes even more of a necessity to achieve full spectrum dominance. Enormous amounts of the information required by U.S. forces will be collected and disseminated via a space system.

The necessity of U.S. Forces to utilize space to properly execute operations, combined with the fact that space has been acknowledged as a national vital interest in DOD policy, dictate that U.S. Forces must be able to protect space systems and accurately distinguish the counterspace threat. The military has basically followed the lead of the nation and shifted from an industrial base to an information base. The way a nation makes wealth is the way it makes war.[8]

This ever-increasing dependence on space systems may increase the prospect that potential adversaries will take an asymmetric approach. During this approach, opposition will focus on the development of niche capabilities.

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[7] U.S. Space Command, *Long Range Plan*, p. 1, Peterson Air Force Base, Colorado, 1998

[8] Toffler, Alvin and Heidi, *War and Anti-War*, p. 2, Warner Books, 1993.

They develop and use approaches that avoid U.S. strengths and exploit potential vulnerabilities. The goal is to create conditions that effectively delay, deter, or counter the application of U.S. Force capabilities by radically altering methods of operation.[9] This is an approach tailor-made for counterspace tactics.

The growing dependence of U.S forces on space systems must be properly managed and examined. U.S. forces can not allow its reliance on space systems to evolve from an asset that enables operations to a vulnerability that can be exploited. This is the principal rationale for developing a framework that enables DOD decision-makers to evaluate the counterspace threat. If a vulnerability exists, there must be a mechanism to identify it, so that U.S. forces may adapt and overcome the disadvantage.

E. DEPENDENCE HAS OUTPACED BUDGET AND PRODUCTION

U.S. Forces dependence on space systems has and will continue to outpace its budget and production capability. U.S. Forces are constantly in search of opportunities to procure bandwidth. This has resulted in U.S. Forces looking to the commercial sector to satisfy a portion of its requirements. Because of the high cost associated with space systems and the declining DOD budget, the number of commercial space assets is predicted to surpass the

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[9] U.S. Joint Chiefs of Staff, *Joint Vision 2020*, p. 6, Washington, D.C., 2000.

number of military space assets before the year 2010. Figures 1 and 2 denote the composition of space assets in 1996 and the projected composition in 2010.

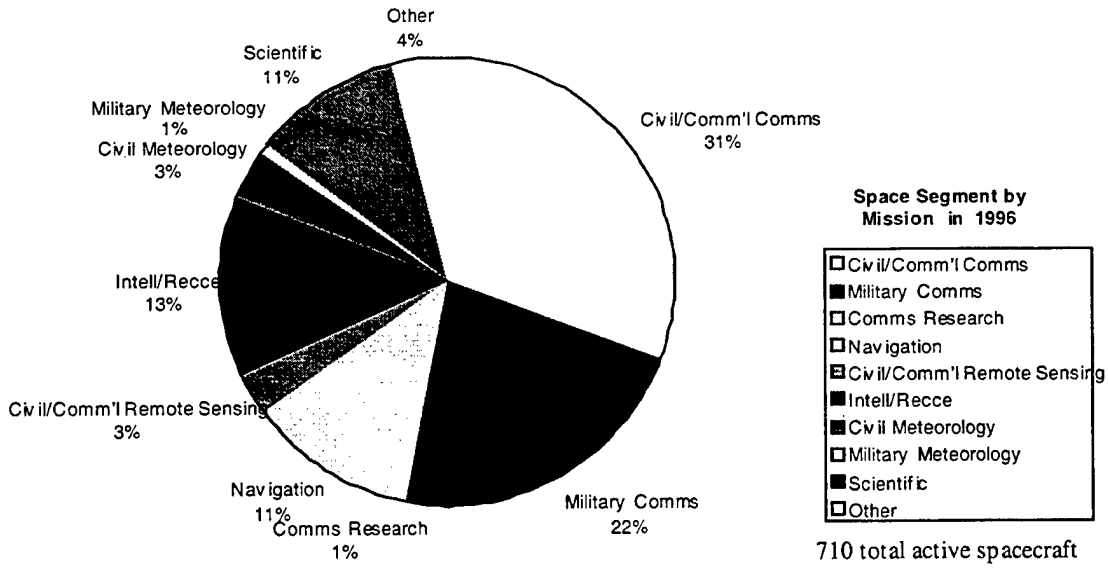

Figure 1: 1996 Commercialization of Space (From NDIA[10])

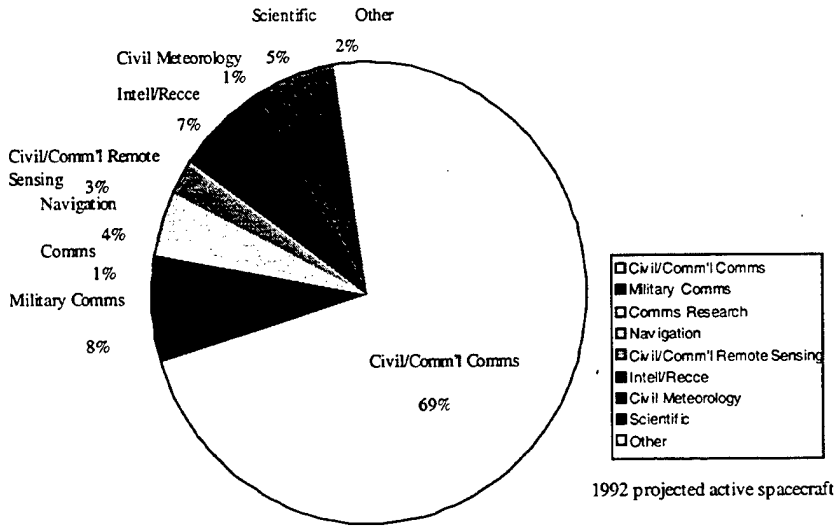

Figure 2: 2010 Commercialization of Space (From NDIA[11])

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10 National Defense Industrial Association (NDIA) Space Study Presentation Brief, 1998.

11 National Defense Industrial Association (NDIA) Space Study Presentation Brief, 1998.

Figures 1 and 2 illustrate that commercialization of space will continue to surpass military production. In 1996, civil/commercial communications accounted for 30 percent of all spacecraft. In 2010, it is projected that civil/commercial communications will account for nearly 70 percent of all spacecraft.

The share of military space system requirements that will be accomplished through the commercial sector is expected to exceed 60 percent of communications services and 30 percent of remote sensing services. Figure 3 summarizes the growth of military dependence on the commercial sector through 2010.

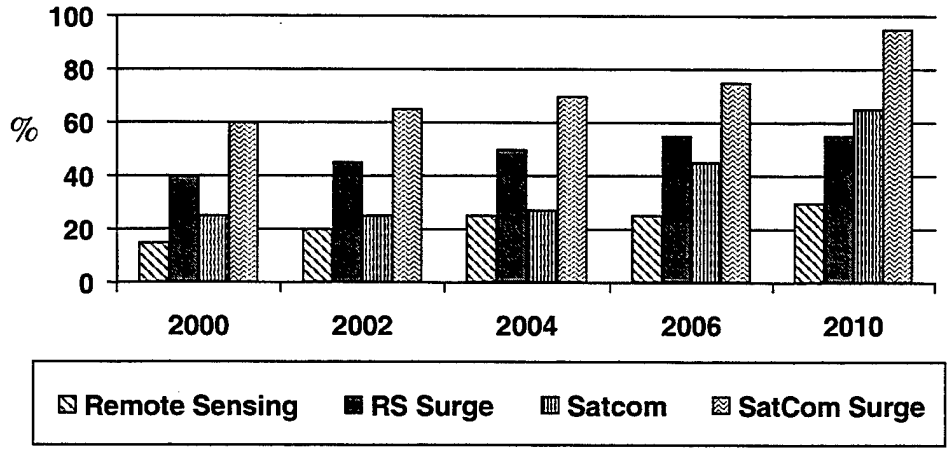

Figure 3: Military Dependence on Commercial Assets (From NDIA[12])

[12] National Defense Industrial Association (NDIA) Space Study Presentation Brief, 1998.

Although the commercialization of space has definite benefits by allowing U.S. Forces to leverage off its emerging capability and technology, it does present interesting potential problems. One of the questions that needs to be addressed is "What constitutes a U.S. space system?". Commercialization of space has introduced a number of multi-national organizations. "Does U.S. Forces utilization of these assets require that it be considered a U.S. space asset that must be protected?". Another question is security: "How secure must these systems be?". The final question is survivability: "Do these systems require a more rugged design to increase survivability against enemy attack?". These are all valid questions but not the focus of this thesis. Additional information on these issues can be obtained from the National Defense Industrial Association (NDIA) Space Study 1998, and GRC International, Incorporated's "The Next Decade in Space."

This thesis is focused primarily on how these issues impact counterspace threats. The problem commercialization of space poses for counterspace is two fold. The first issue is that U.S. Forces are more dependent on commercial systems that are more vulnerable. The second issue is that the commercialization of space has provided potential adversaries with enhanced information.

The issue of vulnerability of commercial space systems applies directly to an adversary's willingness to employ particular counterspace tactics. If an opponent is aware of U.S. dependence and the ease of degrading a commercial

space system, his willingness to degrade or disrupt the system will increase; and therefore, the threat has increased.

The second issue of providing enhanced information to possible foes pertains directly to U.S. Forces' ability to identify foreign capability. The volume of information readily accessible allows potential adversaries to become more familiar with U.S. capabilities and increases the ability to counter. For example, commercially available 1-meter imagery will increase an adversary's ability to determine the location of U.S. space system ground segments. This information would enhance the effectiveness of several counterspace tactics such as Ground Segment Attack and Sabotage (GSAS) and Denial and Deception (D&D).

F. ADVERSARY AWARENESS

The growing importance of space is not a phenomenon unique to the United States. Countries throughout the world are increasing their awareness and utilization of space. The reality that U.S. Forces are becoming increasingly dependent on space systems is not a fact lost on other countries. The following quotation is the perfect elucidation:

> Counterspace operations are viewed as an inevitable aspect of future warfare and as part of an overall information denial doctrine. Academy of Military Science (AMS) writings note that the United States relies on satellite platforms for 70 percent of its communications (90 percent for navy communications), and 90 percent of its intelligence. Chinese strategists and engineers perceive U.S. reliance on communications, reconnaissance, and navigation satellites as a potential "Achilles' heel." COSTIND advocates believe China must develop

> space combat systems which are a fundamental aspect of the revolution in military affairs and a new sphere of warfighting.[13]

It is certain that other countries are cognizant of U.S. Forces expanding utilization of space. Potential adversaries view this reliance on space as a liability that can be exploited. The accurate, timely identification of the threat will enable U.S. Forces to anticipate the possible impact of counterspace tactics on the battlespace and to develop plans to compensate.

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[13] Stokes, Mark A., *China's Strategic Modernization: Implications for the United States*, p. 117, Strategic Studies Institutes, United States Army War College, September 1999.

III. COUNTERSPACE TACTICS

A. DEFINITION OF A SPACE SYSTEM

1. Introduction

The purpose of this chapter is to introduce an understanding of what a space system encompasses. Counterspace tactics, means used to exploit vulnerabilities in a given space system, will be defined. The researchers will use the definitions presented in this chapter, as the domain in which the space system and counterspace tactics will be used within the context of the thesis framework.

2. Elements of a Space System

Space systems can be defined by a component breakdown of an entire system. The researchers will work within using the space mission architecture, as presented in Space Mission Analysis and Design[14], as what constitutes a space system. The following elements of a space system are defined:

- Subject- the thing which interacts with or is sensed by the space payload: moisture content, atmospheric temperature, or pressure for weather missions; types of vegetation, water, or geological formations for Earth-sensing missions; or a rocket or intercontinental ballistic missile for space defense missions.
- Payload- consists of the hardware and software that sense or interact with the subject.

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[14] Larson, Wiley and Wertz, James, *Space Mission Analysis and Design*, pp. 9-11, Torrance, California: Microcosm, Inc & Kluwer Academic Publishers, 1992.

- Launch System- includes the launch facility, launch vehicle and any upper stage required to place the spacecraft in orbit, as well interfaces, payload fairing, and associated ground-support equipment and facilities.
- Orbit- is the spacecraft's trajectory or path.
- Communications Architecture- the arrangement of components, which satisfy the mission's communication, command, and control requirements.
- Ground System- consists of fixed and mobile ground stations around the globe connected by various data links. They allow us to command and track the spacecraft, receive and process telemetry and mission data, and distribute the information to the operators and users.
- Mission Operation- consists of the people occupying the ground and space segments, the mission operations concept, and attendant policies, procedures, and data flows.

3. Conclusions

The basic elements of a space system have been introduced so that the user understands that the space system encompasses more than just a satellite. Each of the components of a space system is vulnerable to attack. Therefore, space systems pose a risk to operational commanders if a threat is imposed on any components of a space system. The counterspace system threat tactics will now be defined.

B. COUNTERSPACE TACTICS

1. Introduction

Once a definition of a space system is agreed upon, the tactics that an adversary may employ to exploit any components of the space system must also be defined for the purposes of this thesis. Offensive counterspace

operations or "tactics" neutralize an adversary's space systems, or the information they provide. These "tactics" are conducted through attacks on the various elements of those systems for the purpose of achieving space control objectives. These offensive counterspace operations involve the use of lethal or nonlethal means and are conducted to achieve five major purposes:

a. deception

b. disruption

c. denial

d. degradation

e. destruction.

Four broad categories of offensive counterspace tactics will now be defined and used in the thesis framework.

2. Four Counterspace Tactics

The threat analysis framework being developed in this thesis will use the primary counterspace tactics used by the National Air Intelligence Center threat analysis model[15]. The four counterspace threats that will be used throughout the framework are a) Denial and Deception, b) Electronic Attack, c) Ground Station Attack and Sabotage, and d) Anti-Satellite Systems. Each of the tactics will be defined with a brief explanation of their advantages and disadvantages.

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[15] *Threats to US Military Access to Space*, pp. 3-6, National Air Intelligence Center, Wright-Patterson Air Force Base, Ohio.

a. Denial and Deception

The first counterspace tactic introduced is Denial and Deception (D&D) Attack. D&D techniques are those tactics that can be used to limit or corrupt information obtained by an intelligence collection satellite. D&D can be employed by no directed and directed means. Non-directed means is the routine employment of camouflage, concealment, and deception (CC&D) to deny or corrupt intelligence collected by satellites which may not be in direct response to U.S. reconnaissance satellites. Directed means is the employment of camouflage, concealment, and deception (CC&D) techniques to deny or corrupt intelligence by satellites mainly during the overflight of a specific low earth orbit intelligence collection satellite.

In D&D, potential targets include reconnaissance systems, imaging systems, and other intelligence gathering satellites. D&D tactics are relatively easy and inexpensive to employ and have the advantage of being able to be conducted during peacetime situations. A disadvantages of using D&D tactics is that the D&D program will only be effective if it is strictly adhered to by all participants in their goal to limit or corrupt information. Because of this strict adherence, it is necessary to limit the target set of this D&D counterspace tactic to get better results.

b. Electronic Attack

The second counterspace tactic is Electronic Attack (EA). This tactic is defined as functionally neutralizing a space system by jamming or

spoofing the electronic equipment on the satellite or at their ground facilities. EA tactics can be used to disrupt communication, navigation, and data links within the space system. EA techniques are moderately difficult to employ. Some advantages of EA techniques are that they are inexpensive and have the ability to effect multiple space system receivers. The disadvantage of EA attack is that it is only effective while the EA system is being operated.

c. Ground Station Attack and Sabotage

The third counterspace tactic is Ground Segment Attack and Sabotage (GSAS). This tactic employs physical attacks and/or sabotage against critical ground facilities associated with space systems in an effort to disrupt, deny, degrade, or destroy the utility of the space system. Any ground station, including communications stations, data reception facilities, control facilities, or launch facilities are potential targets. GSAS is relative low in difficulty to employ and has the advantage of being essentially permanent in terms of damage to the space system. Thorough knowledge of the target ground segment is essential to employ this tactic successfully. Adversaries can employ this tactic, specifically sabotage, in peacetime situations. Because of the visibility of destroying a ground station, the employer of the GSAS tactic will likely be faced with negative repercussions in the political world order.

d. Anti-Satellite Attack

The final counterspace tactic that will be defined is Anti-Satellite (ASAT) Attack. ASAT systems are designed to exploit a number of

susceptibilities to disrupt, deny, or degrade, or destroy satellites. All satellites are potential targets. ASATs are often defined as soft kill (directed energy) or hard kill (interceptor-based) systems. The advantages of using ASAT are that they are effective when the ratio of ASATs to target satellites is low. ASATs can permanently disable a space system. Because of the relative high cost of employing this satellite, wealthy states are the probable users of this technique.[16] Political realities dictate that employment of ASAT systems is most likely to be done during or just prior to war.

Table 1 gives a summarized picture of the four counterspace tactics presented:

	Relative Implementation Difficulty	Potential Targets	When Employed	Cost to Employ
D&D	low	Reconnaissance systems	Any time	low
EA	low	Communications, navigation, data links	Any time	low
GSAS	moderate	All ground segments	Any time	medium
ASAT	high	All satellites	During or prior to war	high

Table 1: Counterspace Tactics Overview

3. Conclusion

The basis of the threat analysis framework being introduced in this thesis will use the four counterspace tactics as described in this chapter. For the

[16] U.S. Space Command, *Long Range Plan*, p. 3, Peterson Air Force Base, Colorado, 1998.

purposes of this framework, the researchers have narrowly defined what each of these tactics possesses as attributes. The relationship between all tactics in their entirety has not been addressed. Each counterspace tactic will be considered individually for their strengths in the ability to exploit vulnerabilities of a space system. The four counterspace tactics: a) Deception and Denial, b) Electronic Attack, c) Ground Station Attack and Sabotage, and d) Anti-Satellite Systems are the backbone of the framework introduced in the next chapter.

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IV. A FRAMEWORK FOR EVALUATING COUNTERSPACE THREATS

A. INTRODUCTION OF THE WARFIGHTERS' COUNTERSPACE THREAT ANALYSIS (WCTA) FRAMEWORK

1. Framework Purpose and Problem Statement

The purpose of this chapter is to present an evolutionary approach to evaluating the counterspace threat. The framework presented, the Warfighters' Counterspace Threat Analysis (WCTA), is a motivation oriented, capability based approach. It is designed to be a step-by- step approach, which guides the user through the proper methodology to accurately assess the threat. The problem answered by this evolutionary approach is identifying the current threat in the AOR based on the most recent events.

The framework limits the scope of the problem by presuming a linear, independent relationship between the various counterspace tactics. This simplifies the problem while still producing highly accurate results in support of DOD-decision makers. The next evolution of the framework may explore the interdependency of the various tactics and how it effects the AOR.

2. The Need for an Effective Counterspace Framework

The next generation CSTM must provide timely, accurate assessments of the constantly changing threat experienced while operating in an AOR. U.S. Forces need to have a near real-time assessment of the counterspace threat. This point is extremely important because U.S. Forces

must be able to readily identify a counterspace threat; thoroughly understand the impact on the AOR; and effectively develop methods to counter.

The authors of this thesis believe that the only way to accomplish this is to develop a framework that encourages an increased understanding of space. The framework will accomplish this by allowing DOD decision–makers to take an active role in evaluating the threat within their AOR. The user will gain new insight on space while accomplishing each step of the framework. The user will contemplate space-related issues, which effectively build the foundation needed to fully understand the impact of counterspace tactics on the AOR. With this enhanced understanding, DOD decision-makers will be better equipped to make decisions on how to counter the threat.

3. Methodology

The framework is presented as a step-by-step approach to complete the evaluation. Each step is further defined through comments, examples, and figures to assist the user in properly accomplishing each step. The framework is designed for DOD decision-makers to obtain an accurate counterspace assessment based on the most recent and relevant factors within the AOR. The reader is assumed to have a basic level of knowledge about space, the AOR, and potential adversaries within the AOR.

B. THE FRAMEWORK

1. Overall Framework View

The framework contains four top level steps, each containing one or more substeps. The four top level steps are:

- Assess political reality
- Determine the required capabilities needed in each counterspace tactic
- Evaluate the adversary's counterspace capabilities
- Determine overall counterspace threat.

Figure 4 provides an illustrative summary of the steps in the new framework. Steps 2 and 3 must be accomplished for each of the four counterspace tactics presented; however, the order in which the counterspace tactics are completed is immaterial. The authors of this framework recommend that once a counterspace tactic has been chosen, Steps 2 and 3 should be completed consecutively for that tactic. Then begin steps 2 and 3 for the next tactic to avoid confusion. The overall view presented in Figure 4 will be used to examine each of the steps throughout the framework.

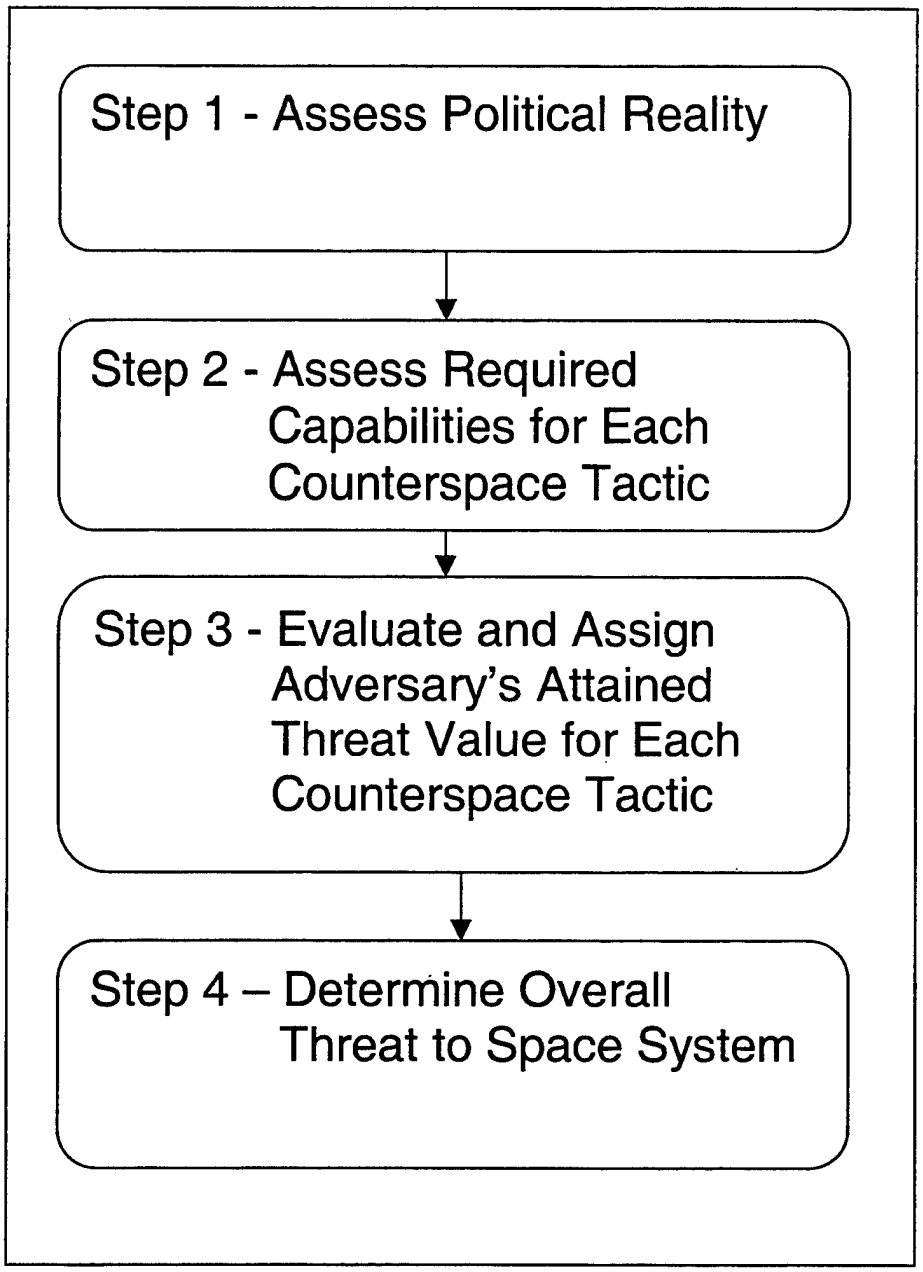

Figure 4: Warfighters' Counterspace Threat Analysis (WCTA) Framework

2. Framework Steps

a) Assess Political Reality

The first step of the framework may be the most difficult to accomplish. This step is difficult because people are accustomed to thinking in specific terms, such as number of satellites. This step requires the user to think in abstract terms. As discussed previously, threat is primarily comprised of two elements, the adversary's willingness to utilize and their ability to produce a counterspace tactic. This step addresses an adversary's intent or willingness to employ counterspace tactics. Figure 5 summarizes this step.

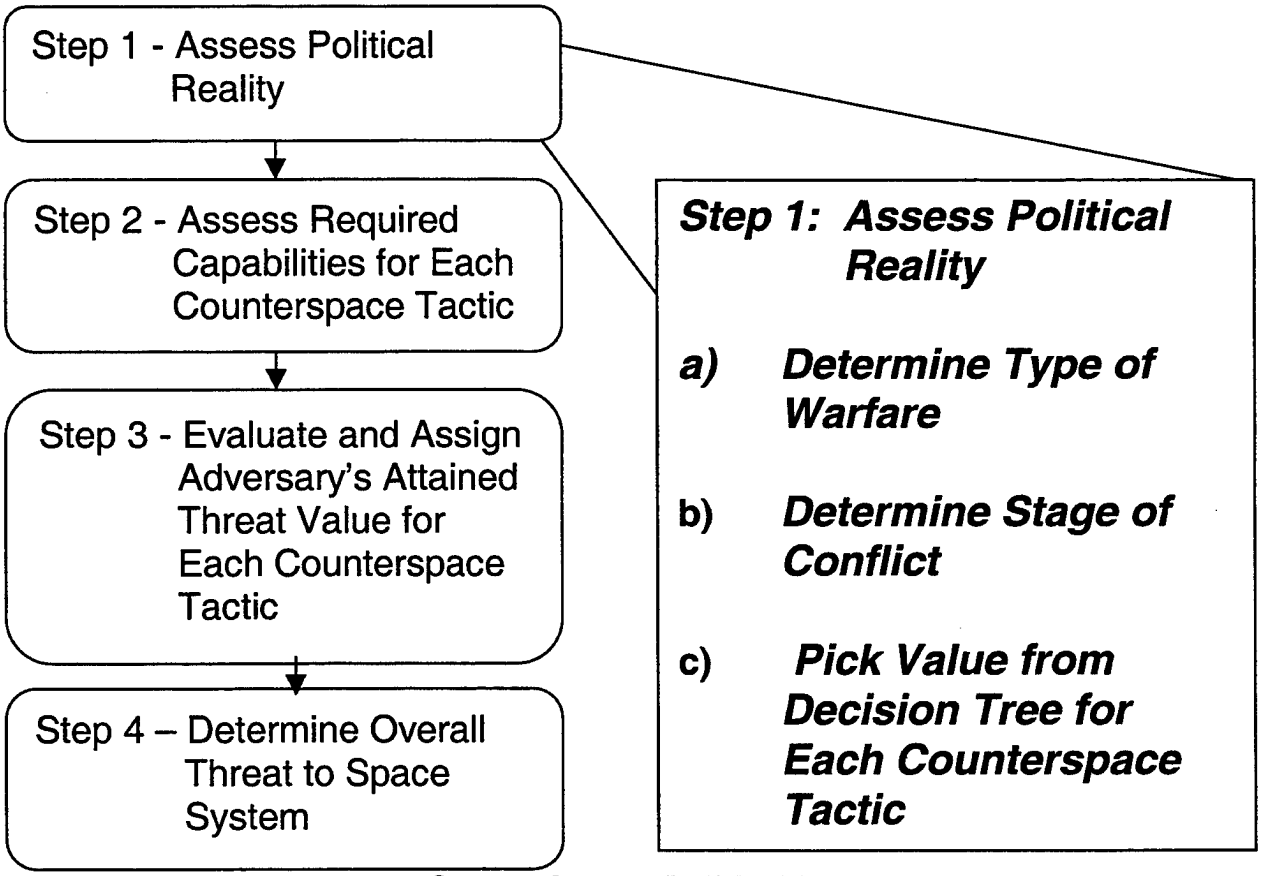

Figure 5: Step 1- Access Political Reality

To complete this step, the user must evaluate the political reality of the AOR and decide two issues. The first issue is what type of warfare does the AOR most closely resemble. The second issue is what stage of conflict is being experienced in the AOR.

Although wars are very diverse in nature and each war tends to have unique qualities, the authors of this thesis have adopted the four images of warfare presented in the article entitled "Which Way to the Future?," presented in the Summer 1999 issue of Joint Forces Quarter (JFQ). This article provides an excellent description of four major types of warfare U.S. Forces are likely to encounter in the future. The four types of warfare are depicted as follows:

- **Systemic War** – This image anticipates a future in which war will be fought with missiles, precision-guided munitions, and space-based assets.
- **Cyberwar** – A soft power image in which conflict is waged by combatants at computer terminals. In its purest form, this image of future war does not see the enemy being attacked with bullets and bombs. Rather, manipulation of information suffices to inflict sufficient damage to bring about the desired end state.
- **Peacewar** – Captures the ambiguities and shifting boundary between war and military operations other than war. The prevailing image has soldiers, more or less equipped as today, engaging in a range of low-intensity constabulary duties.
- **Dirty War** – This image lies on the hard-powered end of the spectrum and is closer to the systemic war image of high-technology warfare. Future conflicts will pit the U.S. against a motley collection of non-state actors.

In accomplishing the first step of the framework (Step 1a), the user must associate the political reality of the AOR to one of the above types of warfare. Although every possible type of warfare is not addressed, the four

images of warfare presented above do more than an adequate job encompassing the nature of most conflicts.

Once the type of warfare has been identified, the next task (Step 1b) is to determine the stage of conflict. In performing this function the user must understand that stage of conflict embodies the vast range of possibilities from peace to war. Stage of conflict does not consist of a mere two possibilities (peace or war) but an infinite range. Sun Tzu described this best when he wrote the following passage.

> The master conqueror frustrated his enemy's plans and broke up his alliances. He created cleavages between sovereign and minister, superiors and inferiors, commanders and subordinates. His spies and agents were active everywhere, gathering information, sowing dissension, and nurturing subversion. The enemy was isolated and demoralized: his will to resist broken. Thus without battle his army was conquered, his cities taken and his state overthrown. Only when the enemy could not overcome by these means was there recourse to armed force, which was to be applied so that victory was gained: in the shortest time possible; at the least possible cost in lives and effort; with infliction on the enemy of the fewest possible casualties.[17]

The above passage eloquently clarifies the concept that warfare encompasses a wide range of concepts. War does not necessarily require a declaration of war or forces actually engaged in armed conflict. This is particular applicable to operations U.S. Forces are frequently engaged in. U.S. Forces are called upon to perform duties ranging from humanitarian relief to armed conflict. In an effort to simplify the very complex question of stage of conflict, the authors of this thesis have narrowed the spectrum to three choices: beginning, middle, or end.

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[17] Tzu, Sun, *The Art of War*, p. 39, Oxford University Press, 1963.

This last part of this step (Step 1c) requires the user to utilize decisions made above to obtain an available value for each counterspace tactic from the political reality decision tree provided in Figure 6. The authors have developed a political reality decision tree to assist the user in determining available values for each counterspace tactic. These values reflect the willingness of an opponent to employ that particular tactic based on the type of warfare and stage of conflict engaged.

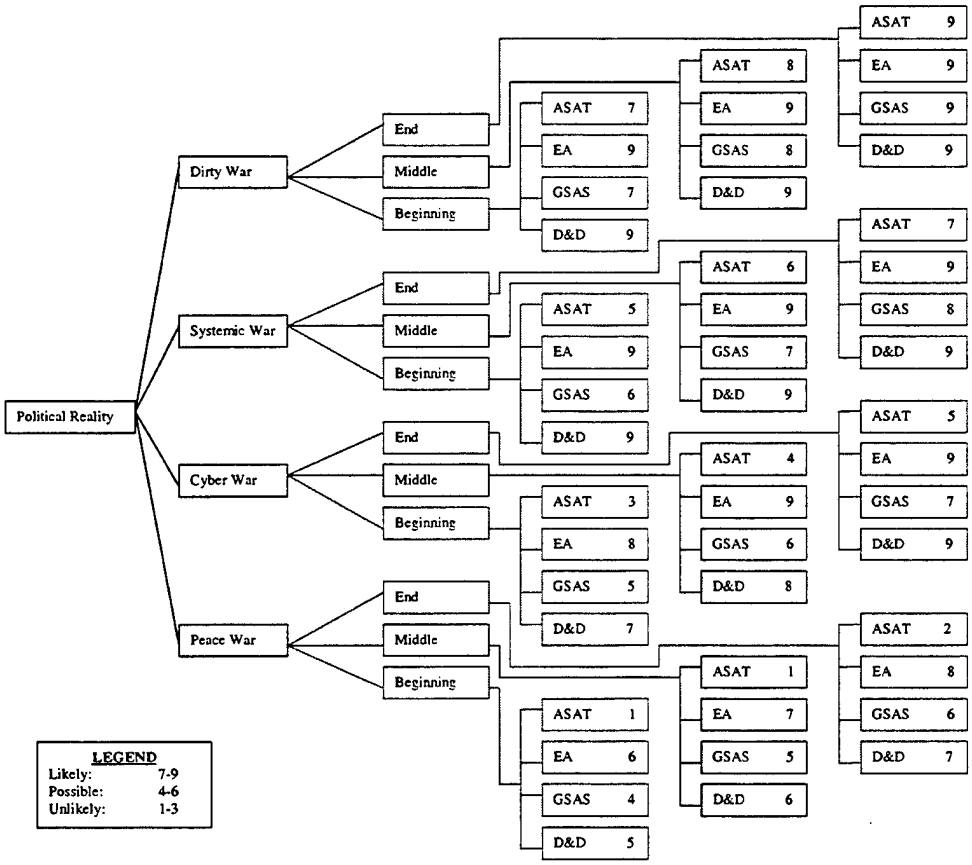

Figure 6: Political Reality Decision Tree

b) Assess Required Capabilities for Each Counterspace Tactic

Step 2 of the WCTA framework is to assess the required capabilities needed in each counterspace tactic. This step is summarized in

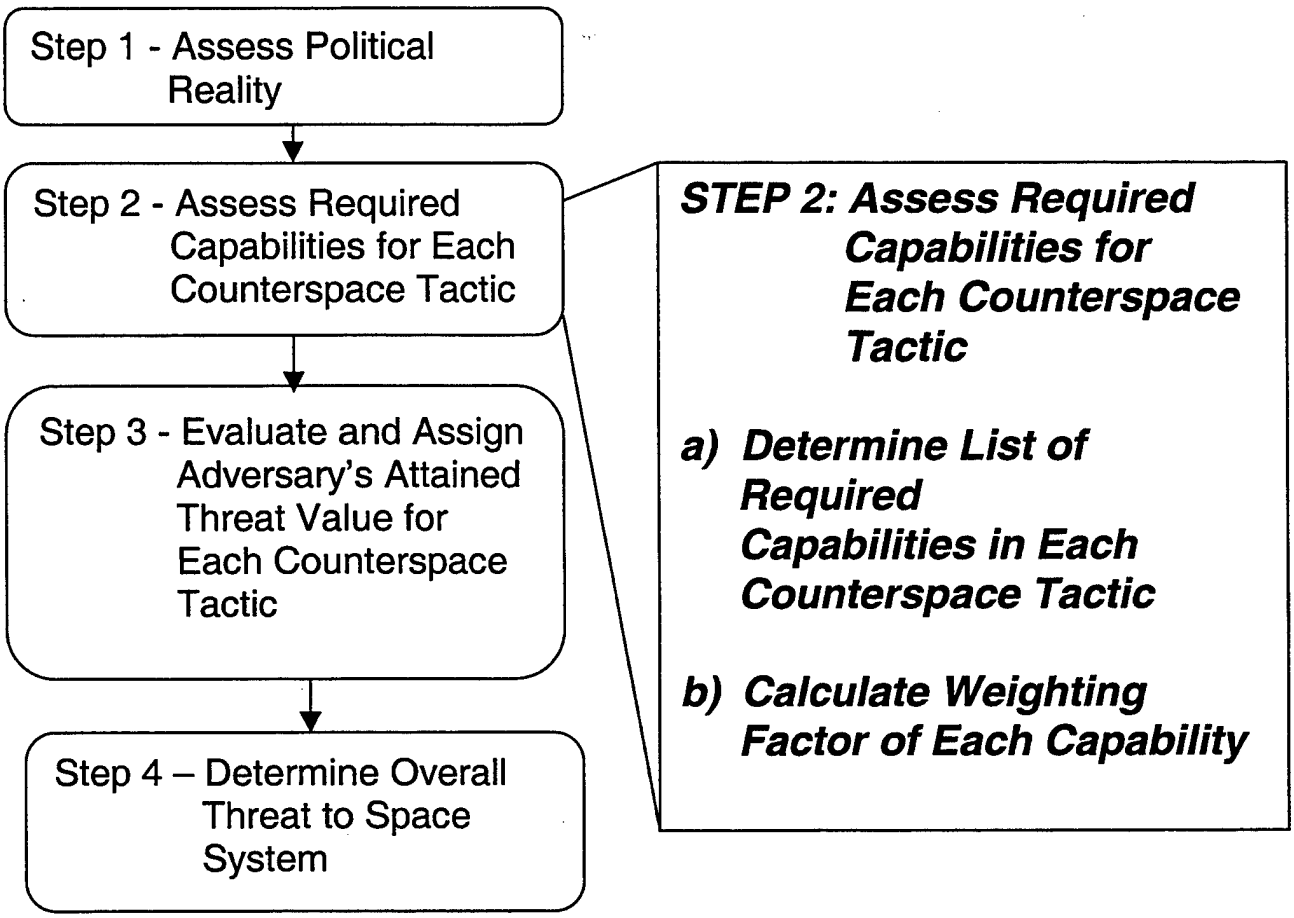

Figure 7: Step 2- Assess Required Capabilities for Each Counterspace Tactic

The first part, Step 2a, is to determine the list of required capabilities needed for each of the four counterspace tactics being used in this framework. Figures 8 a-d provides a template and a baseline list of required capabilities in each of the counterspace tactics.

To complete Step 2a, the user must look at the given baseline required capabilities lists and decide if there are other capabilities that need to be included when studying a given AOR. New capabilities should be added to the bottom of the list and numbered numerically. The researchers have provided a means to add to the capabilities lists, which will assure that the warfighter uses their own expertise in the subject matter, which will in turn tailor the given framework to best suit the needs of the operational scenario. An example of the use of the WCTA framework and each of its steps will be provided as an Appendix to this thesis.

DENIAL AND DECEPTION

REQUIRED CAPABILITIES
(Weighting factor:__)

__1 Camouflage techniques
__2 Concealment techniques
__3 Deception techniques
__4 Satellite tracking techniques (include amateur astronomers and internet access)
__5 Space surveillance and tracking sensors
__ (other)

Figure 8a: D&D Capability List

ELECTRONIC ATTACK

REQUIRED CAPABILITIES
(Weighting factor:__)

__1 Jamming capabilities
__2 Spoofing capabilities
__3 Intrusion methods
__4 Detection methods
__5
__6

__ (other)

Figure 8b: EA Capability List

GROUND SEGMENT ATTACK/SABOTAGE

REQUIRED CAPABILITIES
(Weighting factor:__)

__1 Terrorism
__2 Missiles (short/long range)
__3 Bombers/Aircraft
__4 Physical attack assets
__5 Any military assets (include SOFs)
__6 Intelligence on ground station

__ (other)

Figure 8c: GSAS Capability List

ANTI-SATELLITE SYSTEM

REQUIRED CAPABILITIES
(Weighting factor:__)

__1 Ballistic missile capability
__2 Nuclear capability with delivery vehicle
__3 ASAT R&D
__4 Space program
__5 Tracking capabilities
__6 On orbit satellites

__ (other)

Figure 8d: ASAT Capability List

Step 2b requires the user to calculate the weighting factor of each of the capabilities listed. For the purpose of this thesis, each capability will be weighted equally within a given counterspace tactic. [18] To accomplish this final portion of Step 2, count up the number of capabilities listed in a particular counterspace tactic. Take this number and divide it into the value found in Step 1c, the highest available value of that particular counterspace tactic. The result is the weighting factor for each of the capabilities listed in that counterspace tactic. Annotate this result in the space provided in the capability lists and repeat for each of the other three counterspace tactics. The following formula and example are provided to guide the user through the given process:

$$\text{Weighting Factor} = \left(\frac{\text{Highest Available Value in Counterspace Tactic (Step 1c)}}{\text{\# of Required Capabilities Listed in a Counterspace Tactic}} \right)$$

If there are six capabilities listed under a counterspace tactic, with a highest available value of 7 (as determined in Step 1c), the weighting factor will be determined as follows:

$$\text{Weighting Factor} = \left(\frac{7}{6} \right) = 1.67$$

[18] Further explanation of capability weights will be given in Chapter V.

c) *Evaluate and Assign Adversary's Attained Threat Value for Each Counterspace Tactic*

In Step 3, the user must now evaluate his adversary and assign an attained value to the threat that the adversary poses to the AOR. Step 3 has two substeps that are shown in Figure 9.

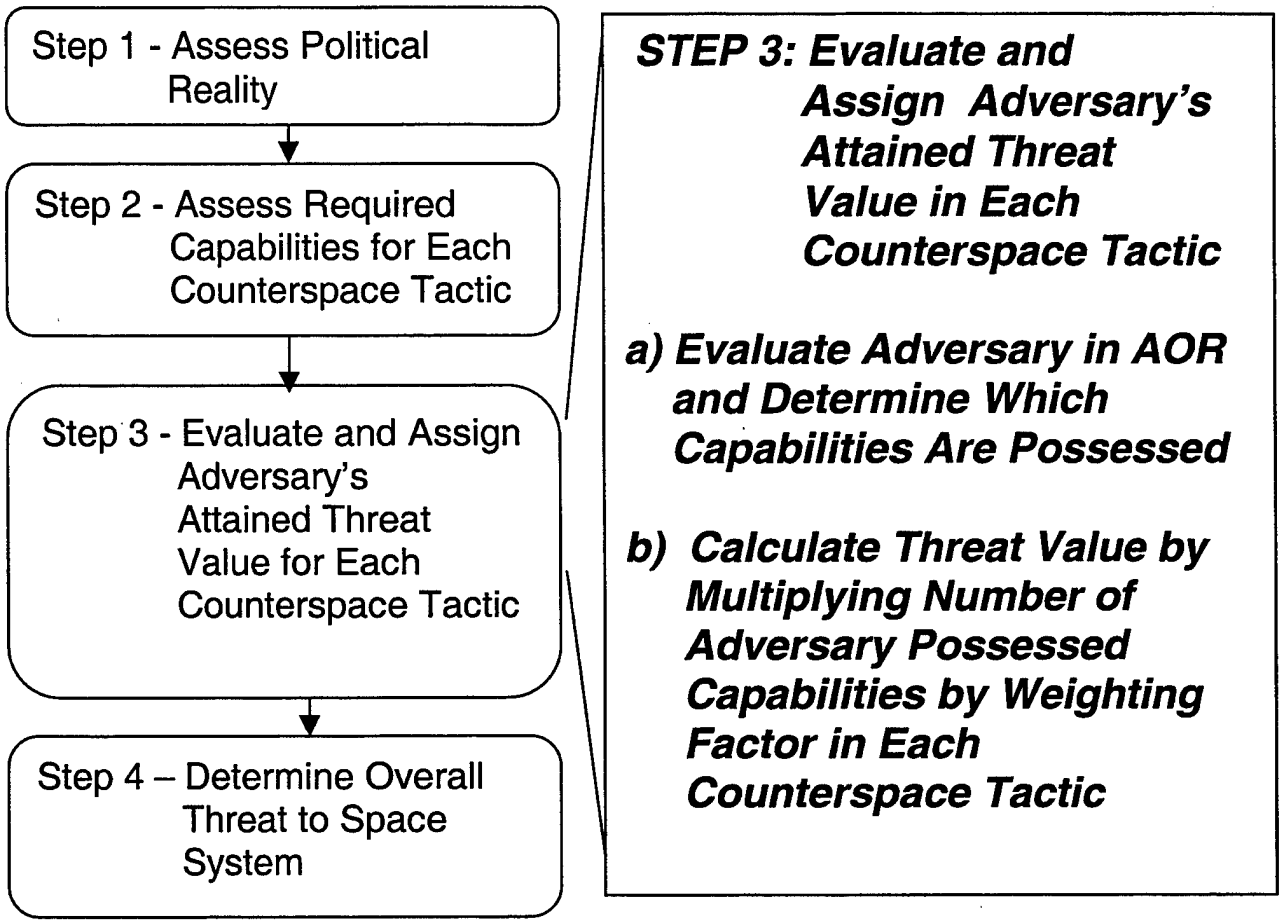

Figure 9: Step 3 – Evaluate and Assign Adversary's Attained Threat Value in Each Counterspace Tactic

Step 3a is to determine what capabilities the adversary possesses. Taking the capability lists developed in Step 2, the warfighter can use these lists as a checklist and as a tool to determine what attributes the

adversary under study possesses in terms of each counterspace tactic. To complete this portion of Step 3, check all capabilities that apply to the adversary.

Step 3b is to give an overall threat value to each of the counterspace tactics. The overall threat value of a particular tactic will be found by first, counting all the possessed capabilities that the adversary possesses, then multiplying that number by the weighting factor found in Step 2. The following formula and example are provided to guide the user through the given process:

$$\text{Overall Threat Value of Counterspace Tactic} = \left(\begin{array}{c} \text{\# of Checked Capabilities} \\ \text{Possessed by Adversary} \end{array} \times \begin{array}{c} \text{Weighting} \\ \text{Factor (Step 2b)} \end{array} \right)$$

If the adversary possesses three of the six capabilities listed, with each capability being weighted 1.67, the overall threat value to that given counterspace tactic will be determined as follows:

$$\text{Overall Threat Value of Counterspace Tactic} = \left(3 \times 1.67 \right) = 5.01$$

This value will represent the total (highest available value that you can receive in a particular tactic, as determined in Step 1c), or a portion of the available value determined in Step 1c. In this case, 5.01 of 7 was given to the counterspace tactic being studied. For the adversary under consideration, Steps 3a and 3b

should be repeated for each counterspace tactic. Once there is a threat value assigned to each of the four counterspace tactics, the warfighter can proceed to the final step of the analysis to determine the overall threat posed to the space system.

d) Determine Overall Threat to Space System

The fourth step of the WCTA Framework will determine the overall space system threat in the given AOR. This final step is summarized in Figure 10. Step 4 requires the user to utilize decisions made while working within the framework, specifically values determined in Step 3 in each of the four counterspace tactics, to obtain the overarching threat number for the whole space system.

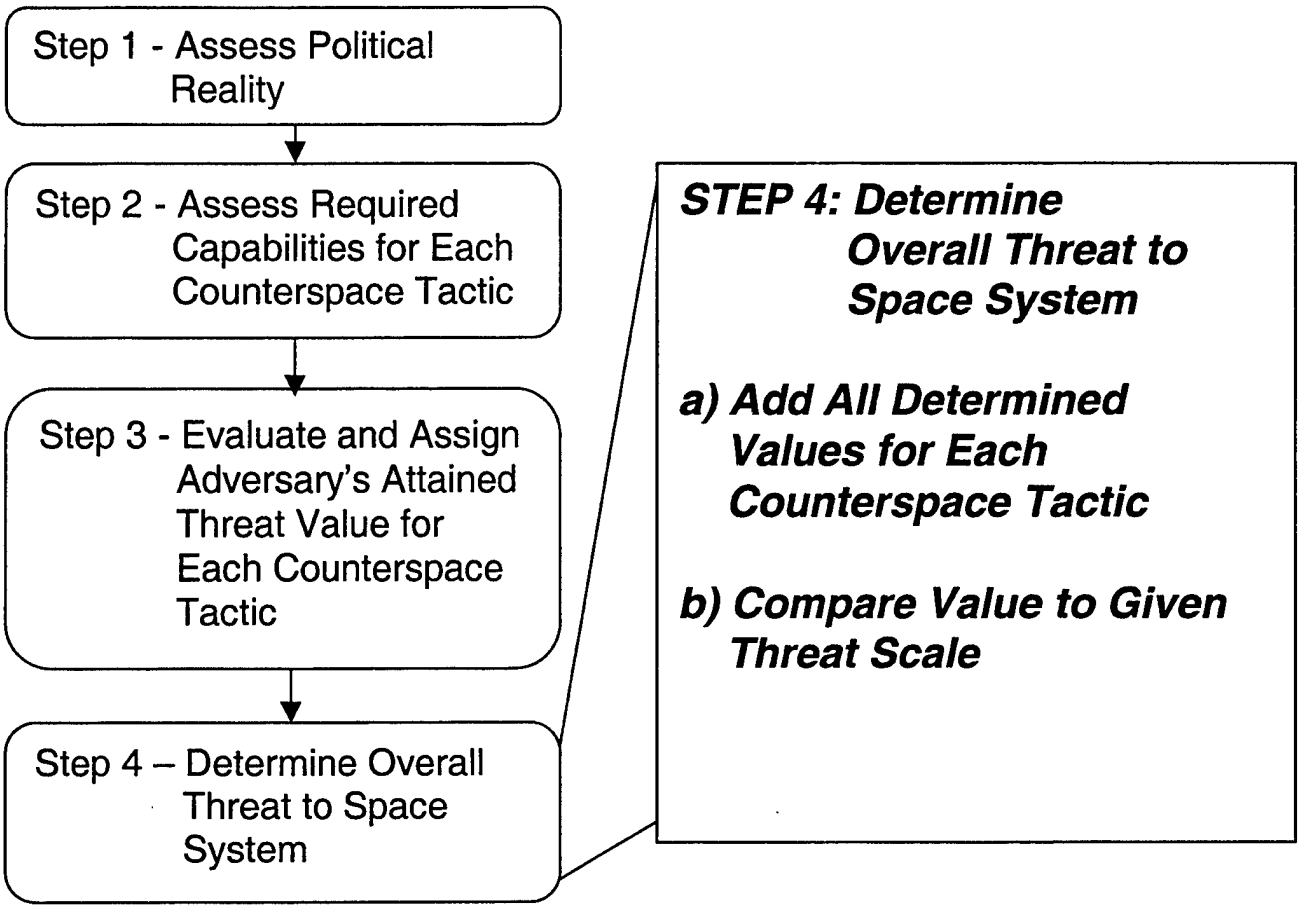

Figure 10: Step 4 – Determine Overall Threat to Space System

In Step 4a, add all attained values of each counterspace tactic (as determined in Step 3b), to get the overarching threat number for the entire space system being evaluated:

D&D__+EA__+GSAS__+ASAT__= <u>(Step 4a - Overarching Threat Number)</u>

This overarching threat value should be between zero and 36.

The final step of the entire framework, Step 4b, is to compare the overarching threat number result to a given scale. This scale will provide the warfighter with the needed tool to compare each of the adversaries to each other. The given scale assigns relative quantitative assessments to each adversary and is not meant as an absolute in comparing the threat[19].

Assessment of the counterspace threat is important due to the possibility of hostile events, which could be initiated in an attempt to interfere with or damage space system components within an AOR. The following are the researchers assessments which are used to convey an evaluation of the total counterspace threat within the given AOR. The total assessment takes into account the political and technical realities of the adversary and evaluated AOR.

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[19] Further explanation of the relative values of this framework will be discussed in Chapter V.

NO	CONCERN	MEDIUM	HIGH

0 20 28 32 36

Table 2: Comparative WCTA Scale

NO (0-20) – In the judgment of the researchers, an attack against a space system in the AOR is not likely.

CONCERN (21-28) – In the judgment of the researchers, events or technological capabilities are available in this AOR that have raised the level of concern. Further assessment is necessary in order to determine the nature of the political intent or the lethality of the adversary's technical capabilities. Pending completion of the in depth assessment, precautionary measure to enhance responsiveness or survivability are suggested.

MEDIUM (29-32) – In the judgment of the researchers, an attack against a space system may occur if political realities dictate or change to a higher state. There is slight intent and the adversary is highly capable of inflicting damage to the AOR's space system, affecting the space system and mission effectiveness.

HIGH (33-36) – In the judgment of the researchers, there is verifiable intent to harm the space system.

C. CONCLUSION

This completes the use of the Warfighters' Counterspace Threat Assessment Framework. Steps 1 through 4 should be followed to evaluated the relative threat of each adversary in a given area of responsibility. This comparative analysis will provide the warfighter with the most current and most useful assessment of vulnerabilities to the space system under analysis. The next chapter will discuss the research methodology used in developing the WCTA framework.

V. RESEARCH METHODOLOGY

A. A NEW SYSTEMS APPROACH

The WCTA framework presented in this thesis is an evolutionary approach to analyzing threat. The new systems approach[20] of the WCTA has several advantages that will increase warfighter involvement and make the threat more comprehensible at the operational level. Some of the attributes of this new approach are:

- Representative of the whole system: the entire space system is taken into account, not just the satellite vulnerabilities
- Outsiders as participants: the warfighter is now involved in the threat analysis and does not simply have to rely on intelligence reports
- Balanced expertise: the framework allows for warfighter expertise to be included in the analysis
- Shared Power in analysis: Different results may occur from different analysts, but the framework provides a route to identifying the differences and discussing them
- Concurrent in Time: No time boundaries, results are of current political realities and can inject current affairs
- Iterative: Framework can be used many times on the same adversary to ensure a comfortable analysis among the warfighters
- Collaborative in design: Design does not have to rely on just one person, can have collaborative analysis
- Immediate Feedback: Framework is designed for ease of use and immediate results
- Shared responsibility in analysis: The analysis does not rely on one level of analysis. Analysis at an operational level may have advantages.

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[20] Roberts, Nancy. Course notes for NS4950, Wicked Problems, Naval Postgraduate School, Summer Quarter, 30 August 2000.

Further detail of the design of the WCTA framework will now be discussed in the rest of this chapter.

B. REASONING BEHIND THE POLITICAL REALITY DECISION TREE

As discussed previously, the counterspace threat is comprised of two basic components. The first component is the willingness of an adversary to utilize a particular counterspace tactic and the second component is the ability of an adversary to develop the capabilities necessary to utilize a particular counterspace tactic. The authors of this thesis presented the four counterspace tactics and provided insight about the advantages, disadvantages and ease of implementation of each tactic. The decision tree directly addresses the question of an adversary's willingness to employ tactics based on a three-phased approach.

The first phase is based on the tactic in question. Some counterspace tactics are relatively simple to implement and the utilization of this tactic would have very little disadvantage or repercussion. For example, the counterspace tactic of D&D is easily implemented and the utilization of this tactic would have very little repercussions during peace or war. These factors increase the likelihood that D&D would be implemented. The concept that some tactics are more prone to be utilized has been incorporated into the decision tree by the assignment of higher numbers across the tree for that particular tactic.

The next phase is based on the type of war engaged. The description of each of the four types of future war adopted in this thesis was presented in

Chapter IV. The four images of future warfare presented all have particular characteristics that advocate that some counterspace tactics would be more acceptable and expected given the type of warfare. For example, if engaged in Peace War, the use of ASAT would not be considered acceptable and expected. Therefore, the employment of ASAT is probably not likely and the numbers assigned within the decision tree reflect this belief.

The final phase is based on the stage of conflict. War progresses through numerous stages and this has definite implications on the types of counterspace tactics that will be employed. For example, the likelihood GSAS will be employed at the beginning stages of war is more unlikely than at the final stages. The decision tree incorporates this idea by assigning higher numbers to specific tactics as the stage of conflict moves from beginning, to the end of conflict.

The authors of this thesis believe that it is imperative to have an understanding of the reasoning behind the numbers assigned to the decision tree. The decision tree attempts to quantify a very abstract concept, which is adversary's will. The decision tree is designed to simplify a very complex three-pronged problem. As the user becomes more familiar with the framework and the underlying concepts, they will be able to refine the actual numbers assigned within the decision tree to better meet the realities of their AOR.

C. REASONS BEHIND THE REQUIRED CAPABILITIES LISTS

One of the main focuses of developing the WCTA was to give the warfighter the option of being involved in the analysis of the threat poised to space systems within their AOR. The capability lists are the second component of the counterspace threat, measuring the ability of an adversary to develop the capabilities to utilize a particular counterspace tactic. The space system threat, to the counterspace tactics, to the listed capabilities, were developed with a hierarchical structure in mind. Figure 11 gives a brief overview of the hierarchical organization of the framework presented[21].

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[21] Powers, Darin L., *Required Performance Parameters For Naval Use of Commercial Wideband SATCOM*, p. 22, Naval Postgraduate School, September 1998.

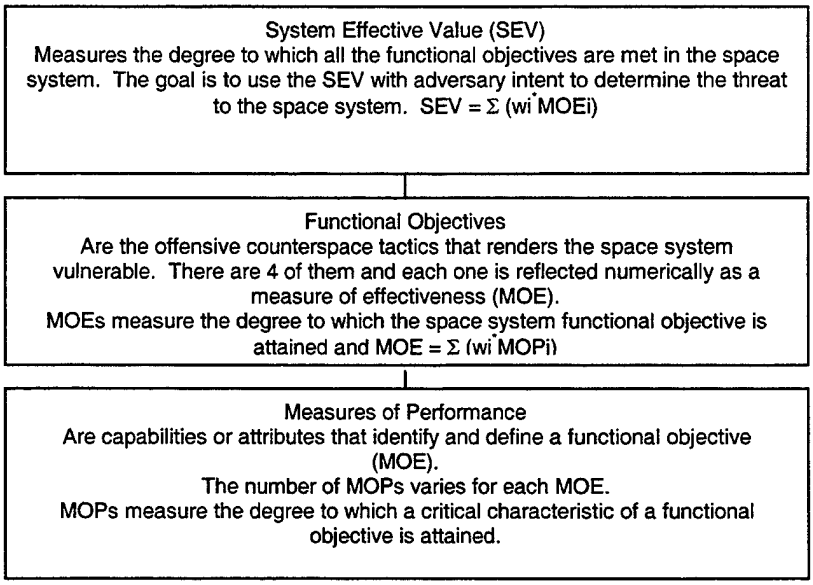

Figure 11: Hierarchical Organization of the WCTA

A baseline list of capabilities was developed using existing counterspace threat models as a guide[22] [23]. These lists are attributes of the given counterspace tactic and represent only the top level within that hierarchical level. The researches did not try to analyze the capabilities individually, but assumed the same level of effectiveness was equal in each required capability listed.

1. Level 1: System Effectiveness Value

The top level of this hierarchy represents the entire space system threat. The threat is translated into a System Effectiveness Value (SEV) that is a

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22 *Threats to US Military Access to Space*, pp. 3-6, National Air Intelligence Center, Wright-Patterson Air Force Base, Ohio.

23 U.S. Space Command, *Joint Narrowband Concept of Operations*, pp. 5-8, Peterson Air Force Base, Colorado, 21 January 2000.

weighted sum of all the functional objectives (measures of effectiveness (MOE)) and reflects the degree to which all the functional objectives are attained:

- $SEV = \Sigma (w_l * MOEi)$
- w_l = the weight of the lth MOE
- MOE_l = the lth MOE that reflects the lth functional objective

The SEV is a relative (ordinal) scale score that is determined using the given political reality. The final scale given in Step 4 of the framework represents this given ordinal scale. It does not represent an absolute value of the mission degradation of the threat; but rather, sets up a convenient way to compare the attained threat value so an assessment can be made between adversaries.

2. Level 2: Functional Objectives

Functional objectives make up the middle level of the analysis hierarchy. For the purposes of this framework, the researchers have used four offensive counterspace tactics within this middle level that include: D&D, EA, GSAS, and ASAT. MOEs are the numerical aggregation of Measures of Performance (MOP):

- $MOE_i = \Sigma (w_j * MOP_j)$
- W_j = the weight of the jth MOP
- MOP_j = the jth MOP that reflects the lth functional objective (MOE)

3. Level 3: Measures of Performance

Measures of Performance are the lowest tier in the hierarchy. Each MOP is grouped under a functional objective and directly related to a counterspace tactic. For the purposes of this framework, we have used "capabilities" as the equivalent of a measure of performance. For simplicity, each MOP is weighted equally.[24]

[24] Further research in this area will dictate the distinguishing features of each capability and will force the user to weigh the MOPs differently.

4. Summary

Figure 12 summarizes the hierarchical structure of the space system framework being used in the WCTA:

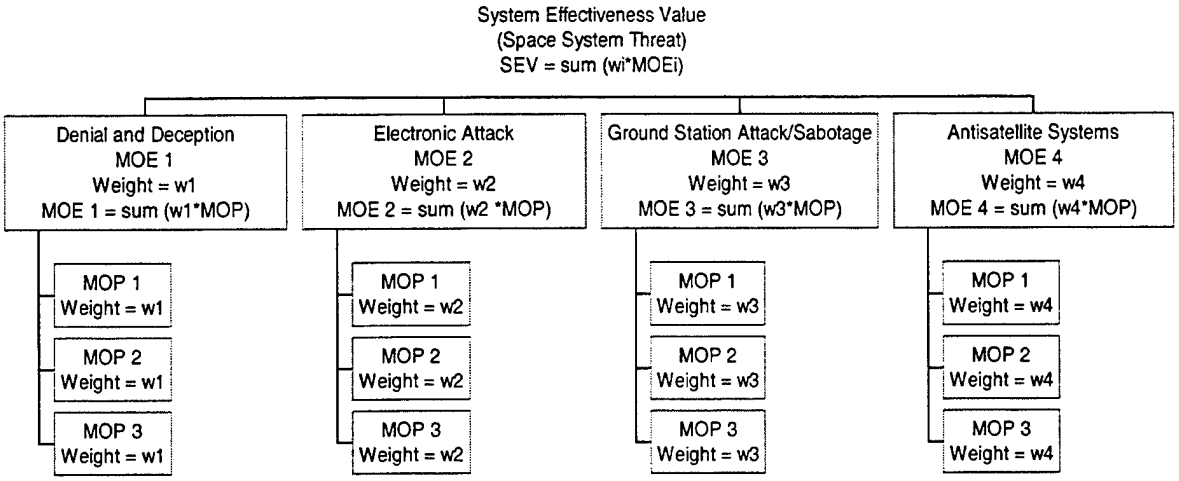


Figure 12: System Hierarchical Structure

D. FRAMEWORK STEPS AND ASSIGNMENT OF RELATIVE VALUES

In order to provide a framework that provides useful tools to the warfighter to compare between different space system threats, relative quantitative values were assigned to different decisions made within the WCTA. These values do not represent any absolutes, but merely serve as a venue to comparing different adversaries. Because the authors feel that the threat analysis takes into account the intent of the adversary, it is realized that the final result may appear subjective. This subjectivity is part of the design of the framework, because it

adds to the discussion of why there may be different analyses of the same adversary. The framework will lead the analysts to where differences lie. Upon using this framework, the authors envision that the warfighters who use this process will tailor the framework and quantify the different attributes using their own justification. For the purposes of this thesis, the researchers have assigned educated values for simplicity and ease of use of the framework. The following table gives the intersection of where "intent" of the adversary may fall within the given overall threat scale provided in Step 4.

Threat Level	NO	CONCERN	MEDIUM	HIGH
Types of War	Peace (beginning) Peace (middle)	Peace (end) Cyber (beginning) Cyber (middle)	Cyber (end) Systemic (beginning) Systemic (middle)	Systemic (end) Dirty (beginning) Dirty (middle) Dirty (end)

Table 3: Analysis Intersection of Political Reality and Overall Threat Figure

E. FINAL WORDS ON THE WCTA FRAMEWORK

The WCTA framework presented is not intended to be a one size fits all assessment. What this framework does, is provide a step-by-step process to evaluating threat when counterspace tactics are being employed by an adversary. Much thought went into designing a framework that could be utilized by any analyst from the enlisted to officer ranks. The design of the framework incorporated ways in which the expertise of the analyst could be included into the

final analysis of the threat. This tailorable process should be continued in all areas of this framework. The use of relative values in the given framework provide for the baseline for comparison among different adversary entities and provides the groundwork to compare differing results by different analysts, if the situation should arise. Analysts will be able to compare their work with others by showing what decisions were made and what values were chosen to get the final assessment. The design of the WCTA framework included:

-ease of use

-tailorable

-quantifiable

-sensitive to system design and political changes within AOR.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. THESIS SUMMARY

In its current form, this thesis provides a basic framework to address counterspace threats on a relative scale. The primary goal was to stress that the threat is comprised of two essential elements: 1) an opponent's willingness to employ a counterspace tactic, their '*intent*' ; and, 2) the opponent's ability to develop the necessary tools to employ a counterspace tactic, their '*capability*'. The authors believe that the "*intent*" component of the threat changes more rapidly than the present models can easily accommodate. Therefore, a process, such as the one presented in this thesis, will enable DOD decision-makers that experience many of the changes of "*intent*" first hand to rapidly and accurately assess the threat as the condition changes within the AOR.

In this thesis, the authors presented a framework for analyzing counterspace threats to a space system that was designed:

-For the Warfighter

-For Operational Use.

B. RECOMMENDATIONS FOR FUTURE RESEARCH

During the course of the authors' research, no other threat analysis framework was found to exist for operational use to the warfighter. Continuing

work in this area will be beneficial to U.S. military organizations as the country adjusts to countering unknown entities or states of concerns. Related areas of research include:

-Fidelity of Analysis (Conduct further research and analysis in the interactions between the different counterspace tactics introduced in the WCTA framework. Develop capability lists that accurately reflect different weightings due to lethality and effectiveness).

-Mission Degradation (Incorporate mission impact into the design of the WCTA framework. Include how counterspace tactics will affect operations and offer counterspace defensive tactics).

-Automated Decision Support System (Use existing programs to automate the WCTA process or develop an automated decision support system that incorporates the WCTA framework).

APPENDIX. ESPERANZA SCENARIO USING THE WCTA FRAMEWORK

Background

(Adapted from the Esperanza Scenario found in http://www.teleologic.net/ISO/Journal/)

Five years of enthusiastic but largely ineffectual republican government resulted in a conservative backlash and civil war in 1948. Contributing causes included efforts to deprive the Church of its property, other land reforms designed to break-up large land holdings in the high plains of Esperanza, a significant reduction in the size and budget of the military, the prospects for giving Altair internal autonomy, and an increasing communist involvement in the government. In 1948 a Colonel Eric Fire, commander of the Coronado military region, announced a revolution for "national restoration and the defeat of communism." The Civil War ended in 1953 with General Fire and conservative elements in command. General Fire began the first of what would become seven six-year presidential terms. Fire ruled until his death in 1990, which precipitated the nation's transition to democracy. Fire rebuilt the Esperanzan economy and social fabric along conservative nationalist lines. He allowed the United States to maintain air and naval bases in Esperanza, and developed the manufacturing, tourist, and export agriculture industries.

In 1976 President Fire sponsored a new constitution which restored many parliamentary features to Esperanza but was by no means a democratic constitution. Half the members of the Parliament were directly appointed by Fire, and the other half were elected through a mechanism of institutional representation. While the cabinet was mostly civilian, it was a creature of the President not the Parliament. The constitution also called for the restoration of the monarchy. Legislation was passed during Fire's last two terms that called for Prince John, son of the deposed King Paul, to become Monarch upon the death of the President. Fire groomed Prince John for his future role as King, brought him back from exile, and sent him to the Military Academy and then to law school at Oxford.

The 1976 constitution established a supposedly secure position for the National Movement Party, and enabled Fire to pursue a series of policies that strengthened strategic industries and developed the infrastructure of the country. The Railroad Revitalization Act 1978 and a variety of expenditures on highways and airports characterized this time. Fire's special relationship with the United States enabled him to pursue a more aggressive foreign policy, including actions that led to the 1978 "Sardine War" with Franconia and several naval skirmishes with Alerian gunboats over disputed maritime borders. Esperanzan nationalism

under Fire did much to hide some basic problems that would come to the surface after Fire's death.

During the 80s members of the National Movement Party began to take advantage of their privileged positions and corruption ran rampant underneath the nose of an aging Fire. Focus on strategic industries led to blindness regarding basic social welfare issues that were hidden under the boot of an authoritarian state. The détente between the United States and the Soviet Union also made the military bases offered by Esperanza to be a less important asset to the United States than they had been during the Cold War. American Presidents began to focus on the authoritarian nature of the Esperanzan government as opposed to their previous praise for Esperanza's staunch anti-Communist policies.

When Fire died in 1990, the stable transition he envisioned was disrupted by the hierarchy of the National Movement Party. Fearing the Prince's purported liberal tendencies, the party leaders attempted to postpone his coronation indefinitely through the mechanism of a Party-organized regency. This move by a party widely reviled as corrupt and bloated led to popular demonstrations across the country in support of the Prince. The Spring of 1991, as this outpouring of support for Prince John came to be called, resulted in a confrontation between the armed services and the National Movement when the Civil Guard and Army refused to fire upon protesters. Rather than be deposed by an irate military, the National Movement regency made arrangements for the coronation of Prince John in January of 1992.

King John Patroclus IV began his reign approving legislation that legalized independent trade unions, political parties, and political expression. He then dismissed the Parliament and reconvened it with a diverse cadre of influential and powerful Esperanzans. The 1993 constitution emerged from this gathering, and Esperanza was set on the path of becoming a constitutional monarchy.

The first election under this constitution had a not unsurprising result. After years under political conservatives, the people voted in masses for left wing candidates. The Socialists, under Gregor Mendoa formed a governing coalition and went about attending to issues of social welfare, education and environmental protection, which had been neglected for so long under the National Movement.

During Mendoa's regime, the Esperanzans signed various international agreements regarding the environment including the Biodiversity and the Endangered Species Agreements. Mendoa's regime failed to attend to issues of fiscal responsibility and three years of negative economic growth promised to make this a nagging problem for the Socialists. The innovative solution they proposed to remedy this problem, autonomy for the various provinces of Esperanza, was the undoing of the Mendoa government.

Mendoa proposed experimenting with autonomy for Altair. Mendoa argued that smaller economies could be more efficiently organized under socialist principles. Conservative forces and the average Esperanzan heard the

death knell of a greater Esperanza in this proposal. King John called for a referendum on this vital issue and the result was a resounding defeat for Mendoa's Socialists, though not for Esperanzan democracy. Andrew Aranda's Centrist Convergence Party was able to sweep the field on the basis of an argument for the liberalization of the Esperanzan economy and a localization of governance without the divisions conjured up by the vision of autonomous provinces. The Agrarians and the Republica Esperanza joined Aranda's party to form today's governing "national unity" coalition.

Aranda's coalition faces many problems. They must find a way to balance the budget, lower unemployment, improve the balance of trade, maintain the support of the military, and prevent divisive forces from pulling Altair away from a greater Esperanza. The rejection of Altairian autonomy has inspired Land and Liberty, a radical Altairian separatist movement to launch a campaign of terror. This radicalism has in turn strengthened the conservatives including the reactionary League of Honor. The diverse nature of Esperanza's population makes the successful handling of the issue of provincial minorities central to the success of any government seeking to preserve Esperanzan democracy.

Facts and Figures on The Kingdom of Esperanza

Area:
total: 504,000 sq. km

Area-comparative:
Slightly more than twice the size of Oregon

Maritime claims:
Long-term dispute with Latia regarding shared maritime border; fishing rights disputes with Franconia related to waters north of the Celtan Islands; ongoing tension with Aleria regarding potential off-shore oil deposits .

Climate:
mild temperate; cool, cloudy, wet winters; hot, clear, dry summers; interior is cooler and dryer.

Terrain:
Esperanza constitutes most of a continental peninsula. The peninsula is defined by the ocean and Hieronmite Mountains to the West, the Bay of Altair and Tannus River in the North, the Pindus Mountains to the east, and the Illurian Sea to the South. Between the Hieronomite and Pindus Mountains the terrain is divided between the high Coronado Plateau and the gently descending alluvial hills of the Valdez and Tannus River watersheds.

Elevation extremes:
lowest point: Sea Level 0m
highest point: Mount Alta 4006m

Natural resources:
coal, nickel, cobalt, copper, and timber

Land use:
arable land: 31%
permanent crops: 9%
permanent pastures: 21%
forests and woodland: 37%
other: 7%

Natural hazards:

People

Population:
36,336,754

Age structure:
0-14 years: 15%
15-64 years: 69%
65 years and over: 16%

Population growth rate:
0. 18%

Birth rate:
9.73 births/1,000 population

Death rate:
9.62 deaths/1,000 population

Net migration rate:
0.66 migrant(s)/1,000 population

Sex ratio:
at birth: 1.07 male(s)/female
under 15 years: 1.06 male(s)/female
15-64 years: 1 male(s)/female
65 years and over: 0.71 male(s)/female (1998 est.)

Infant mortality rate:
6.51 deaths/1,000 live births (1998 est.)

Life expectancy at birth:
total population: 77.56 years
male: 73.78 years
female: 81.59 years (1998 est.)

Total fertility rate:
1.21 children born/woman (1998 est.)

Nationality:
noun: Esperanzan
adjective: Esperanzan

Ethnic groups:
Esperanzan 65%, Altarian 20%, Brasan 10%, Latian 5%,

Religions:
Roman Catholic 70%, Muslim 15%, Orthodox 5%, Other 10%

destructive earthquakes; tornadoes

Environment-current issues:
deforestation; soil erosion; water pollution from industrial and domestic effluents

Environment-international agreements:
Air Pollution, Air Pollution-Nitrogen Oxides, Air Pollution-Sulphur 94, Air Pollution-Volatile Organic Compounds, Biodiversity, Climate Change, Endangered Species, Environmental Modification, Hazardous Wastes, Nuclear Test Ban, Ozone Layer Protection, Ship Pollution, Wetlands

Government

Country name:
conventional long form: The Kingdom of Esperanza

Data code:
KE

Government type:
Parliamentary Monarchy (in transition from authoritarian corporatist state)

National capital:
Neuvilla

Administrative divisions:
7 provinces

National holidays:
Monarch's Birthday (currently May 12)

Constitution:
November 1976

Legal system:
Based on Napoleonic Code

Suffrage:
18 years of age universal and compulsory

Executive branch:
Head of state: King John Patroclus IV

Languages:
Esperanzan; Latian, Arabic

Literacy:
definition: age 15 and over can read and write
total population: 95%
male: 95%
female: 95%

A nascent high technology industry appears to be developing around the U.S. Air Force base thirty miles northwest of Pireus, but per capita income in Southern Esperanza remains about 60 percent of that in the industrial North. Yet Southern Esperanza's economy is sufficiently more robust than that of neighboring Brasas that the migration of "temporary workers" from that nation has served to keep wage increases modest. In recent years, military spending has become an issue with pensioners and the military itself beginning to drain government coffers. Esperanza ran a deficit in 1996 and has done so for the past 3 years.

GDP:
purchasing power parity-$482.4 billion (1997 est.)

GDP-real growth rate:
-1.8%

GDP-per capita:
purchasing power parity-$14,400

GDP-composition by sector:
agriculture:24%
industry: 52%
services: 24%

Inflation rate-consumer price index:
2.1%

(since 1992)*Head of government:* Prime Minister Andrew Aranda (since 1998) *Council of Ministers:* Named by monarch in consultation with the Prime Minister

Legislative branch:
Senate, consisting of 220 members elected to serve three year terms (last election 1998). All legislation originates in the Senate; and Council of State, consisting of approximately 25 members who serve at pleasure of the Monarch, must affirm Senate legislation or may return legislation to Senate with recommendations for improvement. Legislation may be returned to Senate by Council of State up to three times over a period of two years.

Judicial branch: Five-member Supreme Court, judges are appointed by the Monarch

Political parties:
Socialist (35 Senators), Christian Democrats (18 Senators), Republica Esperanza (32 Senators), Centrist Convergence (84 Senators), Agrarian (21 Senators), National Restoration (15 Senators), The National Movement (5 Senators)

Economy

Economy-overview:
Esperanza has a mixed capitalist economic system with some unique peculiarities,the most notable a constitutionally mandated 7% GDP expenditure on the military. Estimates for military income range between 3-5% of GDP, still short of their 7% mandate. The government controls the majority of transportation, communications, electricity and about 60% of a well-developed durable goods manufacturing system. The manufacturing sector is largely concentrated in a crescent running from Altair in the North to Neuvilla in the South and extending along the River Tannus (border with Franconia).The mining industry, concentrated in the northeastern mountains, has been able to

Labor force:
total: 13.2 million
by occupation: services 20%, manufacturing, mining, and construction 55%, agriculture 25% (1997 est.)

Unemployment rate:
9% (1997 est.)

Budget:
revenues: $113 billion
expenditures: $139 billion, including capital expenditures of $15 billion (1995)

Industries:
textiles and apparel (including footwear), food and beverages, metals and metal manufactures, mining, chemicals, weapons, durable goods, machine tools,

Industrial production growth rate:
0.8% (1996)

Electricity-capacity:
39.583 million kW (1995)

Electricity-production:
154.144 billion kWh (1995)

Electricity-consumption per capita:
4,026 kWh (1995)

Agriculture-products:
grain, vegetables, olives, wine grapes, sugar beets, citrus; beef, pork, poultry, dairy products

Exports:
total value: $94.5 billion
commodities: semifinished manufactured goods, foodstuffs, machinery, ores,

Imports:
total value: $98.3 billion
commodities: machinery, transport equipment, fuels, semifinished goods, foodstuffs, consumer goods, chemicals

Debt-external:
$37 billion

Currency:

remain out of the hands of the government and employs nearly 20% of the population. Rich deposits of coal, nickel, cobalt, copper, and timber have helped place Esperanza in a highly competitive position in the mining industry. Beef from the high plateau of Central Esperanza and wine from the coastal region of Pireus are also sources of export revenue and national pride. Over the last 15 years there has been significant attention to building the tourist industry along the beaches of Pireus Province and the Pindus Mountains of Southeastern Esperanza.

1 Drachma = 100 centimes

Fiscal year:
calendar year

Communications

Telephones:
15.6 million (1990 est.)

Telephone system:
generally adequate, modern facilities
domestic: NA
international: 22 coaxial submarine cables; satellite earth stations-2 Intelsat (1 Atlantic Ocean and 1 Indian Ocean), NA Eutelsat, NA Inmarsat, and NA Marecs; tropospheric scatter to adjacent countries

Radio broadcast stations:
AM 190, FM 406 (repeaters 134), shortwave 0

Radios:
5 million (1992 est.)

Television broadcast stations:
100 (repeaters 1,297)

Televisions:
8.7 million (1992 est.)

Transportation

Railways:
total: 5,172 km

Highways:

Military

Military branches:
Army, Navy Air Force, Civil Guard, National Police.

Military manpower-military age:
18 years of age

Military manpower-availability:
males age 15-49: 8,987,539 (1998 est.)

Military manpower-fit for military service:
males: 8,369,756 (1998 est.)

Military manpower-reaching military age annually:
males: 323,552 (1998 est.)

Military expenditures-dollar figure:
$9.4 billion (1995)

Military expenditures-percent of GDP:
7% (1995)

Transnational Issues

Disputes-international:
Latia has never recognized the legitimacy of the Esperanzan occupation of the Iliki River Valley (1879), but there has been no active effort by Latia to reclaim this

total: 144,847 km
paved: 141,399 km (including 7,747 km of expressways)
unpaved: 3,448 km (1996 est.)

Waterways:
545 km but of minor economic importance

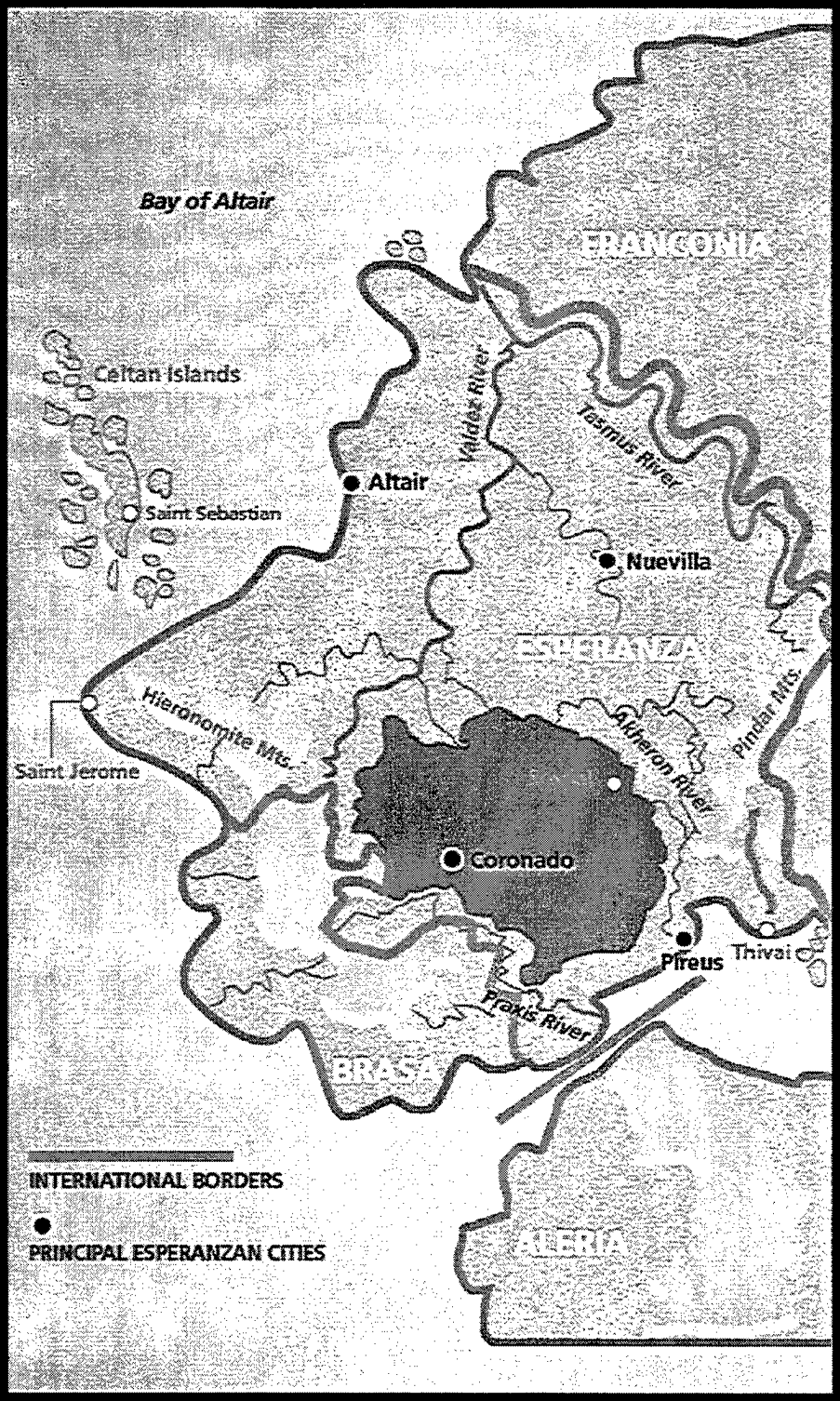
Pipelines:
crude oil 265 km; petroleum products 1,794 km; natural gas 1,666 km

Airports:
48 (1997 est.)

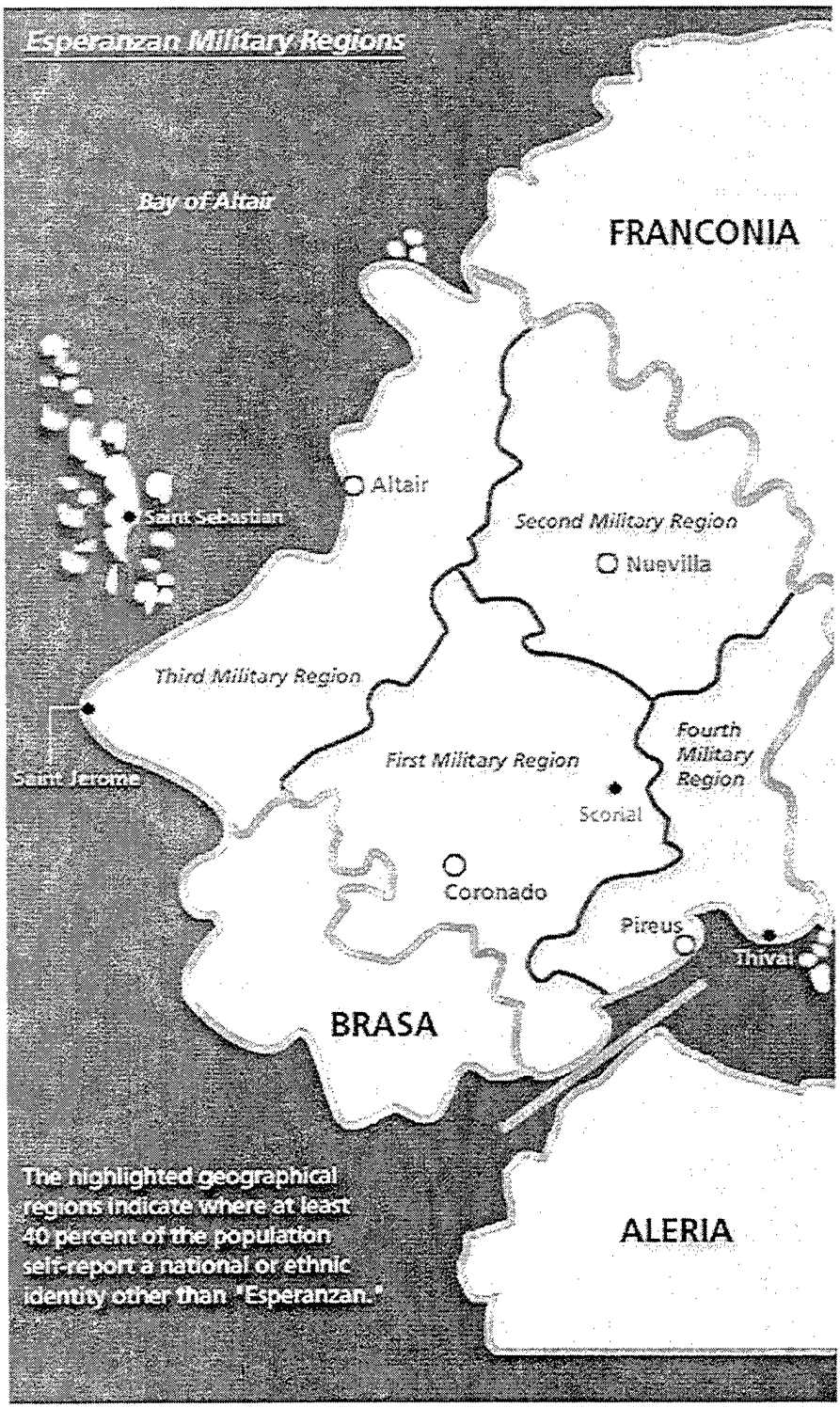
Airports-with paved runways:
total: 45
over 3,047 m: 15
2,438 to 3,047 m:7
1,524 to 2,437 m: 6
914 to 1,523 m: 8
under 914 m: 9 (1997 est.)

Heliports: 8 (1997 est.)

territory since a failed mediation effort in 1905. Esperanzan and Alerian gunboats have exchanged occasional fire, but sustained no damage, in an ongoing dispute regarding their maritime border. This issue has, however, been complicated recently by the identification of undersea oil reserves in the boundary zone. In 1976 a so-called "Sardine War" briefly flared in the Bay of Altair as Esperanzan and Franconian naval forces sought to enforce disputed fishing zones. The issue is currently before the International Court of Justice, but joint fishing has proceeded without incident since 1978. The 1902 International Covenant recognizing the independence of Brasa was ambiguous regarding the status of the region southwest of the Praxis River, but this region has been consistently occupied by Esperanza and Brasa has undertaken no formal diplomatic measures to clarify the ambiguity, though it remains an occasional cause for friction in bilateral relations. Right-wing parties in Esperanza continue to call for reintegration with Brasa, but since 1902 no Esperanzan government has articulated this as official policy.



Map of Esperanza



Esperanza Military Districts

THE KINGDOM OF ESPERANZA CIVIC COMPOSITION

The earliest recorded human institution in Esperanza was the Council of Pireus (circa 440 BC), the governing body of the Latian commercial colony located near the modern city of the same name. During the late Medieval period a dense fabric of institutional structures emerged, including municipal councils, commercial guilds, feudal fiefs, Catholic parishes and dioceses, Muslim administrative regions, and, over-time, the various instruments of centralized royal administration. Some of these institutions continue unto the present day. In the 1th Century traditional political and cultural institutions were supplemented by a new kind of economic institution focused less on specific trades than on major financial sectors.

The following provides brief summaries of the principal governmental, economic, and cultural institutions of modern Esperanza with a focus on the last half-century. Political parties, while clearly important, are not summarized. Since 1990 the political situation has been so fluid that it would be largely inaccurate to perceive any of the political parties as sufficiently stable to constitute an "institution." Even the Agrarian Party, established over 100 years ago, would today be unrecognizable to its founders.

Political Institutions

The Monarchy - Claiming direct descent from Prince Alexander Patroclus, recognized by the Sultan of Aleria as King of Crotona in 982 AD, the royal family is actually of a highly cosmopolitan historical and ethnic background. The current dynasty is principally of Nordic heritage and was introduced to Esperanza in 1712. The monarchy as an institution has been significantly influenced by the pattern of the Avadorres Regency (1876-1894) regarding which the current King has been a serious student.

The Monarch is recognized as the "personalization" of the nation's sovereignty, and in his or her (the 1993 Constitution allows female succession) hands are concentrated all political authority. By law this political authority is delegated to other institutions of the state. By recent practice, this delegation of authority is substantive and not liable to review or revision by the monarch. But legal scholars argue that the Esperanzan monarch is, de jure, an absolute sovereign, even though practice and political reality has significantly limited the Monarch's de facto political decision-making. For example, to date the current King has not used the power of legislative veto explicitly granted in the Constitution.

The Monarchy maintains its own bureaucracy, separate from that of the government. The Royal Administrative Office is headed by a Lord Chamberlain, and consists of a Household Office, a Calendaring Office, a Logistics Office, a

National Security Office, a Legal Office, and a Research Office that operates as a kind of in-house think-tank.

The Council of State - The 1993 Constitution created a Council of State of indeterminate size. The current King has generally maintained a Council of approximately twenty-five members. The Council must affirm and register laws adopted by the Senate. It may return laws to the Senate with recommendations for improvement up to three times in a period of two years. This power of delay is seen as an important check on any government's excessive focus on the near-term. Constitutional Amendments must be approved by the Council of State. Laws which are registered by the Council of State without the signature of the King are termed "legate in concilium" and may be reviewed and overturned by the courts on constitutional grounds. The King's signature creates a "legate ex cathedra" (from the throne) and may not be reviewed by the courts. Since assuming the throne the King has signed only one piece of legislation, that one focusing on the rights of free association. Meetings are chaired by a Lord President of the Council or by the Monarch. The current King has appointed both of his Prime Ministers to the Council, as well as other selected members of the cabinet. Prime Minister Mendoa is likely to have established a precedent when he resigned from the Council of State when his party lost the 1998 election. Members of the Council serve at the pleasure of the Monarch. In the case of a succession where the monarch is under age 25 the Council of State serves as a Regency Council.

Meetings of the Council of State are held in private. The minutes of its proceedings are limited to motions and formal actions. There is no record of the discussions held. There is an opulent room in the SanLucar Palace reserved for meetings of the Council of State. The Council has also convened at other locations.

The Senate - The 220 Senators are elected from districts of approximately equal population. The Senate House was built during the Avadorres Regency specifically to host an assembly of the people. The structure features a debating chamber that can accommodate nearly 300 and large public galleries. In a fairly unusual feature of modern parliaments, the Senators are seated by provincial rather than political allegiances. A semi-circle of small desks and chairs are arranged from left to right for delegations from the Isla de Sol, Montaigne, Altair, Monterey, San Lorenzo, Nord de Riv, Crotona, and Leponto.

In addition to elected representatives, the Monarch, Heir Apparent, Lord Chamberlain, Lord President of the Council of State, provincial Chief Ministers, and members of the cabinet who are not Senators are also recognized as members of the body with full rights to the floor and participation in debates, but without voting privileges.

The Senate elects from its membership a Tribune who serves as Chair. The Tribune only votes in case of a tie, but has the power to name Senators to committees and appoint special committees. Senate Committees are typically the principal source of legislation. There are currently ten committees.

1. Committee on Agriculture, Commerce, Fisheries, Mining, and Industry
2. Committee on Banking, Finance, and Treasury Affairs
3. Committee on the Budget and Taxation
4. Committee on Defense and Military Affairs
5. Committee on Education, Culture, Health and Social Welfare
6. Committee on Foreign Affairs
7. Committee on Internal Security
8. Committee on Justice and the Judiciary
9. Committee on Transportation and Public Works
10. Committee on Senate Organization and Agenda

The Committee on Senate Organization and Agenda is, by practice, identical to the cabinet, and in this form has the authority to refer legislative proposals to committees and set the agenda for Senate action.

The Government-The monarch names the head of government, presumably from the Party capable of organizing a majority in the Senate. A majority of the Senate is required to vote to confirm the head of government selected by the monarch. The head of government is formally known as the Lord Chancellor, but more usually as the Prime Minister or Premier. Ministers of the government departments are also officially named by the Monarch, but since 1992 have been chosen by the Prime Minister from among various party leaders.

The Cabinet consists of Ministers, Secretaries of State, the Procurator-General, the Lord Chamberlain, and the Heir Apparent (when over age 18). The current members of the Cabinet, in order of precedence, are:

- The Lord Chancellor (Prime Minister): Andrew Aranda, (Center Convergence)
- The Lord Chamberlain, The Marquis of Sully, (non-partisan)
- The Minister of Justice and Procurator-General: Oswaldo Jameson, (Center Convergence)
- The Minister of Foreign Affairs: Count Monte'Oro, (Republica Esperanza)
- The Minister of Defense, Philip Salvadore, (Center Convergence)
- The Minister of Finance and Lord Treasurer: Joseph Monino, (Agrarian)
- The Minister of the Interior: Edward Squillaci (independent)
- The Minister of Education, Culture, and Science: Ferdinand River, (Republica Esperanza)
- Secretary of State for Health and Social Welfare: Maria Fisher (Center Convergence)
- Secretary of State for International Trade: Mark Grimaldi, (Agrarian)
- Secretary of State for Public Works: Nicholas Kyriodas., (Center Convergence)

- Secretary of State Economic Development: Adrian Santerre (independent)

KINGDOM OF ESPERANZA MILITARY COMPOSITION

Throughout Esperanzan history the military has played a critical role in national political life. Since the emergence of a professional military in the early 19th Century, soldiers have regularly been courted by politicians of every ideological stripe. The officer corps, especially in the Army, has typically been conservative in its social and political worldview. When military discipline has been well maintained, the rank and file has generally followed its officers. Military embarrassments have often been the impetus for political reform.

It is somewhat paradoxical that the military bequeathed to Esperanza upon the death of President Fire may be the most professional and non-ideological in the history of the state. While President (formerly General) Fire was perceived outside Esperanza as the leader of a military coup in 1948, he came to view himself more as a social and spiritual leader rather than a military leader. As a result, since at least the late-1960s, military education has focused on the profession of arms and obedience to civilian authority. The most dramatic evidence of this was the refusal of military leaders to support the National Movement's effort to delay the coronation of King John.

But even so, the military as an institution, remains self-conscious of a "special" role it plays in preserving and advancing national unity. It is the only Esperanzan institution that truly transcends regional, religious, and socio-economic divisions. There is also a strong sense of institutional self-preservation on the part of the Military. Access to budget, opportunities for promotion, and engagement in prestigious assignments are the focus of significant intra-institutional energies. While the three military services and the para-military Civil Guard share many institutional characteristics, they are also unique and competitive.

The Army is the largest of the military branches, with a roster outnumbering all other branches taken together. In 1998 the Army consisted of nearly 80,000 troops. The organizational structure consists of four regionally-based Divisions commanded by Captain-Generals. Each division is made up of four or more brigades of approximately 5000 troops each. Regiments of approximately 1000 troops are typically made up of three or four battalions.

The most prestigious commands are the so-called "Old Guard" infantry regiment, closely associated with royal protection; the paratroop regiment; and four armored regiments. Most Army officers, and all general officers, are graduates of one or more of three elite military educational institutions. The College of Arms is the undergraduate military school founded in 1748. The Royal Institute of Artillery, despite its name, is a school for senior staff officers. Both of the foregoing institutions give significant attention to the creation of a shared Army culture and close relations between members of the Army officer corps.

The Joint Defense University was founded in 1972 to provide advanced study in strategy and technology for all military branches.

The King is Commandant-General of the Army and has the rank of Marshal. He is a graduate of the Royal Institute of Artillery and has good personal relations with a cross-section of officers in his generation. The most senior Army officers promoted under the Fire regime are approaching retirement age. They are among the last with personal memories of direct military involvement in political affairs.

The Navy is organized in four squadrons, the Celtic Islands Squadron based in Saint Sebastian, the Bay of Altair Squadron based in Altair, the Illyrian Sea Squadron based in Pireus, and the Coastal Defense Squadron, headquartered in Saint Jerome, but deployed widely along the coasts. Each squadron consists of 15 to 25 ships and submarines and 3000 to 4000 officers and sailors. Each squadron also hosts a 1000 troop regiment of Marines which are used for amphibious operations and base security.

Only about a quarter the size of the Army, the Royal Navy is even more diverse than its larger institutional partner. Less affluent Latians and Alatarians have traditionally found the Navy well-suited to upward mobility and small-town boys from the high plains of central Esperanza have seen the Navy as the path to adventure.

The command philosophy of the navy tends to focus on individual ships rather than integrated squadrons, which has produced a fairly non-hierarchical culture, at least in comparison with the Army. There are generally no more than six Admirals on active-duty. The list of naval captains was only 112 names long in 1998. The intimacy of the naval community is also reinforced by a requirement for all officers above Lieutenant-Commander to spend at least six months in residence at the Royal Naval Academy every seven years. The King is an Admiral of the Fleet and has shown a preference for naval officers in selecting his closest advisors.

The smallest of the military branches is the Air Force. It is currently organized around eight squadrons of fighter jets, one squadron of patrol and reconnaissance craft, and one squadron of heavy transport craft. The total Air Force complement of personnel totals approximately 8000. There is usually one Lieutenant General and four brigadiers Colonels in command of squadrons are, however, considered the jobs-of-choice for career air force officers. The Air Force became a separate branch only in 1964 and has prided itself in a technical and non-political character. The King is a fighter pilot and holds the rank of an Air Force Brigadier

In 1976 President Fire reorganized the military structure to emphasize joint operations. The nation was carved into four military regions with a single commander for all military forces within that region. From 1976 until 1995 Military Regions 3 and 4 were commanded by Admirals, while Regions 1 and 2 were commanded by Army Generals. In 1995, however, an Army General was

appointed commander of Region 3 as a result of an increased focus on the internal security threat of Land and Liberty.

A joint General Staff and High Command was established in 1985. After some resistance, the joint staff has come to be seen as a prestigious and desirable assignment. The current Chief of the General Staff is Captain-General Henry Everett of the Esperanzan Army. General Everett was named by the King to this role in late 1998, over the heads of several more senior Army officers. The King makes the appointment in his role as Commander-in-Chief of the armed forces. The King made it clear, however, that he had consulted with the Prime Minister and Defense Minister in making the appointment.

Since 1976 training and military doctrine have emphasized joint operations, but many of the independent traditions of the three branches have continued. Since 1992 civilian leadership of the military has become more assertive. Civilian leadership of the military has also been advanced by the passing of the Cold War, which has tended to call into question the mission of the Esperanzan military. Participation in international peace-keeping and peace-making operations is popular among the officer corps, but has not been well-received by the general public. The incremental reduction of military forces, especially the Army, began under the Mendoa government and has continued.

The Civil Guard is technically a public safety agency and reports to the Ministry of the Interior rather than the Minister of Defense. But by tradition and organization the Civil Guard is closely related to the armed forces. All Civil Guard officers must be veterans of the Army, Navy, or Air Force. The majority of Civil Guard officers are former Army Officers who did not make promotion to Captain or beyond. At the regimental command level, Civil Guard officers have a high concentration of retired Army Majors and Colonels.

The Civil Guard consists of approximately 40,000 personnel organized around regiments of 1000. Regiments are assigned specific geographic regions. Within each regimental region members of the Civil Guard provide a range of services from customs administration, immigration control, tax investigation, drug enforcement, building inspections, highway patrol, rural law enforcement, emergency response, and much more. The Civil Guard touches nearly every aspect of public safety other than school crossing guards and fire control. On a national basis the Civil Guard has been given particular responsibility for internal security, which has included intelligence gathering and anti-terrorist operations.

During the late 1980s and 1990s, the Civil Guard responded to the threat posed by Land and Liberty by concentrating regiments in Altair, Montaigne, and Isle de Sol provinces. The ratio of Civil Guard personnel to general population in these provinces is nearly twice the national average. Since 1995 the Civil Guard has also been tightly integrated into the communications and intelligence gathering functions of the Third Military Region, which encompasses these same provinces. This concentration of resources, and integration with military functions, has been controversial among civil libertarians, but appears to have been effective in curtailing the tactical operations of Land and Liberty.

The Civil Guard is led by a national commandant, almost always a retired Army general officer, who reports directly to the Minister of the Interior. During the Fire years elements of the Civil Guard became associated with ongoing abuse of civil rights, and the institution continues to resist efforts at thoroughgoing reform. But characterizations of the Civil Guard as simply a rightist goon squad, ignores the extensive engagement of the institution in a vast arena of national administration. In some ways the Civil Guard's resistance to change is a reflection of its roots in day-in-day-out administrivia of life in a modern state.

Description of Scenario

Esperanza is moving toward democracy but the United States has increased its level of concern to this country because of the growing authoritarian nature of their present government. U.S. bases located within Esperanza and the use of the adjacent strait have been designated vital to U.S. national interests.

The Kingdom of Esperanza has voiced its disappointment toward United States involvement in their domestic affairs. The Kingdom of Esperanza has publicly stated that increased U.S. involvement will lead to the closing of all U.S. bases located within their borders and the expulsion of all U.S citizens from their country. In addition, Esperanza claims they will deny use of the adjacent strait between Esperanza and Aleria.

The United States' position is to support democracy throughout the world and to ensure freedom of passage for all international waterways. The U.S. military has been asked to prepare for any event that may include the escalation of political-military affairs between the U.S. and the Kingdom of Esperanza. In preparation, NAVSPACECOM has conducted an evaluation of the space system threat to the area.

WCTA Framework Analysis

Assess Political Reality

Step 1a) Systemic War
Step 1b) Beginning Stage
Step 1c) Highest Available Values in Each Counterspace Tactic

D&D	9
EA	9
GSAS	6
ASAT	5

Assess required capabilities for each counterspace tactic

Step 2a) No additional capabilities added. Use of Required Capability List , as given.
Step 2b) Weighting factors calculated for each counterspace tactic:

D&D	= 9/5 = 1.80
EA	= 9/4 = 2.25
GSAS	= 6/6 = 1.00
ASAT	= 5/6 = .83

Evaluate and Assign Adversary's Attained Threat value for each counterspace tactic

Step 3a) Intelligence reports reveal the following Esperanza capabilities, as indicated by an "x" on the given Capability Lists.

Step 3b)

D&D	=	1.80	x	4	=	7.20
EA	=	2.25	x	2	=	4.50
GSAS	=	1.00	x	6	=	6.00
ASAT	=	.83	x	3	=	2.49

Determine Overall Treat to Space System

Step 4a) Overarching Threat Value of Space System = 20.19
Step 4b) Final Assessment

NO (0-20) – In the judgement of the researchers, an attack against a space system in the AOR is not likely

DENIAL AND DECEPTION

REQUIRED CAPABILITIES
(Weighting factor: 1.80)

x 1 Camouflage techniques
x 2 Concealment techniques
x 3 Deception techniques
x 4 Satellite tracking techniques (include amateur astronomers and internet access)
_5 space surveillance and tracking sensors

ELECTRONIC ATTACK

REQUIRED CAPABILITIES
(Weighting factor: 2.25)

x 1 Jamming capabilities
x 2 Spoofing capabilities
__3 Intrusion methods
__4 Detection methods

GROUND SEGMENT ATTACK/SABOTAGE

REQUIRED CAPABILITIES
(Weighting factor: 1.00)

x 1 Terrorism
x 2 Missiles (short/long range)
x 3 Bombers/Aircraft
x 4 Physical Attack Assets
x 5 Any Military Assets (include SOFs)
x 6 Intelligence on Ground Station

ANTISATELLITE SYSTEM

REQUIRED CAPABILITIES
(Weighting factor: 0.83)

__1 Ballistic Missile Capability
__2 Nuclear capability with delivery vehicle
x 3 ASAT R&D
x 4 Space program
x 5 Tracking capabilities
__6 On orbit satellites

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