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**Swords as Plowshares:
The Military's Environmental Role**

by

Harold W. Bidlack
Major, US Air Force

275 Pages

Ph.D. Awarded

The University of Michigan

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ABSTRACT

This dissertation examines the conditions under which it is appropriate and likely for US military forces to become involved in helping to solve non-military environmental problems. I hypothesize that the unique tools and talents of the armed forces could prove useful in mitigating many significant environmental challenges. I conclude there is theoretical support for broadening the definitions of the terms *national security* and *threat* to include an environmental security component.

I turn to the question of *when* military forces should be used environmentally, developing conclusions based on data from three sources: archival (budget data, congressional testimony, and laws and regulations), elite interviews, and case studies. Eleven "maxims" are developed that can serve as guides in environmental policy making. From these maxims, I craft a model that allows decision makers to consider a series of questions to determine whether military intervention is appropriate, and whether any such intervention is likely to be effective.

Policy makers will make wiser evaluations of the utility of using the military in environmental situations by asking themselves the 11 questions in the decision-making mode developed in this dissertation. These questions include the need for high technology, the importance of great speed of response, the degree of public support, the quality of existing environmental management system, and the potential for danger to those responding to the environmental emergency.

I conclude that the military can be an important environmental partner and that my model will help decision makers evaluate when the military will be most useful.

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**Swords as Plowshares:
The Military's Environmental Role**

by

Harold W. Bidlack

A dissertation submitted in partial fulfillment
of the requirements for the degree of
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(Political Science)
in The University of Michigan
1996

Doctoral Committee:

Professor Gregory Markus, Chair
Assistant Professor Mark Brandon
Professor Harold Jacobson
Adjunct Professor Richard Tucker

ABSTRACT

SWORDS AS PLOWSHARES: THE MILITARY'S ENVIRONMENTAL ROLE

by
Harold W. Bidlack

Chair: Gregory Markus

This dissertation examines the conditions under which it is appropriate and likely for US military forces to become involved in helping to solve non-military environmental problems. I hypothesize that the unique tools and talents of the armed forces could prove useful in mitigating many significant environmental challenges. I begin by examining theory on the role of military forces. I conclude that there is theoretical support for broadening the definitions of the terms *national security* and *threat* to include an environmental security component.

I turn to the question of *when* military forces should be used environmentally, developing some conclusions based on data from three sources: archival (budget data, congressional testimony, and laws and regulations), elite interviews, and case studies. Eleven "maxims" are developed that can serve as guides in environmental policy making. From these maxims, I craft a model that allows decision makers to consider a series of questions to determine whether military intervention is appropriate, and whether any such intervention is likely to be effective.

The archival evidence traces the evolution in military environmental spending and interest. The interviews included White House and Congressional staff, interest groups, the media, and other activists. The case studies examine three military-environment interactions (the US Air Force Academy, Wurtsmith AFB, and Chernobyl). Each data source supports expanded military environmental action.

Policy makers will make wiser evaluations of the utility of using the military in environmental situations by asking themselves the 11 questions in the decision-making mode developed in this dissertation. These questions include the need for high technology, the importance of great speed of response, the degree of public support, the quality of existing environmental management system, and the potential for danger to those responding to the environmental emergency.

I conclude that the military can be an important environmental partner and that my model will help decision makers evaluate when the military will be most useful.

“The Mission of the Air Force is to defend the United States through control and exploitation of air and space”

—Mission Statement of the US Air Force

“There is a new and different threat to our national security emerging—the destruction of our environments. I believe that one of our key national security objectives must be to reverse the accelerating pace of environmental destruction around the globe.”

—Senator Sam Nunn

Harold W. Bidlack
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To Martha,
and
To Christopher, Sarah, and Amanda,
and
To my father
and
To my mother, whom I miss.

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Having read a number of acknowledgments, I assumed this part would be easy. I assumed I would simply make a note of those who were helpful and leave it at that. But as I constructed this dissertation, I came to understand how very many people there are who offer help, and how very difficult it is to make sure you include them all. I will endeavor to thank by name those who made the most immediate and dramatic contributions, but I also understand that I can not, in simple prose, express my gratitude as fully as I should. Nonetheless, to all I offer a heartfelt thank you.

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not possibly know the full importance of their friendship to my life, and to this dissertation. My deepest thanks to them.

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The dissertation has always remained only a small part of my life. My wife Martha and my three children, Christopher, Sarah, and Amanda, remain the center and the light. If the graduate school process was less stressful than I had anticipated, it is because my family was there to bring me back to center when necessary. I find Christopher’s athletic and academic success, Sarah’s joy in gymnastics and school, and Amanda’s delight in dance and in her education more illuminating and captivating than any political science topic could ever be.

PREFACE

My experience as a military officer colors my conclusions, as does my interest in environmental policy. During my 15 years of military service, I have served in both the warfighting role and the environmental role. My first assignment was to the Strategic Air Command, or SAC, as an intercontinental ballistic missile officer. I was a "finger on the button" person, with direct command of ten Minuteman III missiles and backup oversight of forty more, each capable of carrying up to three independently targetable warheads. Having commanded nuclear forces during the Cold War, I agree that a strong military, capable of defending our nation's interests against the real threats the United States faces, is a good thing.

The second portion of my military career has been spent in academia. Under sponsorship of the US Air Force Academy Political Science Department I earned a Masters Degree from the University of Michigan in 1987 and then spent five years teaching undergraduates at the Academy in Colorado. During that time, my long-term personal interest in environmental politics became my dominate research interest. I developed and taught an undergraduate environmental politics course, served as the faculty environmental officer, spoke to citizens about Air Force environmental efforts, and organized base-level environmental programs, such as recycling and tree planting.

I have also conducted research sponsored by the Air Force on future environmental policy options. That research involved discussions with congressional staff, White House representatives, media people, and interest group leaders. The aim was examine the political climate for increased Air Force spending on environmental issues during a time of significant budgetary reductions. The research concluded that the already

high levels of Air Force spending and commitment on environmental concerns could and should be increased. The final paper was sent to the Air Force Chief of Staff (the senior ranking general in the Air Force), who endorsed its conclusions. I was subsequently selected to return to graduate school to earn a doctorate, after which I will return to the Academy to resume my teaching duties.

I have selected my dissertation topic in an effort to satisfy intense personal interest, but also to create a document that will, I sincerely hope, be of practical use to military environmental planners. As my education is being funded by the taxpayers, I feel obligated to strive for a useful as well as scholarly credible thesis.

This dissertation deals with the role of the United States military. As such, it is by definition grounded in a Western tradition. Although concepts such as national security, threat, and the proper role of the military vary from culture to culture, I largely ignore those differences. This necessarily narrows the applicability of my conclusions, but it is the only practical manner in which to make the subject matter small enough as to be workable for me. Further research on the role of militaries in various cultures could prove most fruitful and interesting, but such scholarship is beyond the reach of this author, at this time.

-Interesting Questions, Deferred-

During a recent visit to the United States Air Force Academy in August of 1995, I found a great hue and cry arising from the local citizens about the Army's decision to remove several large Chinook helicopters from the local army base, Fort Carson. These helicopters had little remaining military significance, especially when based in the nation's interior. They did, however, provide one very significant service to the citizens of Colorado: the Chinook, with their powerful engines, could fly into the mountains of the state and provide high country rescue. Thus lost hikers, injured skiers, and accident

victims could be airlifted from mountainsides and flown to hospitals rapidly. There is no denying the value of such a service, but is it one that should be provided by the United States military? No commercial operations are capable of flying helicopters in mountainous terrain due to limitations on the altitudes civilian helicopters can reach. Therefore, if the Army terminates Chinook service, people will die. Is the Army expected to provide for such a non-military function?

Similar examples are regularly seen in the news, as when retirees protest a base closure and the resulting shutdown of the base's medical and shopping facilities. During my last year in Wyoming, the two OB/GYN doctors at F.E. Warren Air Force Base were the only two such specialists *in the state of Wyoming*. High malpractice insurance costs had driven the dozen or so OB/GYNs from the state. When a birth emergency beyond the ability of the local internist or general practitioner developed, the Air Force doctors were called in. Such a service can seem both vital and justified when you or your loved one is nearly at full term. Such a service can seem excessive and unwarranted when you are a policy maker or tax-payer removed from the situation. Which view is correct? Is it the duty of the military to provide basic services to the citizenry when private forces do not? How are military personnel serving during hurricane cleanup fundamentally different from military medical personnel serving during an OB/GYN crisis? Such questions are compelling, but must be deferred.

A brief word about words. In many political science discourses the terms "nation," "state," and "nation-state" are used imprecisely. I adopt the following conventions: a *state* is a political entity, with discernible borders, population, government. A *nation* is a group of individuals who feel a common bond or kinship. A *nation-state* is a state whose population is also a nation— that is, a physical entity whose people feel a sense of belonging and loyalty to the government. When I refer to a concept of "nation-ness," I mean what should be properly called a nation-state.

-Disclaimer-

It is important to fully understand for whom I speak in this dissertation. The ideas contained in the pages that follow are strictly my own. While I draw heavily on my fifteen years of military service throughout this document, at no time do I speak for the Department of Defense, the United States Air Force, or any other governmental organization or for any other individual. The opinions are my own, as are all the errors.

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CHAPTER 1

INTRODUCTION

Few would argue against the idea that defending a nation requires a military. Long before the birth of the modern nation-state in Westphalia, war had become a common method of settling disputes between peoples. In the modern era war fighting has become highly technical and very deadly. Modern military forces have become efficient and capable tools of national will. But what precisely is a military to do beyond the act of war? In this dissertation I examine the non-warfare duties of the military, using as a testable example the role of the military in environmental issues. I offer an answer to the question: Should the proper role of the US military in helping to protect and defend the United States in this century and the next include a significant environmental component?

To be studied properly, such general musings must be converted into hypothetical arguments that can be assessed empirically. My overarching research hypothesis is: *If the military performs non-traditional functions, then the society will be improved.* I have limited my dissertation to working hypothesis that *if military forces are allowed to address environmental issues that are within their realm of expertise, the overall environmental situation is improved.*

The purpose of this dissertation is, therefore, to gather data and arrive at recommendations on how to make wise decisions within this domain. Decision makers who use the model presented in Chapter 7 will be aided in the process of deciding when it is wise to use the military to mitigate environmental problems, and when it does not.

In small, disorganized steps the United States military has become increasingly engaged in non-traditional functions. Examples include the use of Air Force helicopters to pluck stranded men, women, and children from the roofs of homes surrounded by hot mud following the eruption of Mount Pinatubo in the Philippines (Reuter 1995) and the analysis by the Defense Intelligence Agency of the rate of spread of the water hyacinth plant on Lake Victoria, which was threatening to choke off other life forms and hence put pressure on the local food supply and thereby on local and regional stability (Greenhouse 1995). Was a national security objective at stake in either instance? It is difficult to say. The military intervention in starvation-ravaged Somalia began as an effort to feed people, and degenerated into an effort to build a nation. The first action was nearly entirely successful, the later much less so.

There are lessons to be learned from every example of military action in non-traditional domains. But many of these lessons come with high costs in terms of materials, time, and, most tragically as in cases like Somalia, human life. In this dissertation I will present a checklist which will allow decision makers to rank environmental policy choices, and to determine which are most likely to yield desired results, and which are less likely to do so. Before discussing the specifics of such a model, it is necessary to frame the debate in broader theoretical terms, and to determine just what we mean by words such as national security and threat.

When this nation was founded, the forces under arms were small and poorly equipped. During the Revolutionary War, George Washington commanded fewer than a quarter of a million troops, with a total war-time expenditure of less than \$140 million in today's dollars. Today's senior US military commander, Joint Chiefs Chairman General John Shalikashvili, commands a force of 1.8 million, with annual expenditures near \$280 billion (Statistical Abstract of the United States 1995, 350-366). Could those drafting the Constitution of the United States have anticipated the scope and impact of the military in today's United States? Regardless of their visions of the future proportions of the nation

they founded, the authors of the Constitution seem to have understood the special relationship between an armed force and the nation it protects.

The Founders seem to have imagined security in at least two ways. First was simple survival, with the nation safe from foreign invasion and armed insurrection. For this, a traditional military was created. This military was expected to repel invasion, win battles, and maintain a deterrent posture toward potential aggressors. But an additional view of the concept of security was a concern with the *flourishing* of the new nation. The Founding Fathers had long-term hopes for the United States, with visions of greatness and durability. The military was seen as an aid in reaching the first goal, but a possible hindrance to the second. A standing army was, in the minds of many, potentially dangerous to liberty. A story from the era, perhaps apocryphal, gives George Washington's response to a proposal to add to the Constitution a limit of 5000 to the size of a standing army. Washington is said to have stated that he would support such a limitation only if an additional limitation was added restricting any attacking army to the same 5000 (see Madison 1788; Hamilton 1788; Jay 1794; Washington 1796; Jefferson 1801).

As part of the overall separation of powers debate, the military was subject to special attention at the Constitutional Convention, with Congress and the President dividing the powers of war declaring and war making, along with other restrictions to keep the military non-threatening to liberty. It was felt that such a hobbling would create a good servant, and would not threaten to become master (see Madison 1788; Woll and Binstock 1984).

Such a framework requires a clean, clearly understandable differentiation between military roles and civilian roles. Uniformed personnel would handle war, and civilians would take care of everything else. As is often the case, such a system looks more unambiguous on an organizational chart than it appears in real life. American military forces have long engaged in a wide variety of non-combat functions in support of

Americans and those overseas. The armed forces of the United States combined efforts to supply the people of Berlin when the Soviet Union restricted access to the city. American armed forces were used to help secure democracy in the Dominican Republic and in Haiti. Over the years, the Army, Navy, Air Force, and Marines have delivered food, inoculated children, helped build flood levies, housed hurricane victims, invented technologies and managed endangered species.

This blurring of what the Founders may have viewed as a clear partitioning of roles has significant policy ramifications. There is no debate on the role of the armed forces as the protector of the United States in armed conflict. The definition of what is the "proper" role of the military outside of combat has been hotly debated, however. Some argue that a military should be restricted to clearly war-fighting functions, while others suggest that the military is capable of a wider range of functions, can be trusted to perform them, and is perhaps even obligated to undertake such duties (see Brown 1977, Brower 1995).

As noted, for most of our nation's history, this question had a simple answer, and relied on a simple definition of national security. The military's role was to wage war and win. To be secure as a nation for most of the past 220 years meant having a strong traditional military, to have more personnel, more arms, and more resolve to use them than any potential enemy. Deter when possible, fight and win when necessary.

Today, national leaders are confronted with a complex set of challenges that call into question traditional definitions of "national security." The ability to repel invaders, to prevent the seizure of property, to shoot down attacking aircraft, seem insufficient when a nation's security can also be threatened by economic collapse, by civil strife, economic crisis, or ecological calamity. One need only look at the recent histories of the former Soviet Union, Yugoslavia, Rwanda, Chechnya, the Amazon rain forests, and the Mexican economy to see that threats to security can come from a wide variety of causes.

How do nations deal with such diverse and dynamic hazards to national security? In the past, governments sought to protect sovereignty with walled cities and with national

independence. The modern world system, however, is such that no nation can "go it alone." Industrial raw materials, semi-processed goods, and demand for energy guarantee an international environment filled with inter-state trade and communications. The impoverished circumstances found in North Korea and Albania are testimony to the futility of attempting to lock out the outside world and rely only on domestic resources, goods, and services.¹

Interconnectedness among nation-states is a fact of modern international relations. The ability to trade with worldwide partners has increased national wealth and standards of living, but overall, international *cooperation* still can be difficult to achieve. In the modern world, age-old points of conflict merge with (and are exacerbated by) fresh wellsprings of disharmony. With the benefits of increased interconnectivity come new sources of potential conflict.² As nation-states gain from international mail, telecommunications, trade and tariff cooperation, they may lose from strife over technology transfer issues, intellectual property rights debates, and a host of economic questions. As Robert Keohane noted,

cooperation remains scarce relative to discord because the rapid growth of international economic interdependence since 1945, and the increasing involvement of governments in the operation of modern capitalist economies, have created more points of potential friction (1984, p5).

While opportunities for international cooperation exist, so does the potential for antagonism. If the nature of international relations has evolved, does it not logically follow that the role of a key state agent, the military, should also evolve? If so, in what direction should the military be turning?

Within this broad area of intellectual exploration, I examine the specific area of environmental policy. Should the military assume a broader role in helping to assuage the environmental challenges facing the United States and the world? This is not an easy question, and thoughtful people disagree. My experience as an Air Force officer suggests to me, however, that a case can be made for such a role, albeit with limitations.

The literature on the topic of this dissertation is broad and deep in some places, and almost nonexistent in others. Much has been written about the role of military forces in what might be called "traditional" security roles. From the Leviathan of Hobbes and the Prince of Machiavelli to the will of Clausewitz and the games of Axelrod, scholars have authored libraries of books on fighting, war as an instrument of state policy, and deterrence. Yet there is surprisingly little that goes beyond these topics.

In this dissertation, I consider the traditional role of the military in national security, and how that traditional duty fits today's geopolitical situation. I shall avoid entering into the constitutional debate about the role of the military, and will simply assume as an entering condition that broadened environmental action by the armed forces is within the lawful range of military actions. I do believe, however, that the general welfare provision of the Constitution suggests a broad range of duties and opportunities for governmental action.

I will instead investigate how the military is currently adapting to change, and changing to adapt. I will probe for what might be proper roles for the military beyond traditional military functions. I will address a series of questions beginning with a fundamental one -- is it *wise* to assign military forces to non-traditional functions?

I seek to learn about the costs and benefits implicit in a broadened military playing field, as well as the legal, ethical, and practical implications of such military involvement in society. In the early and mid 1990s we saw the United States military used for a variety of non-war-making functions, including dropping food to beleaguered towns in the former Yugoslavia, and assisting South Florida after a deadly hurricane. In late 1994, members of an elite Navy SEAL (SEa-Air-Land) commando team were dispatched to support the efforts of local wildlife managers in the rescue of an endangered Right Whale (Chapman 1995). Is this broadening of military activity within the purview of national security and service to the nation? Is a simple answer possible?

Having examined the varying views of the "proper" role of the military in society, I will, as noted above, consider the theoretical and practical implications of expanded military activity in one of the most rapidly growing domains within the United States military: the environmental arena. I investigate what the military has done in the past, both the environmentally sound and the environmentally destructive, as well as discuss the military of today and plans for the future. I examine options for military-environmental linkages, and offer comment on prospective scenarios. I explore how efficient military forces can really be in performing environmental activities beyond the scope of traditional military functions and assess the impact of such action on the private sector.

Military environmental policy falls somewhere between two extremes. At one extreme the military would handle *all* of society's environmental problems; at the other, the military would deny responsibility for *any* environmental cleanup, including its own. Budgetary, personnel, and logistic limitations make the first extreme unattainable; ethical and moral constraints on military leaders make a policy of environmental abdication equally untenable. It is clear from the literature and public debate that while both end positions are unsound, the middle range is quite open to debate. Should the military aim primarily at environmental policies that directly involve military operations (e.g., developing "cleaner" engines for jet fighters), or should it also include on its agenda environmental problems not directly related to, or caused by, traditional military functions?

Finally, I attempt to craft a model, a set of maxims, that will help predict which, if any, non-traditional functions can be performed effectively and safely by the military. I draw this model from the data I gather, including archival research, elite interviews, and case studies. Such a model may help both military and civilian policy makers evaluate new environmental issues as they arise, and help guide them toward an efficient and environmentally sound response.

Because my fifteen-year military experience has been spent entirely within the United States Air Force, I focus almost exclusively on that service. The Department of Defense (DOD) has many environmental challenges, which vary significantly by branch of service. While I believe my model will have utility throughout DOD, my personal and professional experience, and data availability, predispose my research toward the Air Force.

Why Should We Care?

The questions explored in this dissertation are significant for a variety of reasons. On the practical level, the United States military consumes a substantial share of the nation's resources. The DOD budget in FY 1994 was \$298.5 billion dollars, a massive portion of non-entitlement federal spending (OMB, 1995). Fully 59 percent of federal research and development (R&D) dollars were consumed by DOD in 1994 (Bureau of the Census, 1994).

The ripple effects of DOD's spending go far beyond the five walls of the Pentagon. In many communities, the DOD represents a significant portion of local employment and spending. The recent history of communities upset with "their" base or port being on the base closure list is testimony to the impact of the DOD across the country. For example, the community of Colorado Springs, Colorado, has three major military bases (The United States Air Force Academy, Peterson Air Force Base (AFB), and Ft Carson Army Post), and two smaller facilities (Falcon Air Force Station, and Headquarters-North American Aerospace Defense Command).

The DOD is also not politically unsophisticated in its spending patterns. For example, spending on the Strategic Defense Initiative (SDI) was allocated to defense contractors in all 50 states (Costanzo 1991). Thus every United States Senator had jobs back home at stake in SDI budget negotiations. The recent military drawdown has had a significant impact on home sales, office vacancy rates, and other local economic

indicators. This question will be examined in more detail in Chapter 8 when I look to research issues which merit further investigation.

The military is also a unique tool for policy makers. While many agencies of the federal government have managerial capability, budgetary skills, and other expertise to manage their affairs, the military has these and more. The particular mission of an armed force results in the development of tools and talents not found elsewhere in a government. If such modalities would be of practical use in meeting an environmental challenge, does it not make sense to use them? The ability to survey the land, sea, air, and space in real time, the ability to image any point on the earth's surface from space, the capacity to rapidly airlift personnel and equipment globally, are all capabilities that would be extraordinarily expensive to duplicate in other governmental organizations. What would be the impact of utilizing such tools and talents? Could environmental betterment, on occasion, be a role for the armed forces? Is it possible to engage in such activities without damaging the combat readiness of the United States military? These are important, but difficult to answer, questions.

Finally, I assert that the central questions of this dissertation are important because the military is itself a significant source of pollution, including toxic waste, soil contamination, and (especially) nuclear residue (see Renner 1991b, Finger 1991). Thus the role of the military in environmental compliance and cleanup is not merely an academic exercise, but is in fact already an every day activity for many DOD personnel, both civilian and military.

Security, Past and Present

As the twenty-first century dawns, traditional definitions of security seem to be increasingly less satisfactory. As noted above, in the earliest days of our nation, the notion of security meant little more than the ability to repel direct military attack by an enemy. The great fear of a standing army remained, a hostile remnant of

the odious specter of the traditional standing army of the eighteenth-century Europe: the common soldiery gathered from the scum of society, officered by an insolent and imperious aristocracy, employed for arbitrary purposes, a tyrannical pestilence whenever it moved and wherever it was quartered (Elkins and McKittrick 596-596).

This view did not last. Citizens began to expect more in the way of governmental services. A government needed to protect the nation-state not only from military incursion but from economic stagnation. The government came to be expected to make roads, promote markets, inspect meat, and provide for a variety of needs of individual citizens. As has been the case in other national evolutions, the demands of the citizens upon their government resembled a "societal Maslovian pyramid" with an increasingly sophisticated set of consumer demands placed upon government as the society matured.

With acceptance of a broad role for government came increasing demands for what might be called new types of "security." This evolution brought us from a view that the "business of America is business" to a New Deal, and to a Great Society. Programs which a century ago would have seemed far too intrusive for even the most liberal, are today accepted as normal by many conservatives. While New Deal Liberalism seems in retreat today, most of the electorate still expects government to keep the food pure, the borders safe, the highways maintained, and the schools open. We the People have come to expect and demand "national security" along a *number* of dimensions.

Time for Re-Thinking the Definitions?

For superpowers during the Cold War, nuclear security was a critical component of national security. Once armed with nuclear weapons, the Soviet Union became a superpower. And so were we. Both nations maintained sizable conventional forces as well, and sought a force structure that would allow for deterrence of aggression, and defeat of enemies when necessary.³

With the decline and fall of the old Soviet system came the realization that without its gargantuan military machine, the Soviet Union, and later Russia, was hardly a superpower. By most measures of societal success, Russia was clearly behind nearly all

western nations. Military leaders in this country no longer attempted to justify vast military expenditures on the basis of stopping the spread of Soviet-style communism. In the early 1980s the government in Moscow was, in the view of some leaders, the "evil empire" bent on world domination. Today the Russian government seeks US assistance to rise out of the economic quagmire of post-socialism. Few would claim that Russia's national security is not reduced in the world today, in spite of her relatively undiminished nuclear arsenal. Thus there would seem to be more to national security than owning an atomic stick.

In the 1992 presidential campaign, Ross Perot talked about the need for the United States to become an *economic* superpower. Then-Governor Clinton waged a campaign about economics, jobs, the environment, and welfare and health care reform. Are these national security issues?

So what *is* national security? Is it a military concept? Is it economic? Environmental? Educational? Technical? Clearly no simple, single definition will do. The term can no longer refer simply to the ability of a nation to wield military might to deter or destroy an adversary. To be comprehensive, a modern concept of national security must include some aspects of the issues mentioned above. Economic vitality (both domestically and in terms of global economic growth), strong national infrastructure, adequate health care, and purity of food and water, are all areas where we now expect the government to act on our needs, on our "security." The number of variables that seem reasonable to include in a revised view of national security is potentially quite large. National security is still an important term, but the relative weighting of the variables which comprise it have changed significantly.

Origin and Definition of Terms and Concepts

Thomas Hobbes, in *Leviathan*, argued that the Leader, the King, the Leviathan, owes his subjects only one labor --- the creation of security for the people of the realm. The king must provide a secure world for, as Hobbes noted, life without security is not

pleasant. Hobbes saw but two options: anarchy or an absolute sovereign. With anarchy, people would be left to an unpleasant and fearful “state of nature.” Without a leviathan, Hobbes pronounced the lives of men and women to be “...solitary, poor, nasty, brutish, and short” (Hobbes 1651, 100). The king owes his subjects only the absence of the “state of nature.” The people, on the other hand, owe much to the ruler in a Hobbesian world. Having created security, Hobbes argues, the king is now free to extract what he wishes from the people. The wise king will not be brutal, not because he owes the people justice, but rather because the king himself wants to live. A cruel king runs the danger of insurrection and execution.

That government may itself owe something to the governed *beyond* immediate physical security is a relatively old concept, with roots in Pre-Socratic Greece and ancient Israel (Curtis 23-30). The modern writings which serve as the underpinnings of current thinking on the role of government are those of Locke (1690) and Rousseau (1761), who argued for a “social contract” between the government and the governed. Insecurity could be reduced by such a contract. Where Hobbes saw duty largely as a one-way street from the governed to the Leviathan, Rousseau argued for a contract, a social contract, between the two. While the governed owed, so too did the governors.

Locke developed the concept further and observed that the government has an obligation to protect the rights of the people to life, liberty, and property. If the government is unable or unwilling to provide protection, then it is the right of the subjects to remove their leaders from power. This was, and remains, a truly revolutionary concept. The *right* of a people to remove a leader would have seemed a foolish and dangerous philosophy to Hobbes. In this simple assertion is the seed from which the American brand of democracy would arise.

Not until the Founders of this country began their nation-crafting do we find a *written* contract among *common* people to forge a government—the U.S. Constitution. The Magna Carta, while similar, only applied between the king and his nobles. The

American Constitution stands today as the longest surviving written constitution in history. This contract is a bond between the people themselves and with their elected leaders, but it is not a work of political philosophy.

For philosophy, we can turn to Madison, Hamilton, and Jay and the *Federalist Papers*. In these writings we find an understanding of the Hobbesian world, blended with the freedom and liberties of Locke, Rousseau, and Montesquieu. Montesquieu advocated in 1748 the separation and balance of powers within government as a means of guaranteeing the freedom of the individual (1748). Madison (1787) in particular writes of the steps required to maintain security and liberty simultaneously.⁴ The American model of government embodied in the Constitution attempted to blend elements of security (e.g., maintenance of a standing army) with liberty (e.g., separation of the branches of government). This concept was a written promise between the people and the government. This promise has allowed for over two hundred years of relative security as a nation. Herein lies the genesis of the broader definition of national security appropriate to the United States today, which will be more fully addressed in the next two chapters.

Roles and Variables

How does one measure security? Is it sufficient to count tanks and bombers? Does GNP alone tell you how secure a nation is? The simple answer is no. There are many components of the national security of the United States. I shall focus on what I believe are two key elements to national security. These are the *traditional functions of a military* and *environmental degradation*, which ultimately will be combined into part of a more comprehensive definition of national security.

As a military officer, I am naturally interested in the question of how the military should defend the nation. I am responsive to issues of military preparedness. I believe strongly in the need for a traditional military, and in that military possessing the ability to meet and defeat *traditional, real* military threats to our nation and our allies. While there is much room for debate and disagreement on the force structure, the philosophy of when

and how to deploy armies, and the use of deadly force, the concept of some type of standing military in the United States is accepted by most Americans.

Having staked out this conventional and necessary role for the military, is it possible to move further in exploring the role of the military in defending national interests? I believe there is.

The twelve years of the Reagan-Bush administration resulted in a changing view of the proper role of the federal government on environmental issues. President Reagan's controversial Secretary of the Interior, James Watt, left a legacy of viewing the environment as a commodity. His successor under President Bush was William Reilly, an environmentalist of note. Reilly found himself part of an administration that touted itself as being environmentally oriented, but the administration did not demonstrate with policy initiatives that it was strongly committed to environmental concerns, as illustrated by President Bush's decision not to sign the biodiversity agreement at the United Nations Conference on Environment and Development (UNCED) at Rio.

Surveys show that environmentalism and environmental concerns are quite important to most Americans (Moore 1995). Protection of environmental quality has become accepted as a proper province of governmental action in the minds of most citizens. Environmental quality is viewed as important, and government is perceived as the appropriate actor to safeguard the natural environment.

In addition, as the national and global impacts of a variety of environmental issues become clearer, environmental concerns seem likely to become security concerns. An illustrative example is provided by the issue of strategic minerals. A number of mineral resources are vital to traditional national defense, yet many are not found in commercial quantities within the borders of the United States. These include chromium, manganese, and platinum, imported primarily from South Africa, and cobalt from Zaire. The United States imports roughly 99 percent of its manganese, 95 percent of its cobalt, 90 percent of its platinum, and 82 percent of its chromium (Clark and Field, 38-40). Each of these

minerals is absolutely indispensable in the production of steel and steel alloys, especially high temperature alloys used in jet engines. Absent international suppliers of these mineral ores and products, the industrial capacity of the United States would be significantly reduced. Thus international trade in these extractive products is necessary even for the most restricted view of US national interests. In addition to the economic and industrial ramifications of these minerals, there are direct military outgrowths as well. Should the defense establishment find itself without the raw materials to craft jet engines, ships propellers, and other vital military hardware, US national defense could be directly affected.

Do major environmental problems pose threats to national sovereignty? Does an ozone hole over Australia create an international problem? Does the destruction of the globe's rain forests pose a threat to the national security of the United States? Of Europe? Does the "north-south" conflict, so often demonstrated in environmental matters, compound other security issues? Does potential resource loss create challenges for national defense? I believe the answer is yes, as will be shown in the chapters to come.

These two factors, military readiness and environmental protection, are among the factors that constitute United States national interests. At first glance the two would seem to be a potential nexus for conflict. Military readiness requires troops going on maneuvers, flight testing, driving tanks over deserts, and consumption of fossil fuels. The potential for environmental degradation seems high. By protecting the nation from an outside military threat the military may abet damage to our environmental resources. Is this unavoidably true? I suggest not always, or even most times. The evidence and analysis which will follow will support a basic underlying premise of this work: major environmental destruction is usually *not* a necessary component of military readiness.

Methodology

This dissertation divides roughly into two parts. In the first section I explore the theoretical underpinnings of national security in greater detail. The assertion that environmental security is related to national security should not be accepted uncritically. I therefore examine the question of just what *is* the “proper” role of military forces. Should militaries *ever* be involved in non-military functions? The scholarship ranges widely on this question.

In the second portion of the study, I turn to an examination of the “real world,” and attempt to model it. In light of these mixed approaches, a mixed methodology seems appropriate to the task.

The primary data-gathering instruments used are archival retrieval, elite interviews, and case studies. Archival data were examined to gain an understanding of the change, if any, in Air Force concerns over things environmental. Trends over time in levels of funding, patterns of congressional testimony, and the regulatory history of the military’s environmental programs offer insight into the underpinnings of the armed forces’ ecological traditions.

The interviews cover a wide range of the political, professional, and scholarly communities. These discussions illustrate the wide range of views both in and out of government. There are many stake-holders in the environmental question. My interviews attempt to cover a wide spectrum of beliefs and opinions. As there are so many interested parties in any military decision on environmental policy, it is appropriate to gather opinions from a diverse group of respondents.

Case studies are used to review situations where the military and the environment interacted. I seek to draw from these cases the lessons that can be learned applicable to the theoretical model I construct. As is usually the situation, the lessons are often not clear. What seemed a good and reasonable idea “at the time” can become an oversight of

huge proportion when viewed from the perspective of thirty years later. I seek to draw out the lessons that seem most useful from the viewpoint of today.

Why Should We Care - Revisited

The ability of military leaders to make high-quality environmental decisions while simultaneously maintaining a high quality military force is critical. Too often and for many reasons, important decisions are made with inadequate information, in too great a hurry, and with too little input. For example, while one part of the Air Force was crafting a Halon replacement for fire fighting, another was designing the fire suppression system on the new strategic bomber, the B-2, using CFC-based Halons. Thus the bomber for the next century was predestined to violate the Montreal Protocols before it ever left the drawing board. With the changing world political situation, the storage and disposal of old weapons (both nuclear and conventional) offers a dramatic demonstration of the link between the environment and the military. Estimates of the costs for disposal of only the nuclear and chemical weapons run as high as \$200 billion (Renner 1991b).

Yet there is also encouraging news. One unanticipated result of the Cold War was the creation of a remarkable system of wildlife refuges on military posts. The need for large areas with restricted access resulted in vast sections of pristine lands being preserved. Such bases are now managed with an environmental eye wide open. Vandenberg AFB in California is home to eight endangered species. The California Least Tern and the Unarmored Three-Spined Stickleback fish are two that have thrived due to military operations which protected their habitats (Judd 1991). The Red-cockaded Woodpecker, another endangered species, has found a remnant of its old untouched ecosystem within the boundaries of Eglin Air Force Base in Florida (Stevens 1996).

Beyond these arguments, there are basic economic and free-market issues that make these questions important. When Loring AFB in Maine closed, people living nearby were anxious to have the government rapidly turn the land over to local interests. The European-based airplane maker Airbus was looking for a North American home, and the

old air force base offered a perfect site. The situation was complicated, however, by strict environmental laws which forbade the federal government from turning contaminated lands over to private interests. The lands must be cleaned up prior to government release. This law was designed to prevent unethical dumping of contaminated governmental lands on unsuspecting locals, who would then bear the costs, and suffer the consequences. The law required that even if only a tiny portion of the land was contaminated, none could be turned over until that portion that was dirty was cleaned up. Unfortunately, the citizens of Maine knew that Airbus would not wait indefinitely for the cleanup to occur, and other towns around the nation were interested in Airbus as their local bases closed. The rule was well intentioned but created an awkward situation (Vest 1993). With 123 hazardous waste sites on the military bases listed on the EPA's "Superfund List," these problems are not likely to go away soon.

I believe, therefore, that there is much to discuss, to study, and to analyze in the ongoing dissonance between military security and environmental security. By looking at national level decision making within the Air Force, I hope to establish a theoretical basis that will help to explain past environmental behaviors, predict the consequences of proposed policies, and, hopefully, proscribe an improved system of environmental decision making within DOD.

This explanatory power will be crafted into a decision model, which allows judgments on the basis of logic and evidence. The fundamental question of whether the Air Force "ought" to take on a particular environmental project will be placed in the context of a set of hypotheses which will in turn be converted to operationalized decision maxims. These questions will allow policy makers to evaluate, on the basis of known criteria, the relative merits of Air Force environmental action. Ultimately, the hypotheses will be converted into a set of maxims a policy maker can use to help assess the wisdom of a particular military environmental policy choice.

The model will not only assist in helping decision makers determine when military forces *should* be used, but will also aid in deciding when they should *not* be used. As will be seen in both the interview data and the case studies, political forces play a key role in most governmental decisions. This is, in fact, as it should be in a representative democracy. Nonetheless, constituent pressures can and do incline policy makers to employ the tools of government in ways that may not make sense in the long term.

An example of over-reaching within the military-environmental arena is the Army Corps of Engineers. This organization has a 200-year history of engaging in major transformations of various ecosystems. Many of these projects have resulted in significant benefits, especially in the area of flood control (Caufield 1989). But many other projects fell prey to pressures to create a "human-friendly" result without considering the long-term implications of such actions. This resulted in demands on the Corps to limit flooding, which resulted in significant loss of "several million acres of productive agricultural and forest land and valuable wetlands and marshes" (CEQ 1978, 285). The Everglades in Florida is an example of environmental damage done by the Corps in the name of improvement. The Kissimmee River was straightened to reduce flooding and to increase ease of navigation. The resulting siltification and drying out of the Everglades now must be "fixed" at the cost of \$1.5 billion dollars (Reuters 1996, Brower 1995).

What makes this whole question of the military and the environment interesting to me is that environmental concerns are fought for, debated, and argued as a "war without an enemy." Few would favor the elimination of all military might, and fewer still would defend whole-scale environmental destruction. Clearly the issue demands a balance, which will necessarily change over time, issue, and context. Is our military security *necessarily* in conflict with our environmental security? Or is there a way to integrate traditional military functions and expertise with the profound environmental questions we face as a nation and as a world? Can the unique talents and tools of the military be put to fuller use in reaching

a new, more comprehensive definition of national security? The Department of Defense must find a policy position that addresses real military threats, but recognizes non-traditional threats as well. How we as a military service address these issues will, in large measure, shape the military of the twenty-first century and beyond.

End Notes

¹ For a fuller discussion of international trade and international relations, see Rosecrance (1986). See also Harrop (1992), who focuses on European Community issues of trade and commerce.

² See Samuel P. Huntington, *The Clash of Civilizations* for fuller discussion of how cultural clashes may exacerbate the problems of peacemaking.

³ For fuller discussion of the issue of deterrence, see Brody (1946), George and Smoke (1974), Huth (1988), Kahn (1961), Schelling (1966), Smoke (1987), Tanter (1990).

⁴ See *Federalist 10* and *Federalist 51* for Madison's discussion of factions, power, and governmental limits

CHAPTER 2

THEORETICAL CONSTRUCT & REVIEW OF SECURITY LITERATURE

At its most fundamental level, a military has but a single role --- to protect its nation from threats to that which the nation values. For most of human history, land and territorial security have been valued very highly by national leaders. Many wars and countless lesser battles have been fought over borders, access to the Sea, and other forms of territorial integrity. Armies and navies, and more recently air forces, have engaged in a wide range of military operations to protect what is viewed by national leaders as the vital interests of the nation. In 1648 the Treaty of Westphalia brought an end to the 30-Years-War, and more importantly crystallized the notion of *nation-states* with *inviolable borders*. For the past 348 years, international law has accepted the right of a nation-state to protect the integrity of its borders through force if necessary. The military is accepted as a legitimate tool of nation-states in protecting national borders, as well as other national interests.

Traditional security literature is replete with models of strategic and tactical thinking. Game theory has been used to model a variety of confrontational behaviors. Both these areas contribute to an understanding of national security policy, and offer explanatory power in understanding how environmental factors might affect defense decisions.

Scholars have written insightfully on maximizing one's best interests and the logic of cooperation (Axelrod 1990, Kreps 1990), analysis of the utility of various concepts to employ force (Smoke 1987, Foerster and Wright 1990, Tanter 1990), the utility of nuclear

weapons in various types of confrontations (Huth 1988), the role of psychology in deterrence (Jervis et al. 1989), and the various "waves" of deterrent theory.¹ Three particular models are especially useful to those studying the military and environmental concerns, and I turn to the Prisoner's Dilemma, tragedy of the commons, and the logic of collective action. I will briefly review these areas of literature in order to draw from them some of the many useful concepts they offer this research.

-The Prisoner's Dilemma-

Few areas of scholarship have been as useful to understanding military and near-military conflict as game theory. Game theory uses mathematical models of various behaviors to allow scholars to "speculate on human behavior" more precisely (Lave and March 1975, 10). "Game theory aims to predict the strategic decisions made by the participants in any game" (Bierman and Fernandez 1993, 2). One particular model has been extraordinarily useful in understanding conflict --- the Prisoner's Dilemma (PD). A form of the PD model comes into play in this dissertation in the attitudes and biases found in several interview respondents in Chapter 5.

Two key assumptions are generally made in most game theory. First it is assumed that all players know that they are all rational actors. Secondly, an assumption is made that all players know all the rules of the game (Bierman and Fernandez 1993, 70-71). Rational actors are assumed to make decisions "according to internally consistent criteria" (Bierman and Fernandez 1993, 70). The PD game requires the two actors either to cooperate or not cooperate (defect) on some decision that will result in gains and/or losses for the players. If both players choose to cooperate, each will achieve a small payoff. If both decide to defect, each receives a minimal payoff. But when one cooperates and the other defects, the player who defects gets a large payoff (larger than for mutual cooperation), while the cooperative player gets nothing. Thus one can maximize his or

her utility function by defecting when the other player is cooperating. A sample payoff structure might look like this:

Table 1

	Cooperate	Defect
Cooperate	3,3	0,5
Defect	5,0	1,1

The numbers could represent dollars, remaining days in prison, votes, amount of toxic waste disposed of, or any other concept which the players value. The numbers above are arbitrary, what is important is the relative relationship between the numbers of each cell.

In PD, since all players are rational, the only sensible decision is to defect. If a player defects he can garner a score of five, and do no worse than a score of one. A cooperative player, however, might gain three and might lose five. Thus PD would imply that in any confrontation between rational players, mutual defection is inevitable. Neither player will trust the opponent to cooperate, and the game is forever stuck in the bottom right cell of mutual defection. The environmental ramifications of this “reality” are potentially quite grave. If a business incurs significant costs by following environmentally sustainable practices, but could take an environmentally destructive shortcut, that business has an economic incentive to “defect” and follow the environmentally destructive procedures. If your competitor will produce cheaper paper than you by engaging in clear cutting of old growth forests, you face a difficult decision. Should you also clear cut, or do you engage in environmentally “sustainable” selective cutting and risk being driven out of business?

Militarily, the challenge is potentially greater, as the stakes may be seen by both players as higher. If the confrontation is over territory, or even national survival, the risks of gambling on mutual cooperation may seem too high, and defection may seem the only answer. For example, if the Russian and Chinese governments could cooperate to

demilitarize their mutual frontier, each could transfer needed resources to other sectors of their economies. Yet neither may feel they can back away, as the potential risk is too great.

The units of analysis can be as broad as nations and alliances (e.g., NATO vs. The Warsaw Pact) or as narrow as individual soldiers in trenches (see Axelrod 1990). Even within one military, the planners may be faced with a choice between a slower but environmentally sustainable practice (e.g., use of CFC-free fire suppression systems on bomber aircraft) and more rapid deployment using old CFC technology in order to meet a military threat. Few commanders would risk the nation's security to protect a few ozone molecules. Thus thoughtful and rational people may feel compelled to take actions that cause the "game" to move into the cell of mutual defection.

Axelrod (1990) suggested, however, that if the game is likely to be *repeated*, cooperation *is* possible. By beginning with a cooperative move, and then mimicking your opponent's moves, you and your rival can be far more successful than mutual defection would ever achieve. Axelrod calls this strategy "Tit-for-Tat," and it was the clear winner in his computer simulations involving a large number of competing strategies. With a high enough probability that you will face the opponent again, a player can choose to cooperate. If the opponent also cooperates, a sustained period of cooperation is possible.

This branch of game theory underlies much of the national security discussion to follow, as well as a number of environmental issues and concerns. Many of the assertions in the pages which follow will build upon the assumptions of Axelrod's work. As noted, many of the interview respondents seemed to feel they were trapped in a PD game, with "opponents" (often in the form of the government) intent on "winning" an environmental contest, and "defeating" the other side. Thus many came to view cooperation with the government, be it the EPA or the DOD, as potentially hazardous to their own overall environmental goals. Overcoming this challenge will not be easy, but as Axelrod points out, there may be ways to do so. The issue will be more fully discussed in Chapter 8.

-Other Models-

Tragedy of the commons and the *logic of collective action* are related to PD, but have significant contributions to make on their own. In the chapters that follow, the concepts of both models will be key to a fuller understanding of various views of the appropriate roles of military forces.

Axelrod has suggested that cooperation is possible between rational players, albeit with some difficulty. But his is not the only answer. Absent the high certainty of multiple iterations (and a core of “nice” players who interact with one another), how can people be induced to cooperate in the collective interests? Is heavy-handed (or even light-handed) governmental intervention the only other way? Can you get people to volunteer? Can you get them to share?

-The Logic of Collective Action-

There are many resources within a nation-state. These include such physical items as minerals, oil reserves, arable lands, and other natural stocks. In addition, a viable transportation system is necessary, including an adequate system of roads and bridges. For a nation-state to survive and thrive, it also needs an educational system capable of producing citizens socialized to the national norms and technically trained. A nation-state must have safe water to drink and safe food to eat. It is enriched by art and literature. A nation-state needs a dynamic economy, with job opportunities for the citizenry and markets for the entrepreneur.

Is governmental action necessary to achieve these goals? Mancur Olson (1965) offered an explanation that implied the answer is usually yes. In *The Logic of Collective Action* Olson suggests that rational individuals will not willingly act to provide for the public good if they can still gain the benefits without contributing to the remuneration of the costs. At the core of Olson’s argument is the problem of free-riders. A free-rider is one who enjoys some collective benefit without contributing to the provision of that good.

When an individual can not be excluded from gaining benefits from a public good, he or she has no rational incentive to contribute to that good.

Take for example the case of television. An entrepreneur decides to build a television station broadcasting directly to the antennas on people homes. He also decides to have high quality programming, with no advertising. He will instead rely on voluntary contributions in the form of checks mailed by dedicated viewers. Olson suggests that if the pool of viewers is small, group pressures *might* result in contributions due to social and peer pressure. But if the group size is large, a rational individual watching at home will decide against mailing in a contribution. Why should she contribute? She will continue to receive the signal regardless of whether she mails a check or not. "Rationally," she should become a free rider.

Thus in this example, if a society is going to have commercial-free educational programming, it would seem to fall to the government to provide it. Market forces alone will not. Only a government can extract resources to provide funding for public goods which are not seen by citizens as worthy of funding from larger contributions from their own pockets.

The same argument holds true, Olson would argue, for other collective goods which may be desirable in society. The taxing power of the government allows for the extraction of resources to pay for those goods not willingly funded by free riders. Thus the roads are maintained, the schools are kept open, the Air Force still flies, and Sesame Street still airs. The provision of collective goods within a nation-state, it would seem, often falls on the shoulders of the government.

This traditional collective action argument is useful to this dissertation in explaining the role of the military in providing for a broadened concept of national security. If the military is charged with the provision of common goods such as defense, then an expanded conception of national security and threat is consistent with increased environmental actions by the military. If the military is to provide for national security

and the definition of national security is broadened, then so are the military duties and responsibilities. In Chapter 3 I will explore the underpinnings of the idea of broadened national security to include an environmental security component.

I also posit a new concept which is useful in understanding the relation between the national government and the private sector. I call this a "juxtaposed collective actions" argument, and it will be seen demonstrated in both the interview analysis in Chapter 5 and the case studies of Chapter 6. Imagine a hypothetical situation in which the military needs to create a particular environmental technology for its *own* use. This invention creates a new "potential public good." Further assume that this newly minted technology can be transferred to the private sector and meets the Olson tests of non-exclusivity (the technology is available to all interested entrepreneurs), and non-exhaustability (use of the knowledge-base by one contractor does not reduce the ability of a second contractor to use the knowledge base). Technology transfer by the Air Force to the private sector of these military inventions *encourages* free riding by private vendors. These companies will be able to take the product and/or process created by the research and development sunk costs of the military, and apply them commercially. I suggest that in such a situation, the military is performing a service for the nation by making available for free-riding this new public good. Hence the juxtaposed collective action.

An example of this concept is seen in one of the most powerful ODCs, Halon 1211. This chemical is used in fire fighting, and for years was one of the most important uses of Halons. Unfortunately, Halon 1211's ability to extinguish fires comes at the cost of ozone destruction. Fire suppression is a critical issue for the Air Force, due to the catastrophic results of uncontrolled fires in aircraft. Thus if Halon 1211 was going to be banned, a suitable replacement was needed. The Air Force Technical Laboratory developed a replacement chemical which is currently nearing the end of its test and evaluation. This replacement is an effective fire fighter, and yet reduces ozone damage, when compared to Halon 1211, by 98-99 percent (Sullivan 1990).

This product is an example of this juxtaposed collective action concept. The government needed the technology quickly, and created it. The private sector will be served by the transfer of the chemical technology, as firm R&D costs will be greatly reduced, industrial fire suppression needs will be met, and new commercial products will be developed. The earth is helped by the reduction in ODCs emitted, and the interests of the United States are served by providing the population a safer outdoor environment.

This form of free riding is a positive-sum game, in that the government meets its constitutional charge to promote the general welfare, the public benefits from the wide spread availability of technology their tax dollars purchased, while the contractors gain from increased efficiency. The environment profits from overall reductions in pollution and ecological decay.

For future technologies, it is not clear that in all cases the government can provide the product more efficiently and cheaper than could market forces. Thus this intellectual shorthand of a juxtaposed collective actions argument is appropriate only in cases where government need for a new process or product was such that the invention of the product was done "in house." Thus the utility of this heuristic on future technologies is not certain, and I therefore only apply it to the existing governmental technologies reported in Chapters 5 and 6.

-Tragedy of the Commons-

A second important theoretical perspective nests neatly with Olson's. If collective goods present a problem, so too do the "commons." What happens when a resource is valued by several people, but not owned by any of them? How do we handle conflicts over access and use of such resources as oceans, the atmosphere, public lands, and space?

Hardin (1968) used the example of herders grazing animals in a common pasture to illustrate this point. If there are several herders and each places only a reasonable number of animals on the grass, each can make a living, as the pasture's capacity is not exceeded. But if an individual attempts to gain an advantage over his or her competitors

by placing one or more additional animals, the others may feel the need to place an additional animal of their own in order to stay competitive. This can rapidly spiral out of control until the pasture is stuffed with animals and the entire system collapses under the weight of too many bovine suppliers. In a world with no global sovereign the tragedy of the commons would seem inevitable.

Hardin pointed out the dangers to the "global commons" of such situations. Overfishing of the waters off Canada has greatly reduced the fish stocks and precipitated the seizing of a Spanish fishing boat by the Canadian military (Nickerson 1995). There is no international sovereign with the needed mandate or authority to enforce rules for such areas. The traditional international tool for dealing with such problems has been diplomacy in the form of a treaty. In general, nations do tend to abide by their treaty commitments (Chayes and Chayes, 1993; Weiss and Jacobson, forthcoming), although violations do occur. Compliance is almost exclusively voluntary, as both the lack of a sovereign international governing body and the norm of non-intervention into the affairs of individual nations greatly limit the options available to those who would punish non-compliers.

At the *national* level, however, Hardin's theory would suggest the problem *can* be mitigated, at least to some degree. A government can, and indeed must, regulate common resources. Citizens of nation-states around the world understand and accept intrusion by their governments into a number of areas. The public generally accepts as appropriate the power of national governments to, for example, set standards for product safety. It accepts the government's authority to collect taxes to fund a variety of programs from which a particular taxpayer may or may not receive direct benefit. Most people do want some level of governmental oversight in their lives. There are few true anarchists. Most citizens like to eat safe food, to fly in regulated air lanes, and to give their children safe medications. Definitions of what constitutes "safe" are irresolute, as can be seen in the new Republican congress's efforts to roll back the regulatory powers of the government.

But even in the partisan banter of the House of Representatives there is little serious condemnation of the basic *concept* of governmental responsibility to serve the needs of the citizens, and to protect them from unreasonable dangers. People like to feel secure. Nations do too.

That most people want a nation secure from attack by enemies, free of violence, and protected is proof, I posit, that national security *is* a public good. Thus these theoretical constructs offer support for the contention that a government must strive to manage those resources which contribute to a society's security, and its strength.

This generally accepted broader role for governmental action is a part of what makes a nation secure. It logically follows that national resources will on occasion need to be provided (a la Olson) and/or protected (a la Hardin) by the government as a collective or public good.

All three of these rational-actor models support the notion that *governmental action is needed to maintain national security in this broader definition of the term*. These conceptual foundations now allow us to move beyond the theoretical models and trace the evolution of what I believe is this fuller understanding of the concept of national security.

-National Security and Threat-

There is general agreement within the international system that militaries may protect against threats to a nation's security. But just what *is* national security? And what is a threat? As the next millennium nears, these two questions are critically important. Indeed, they are central to this dissertation, and require further examination. There is a great deal of talk about each, but there seems little agreement on precise definitions of each term, and even less on how to deal with their interaction. I shall now define the terms more precisely, at least for the purpose of this dissertation.

My basic claim is that national security is most appropriately defined *broadly*. It is a collective good, a “product” of a variety of societal mechanisms. There are many things which make a nation secure. Clearly the ability to repulse invasion is significant, but there is much to national strength *beyond* a military. Thus it seems reasonable that there is more to national security than bombs and rockets. If the loss of something of value, say clean drinking water, would damage a nation, that item is of significance to national security. Our nation’s history, I believe, shows the merit of this argument.

-American History and National Security-

As noted above, traditional security literature often discusses threats to national security, without clearly defining it. Some attempts have been made to specify in greater detail what national security is, and where it comes from. Sullivan (1990) suggested that the term, and indeed the concept, date from the immediate post-W.W.II era:

[National Security] was a much more sweeping concept than the ideas of diplomacy and defense which it replaced, reflecting the technological, political, and geographic forces that had emerged during World War II. It implied that the safety of the nation was dependent on a wide, interrelated range of foreign policy issues much more diverse and complex than anything the nation had previously faced. Military force and preparedness became more important elements in the national sense of well-being. Geographically remote areas and issues took on more importance than before the war, and military and foreign policy became much more closely intertwined.

While Sullivan is clearly onto something important about the role of national security in modern society, the concept is older than he allows.

Beyond forging the modern nation-state, the Treaty of Westphalia was also the genesis for the “modern” concept of national security. As borders became internationally accepted, the protection of those borders became critical to the survival of the state. States became physical “things” with clear geographical beginnings and endings. Nations ceased being extensions of the whims and wills of the leaders of the now-defunct Holy Roman Empire, and became nation-states. As such, a new notion arose of what was

needed to survive. What would it take to defend one's borders? And, if conquest was your aim, what would it take to extend your borders at the cost of a neighbor? Such analysis was the first component in modern thinking about national security. And with national survival dependent upon secure borders and the defense thereof, a professional military became vital to a nation-state's well-being. Thus basic national security first became the stuff of armies and navies.

This use of the term still focused predominately on traditional military operations, on secure borders, on territorial inviolability. While some thinkers may have mused on the ramifications of national security on a broader level, the measure of a nation's security was largely military. A trading nation could have a mighty economy, but absent a fleet to protect its ships from attack, its security was at risk. A strong history of art and culture contributed to a nation's character, but the inability to prevent an invasion via an armed force would significantly undercut the ability of the nation to protect its culture for future generations. Thus national security meant military security for most of the post-Westphalian time-frame.

Yet national security is a *dynamic* concept. It has evolved as the machines of war and diplomacy have evolved. Security today means more than repelling fleets of attacking sailing ships. I suggest that the current American version of this broader definition originated in colonial times and continued to evolve to the present day. This more encompassing definition of national security attempts to capture today's broader range of governmental responsibilities.

Echoing John Locke, the First Continental Congress declared in 1774 that the British government had failed to fulfill its duties as a government. The Crown had not, in the view of the Continental Congress, respected the colonialists' rights to "life, liberty, and property" (Commanger 1973, 83). On July 6th, 1775, almost exactly a year before the Revolutionary War began, the Continental Congress stated the issue even more explicitly when it declared "...that government was instituted to promote the welfare of mankind,

and ought to be administered for the attainment of that end" (92). The position of the colonialists, it would seem, was that the government owed the citizens a measure of protection of the values stated.

The Declaration of Independence, after asserting that all men are born with "certain unalienable rights" including "life, liberty, and the pursuit of happiness," stated "[t]hat to secure these rights, governments are instituted among men..." Thus the Founding Fathers codified in the inaugurating document of our nation the notion that government has broad duties to the citizens beyond the limited definition of security suggested by Hobbes. George Mason (1773, 103) wrote even more broadly in stating:

That government is, or ought to be instituted for the common benefit, protection, and security of the people, nation, or community; of all the various modes and forms of government, that is best which is capable of producing the greatest degree of happiness and safety...

The Founding Fathers most profoundly stated their beliefs about the broad duty of government in the most important document of American history, the United States Constitution. The reasons for having a government at all are explicitly stated in the Preamble of this remarkable document. You craft a government "...in order to form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare..." A citizen who is physically safe from attack, feels secure in his or her life, liberty, property, and happiness is a citizen for whom the government has met the obligation of providing basic security. In addition to simply keeping a person safe from attack on the nation or intrusion by police forces, it has been argued that governments have an obligation to be *proactive* in the provision of a broader security. For example, in his first address to Congress, President J. Q. Adams (1825, 242) said:

The great object of the institution of civil government is the *improvement* of the condition of those who are parties to the social compact, and no government, in whatever form constituted, can accomplish the lawful ends

of its institution but in proportion as it improves the conditions of those over whom it is established. [Emphasis mine]

Over a century later, another president continued this refrain of governmental obligation.

In his farewell address, President Eisenhower mused over American history and concluded that:

Throughout America's adventure in free government, our basic purposes have been to keep the peace; to foster progress in human achievement, and to enhance liberty, dignity, and integrity among people and among nations (653).

Thus from the earliest days of our nation to its modern incarnation, the role of government has included the protection of a range of values, from the physical (e.g., protection of borders) to the more ethereal (e.g., tranquillity). This collection of values is at the core of our national sense of safety and contentment.

These ideas are consistent with the theories of Hardin and Olson. Be they collective goods, or common resources, there are many national values. No government can offer its people everything they could ever want, but to protect these central values is key. Keep us safe, keep us free, keep our opportunities open. These make up the stuff of national security. Protection of national security, in this more comprehensive definition, can be seen as a far-reaching task of government, indeed as *the* task of government. It is reasonable therefore to demand that all the tools of government strive to protect these national values. Such a central mission and broad responsibility demands the efforts of a diverse mix of governmental resources.

-National Security Defined-

If this broader definition of the role and responsibility of government is correct, it is possible to move to a more specific working definition of national security. The definition certainly includes the traditional concern of military attack, but must also reflect the evolution of national interests. Threats to commons resources, unneeded PD games which consume resources, and other hazards to national well-being all suggest the need

for a more comprehensive definition. Therefore for the purpose of this dissertation, national security is defined as *the protection of the collection of resources, values, and interests that contribute to the national strength and character.*

-Threat-

What is a threat to national security? The peril posed by bombs and rockets is clearly a threat. If a nation is physically destroyed or mortally wounded, national security is lost, and the military has failed to perform its function.

But what of other issues? Many challenges face national leaders, challenges which are often referred to as threats to children, the aged, the middle class, and so on. Can one capture a broader picture of threat? Recently what some judged an inadequate and too-expensive health care system in the United States was called a "threat" to the well-being of the nation. Others denied the merits of that argument, and asserted that the health care system did *not* pose any threat to America's future. Clearly on health care the concept of threat is not easily defined nor universally accepted.

Another recent area where a call has been heard for the government to protect the rights of individuals and corporations from threat is intellectual property rights. In 1995, the United States and China reached agreement on the reduction of Chinese video and audio products produced without copyright agreement. This "theft" of ideas and intellectual creations was largely focused on monetary losses within the entertainment community, but more profound concerns exist regarding the theft of technological innovation. On the most obvious level, if the ideas stolen are directly related to defense, (e.g., how to produce "quieter" submarines) national security is threatened by the military forces of potential adversaries becoming more capable. On a less obvious level, the United States could be economically threatened by the loss of trade and export dollars associated with the legitimate sale of such items as the video and audio products mentioned above.

The notion of threat is most useful to this dissertation when defined somewhat broadly. I suggest threat *is* a broad concept. National decision makers face a range of challenges in dealing with such wide ranging concerns as trade imbalances, currency flows, military actions, and environmental degradation. Just as an individual may be threatened by job loss, illness, injury, or psychological distress, so a nation is threatened by a similarly broad range of hazards. For this work, I define threat as *any activity, action, or event that presents a significant active or potential reduction in national security*.

Clearly this is a capacious definition, but I believe it appropriate, as it is my contention that both national security and threat *are* broad concepts. To understand that which threatens our nation is to take a wide view of the hazards with which national leaders must deal.

-Summary-

National security and threat are sweeping concepts, and their study requires several approaches. The contributions of traditional security literature suggests that nation-states will seek to defend their borders, stress capability, credibility, communication, and psychology in varying degrees in dealing with national security questions. Game theory offers opportunities to puzzle through a variety of interactions between players. Historical literature suggests that broader concepts of national security and threat have historical foundation. Taken together, this family of traditional literature helps build a framework which I will develop further with the military and environmental literature in the next chapter.

The concepts of national security and threat expounded above will be integrated more fully into an understanding of what the military in general, and the Air Force in particular, has done and can or might do in dealing with the profound environmental challenges facing the Department of Defense.

The question of "ought" is thus half answered. In theory the military should seek to protect the national security of the United States from some kinds of threats. But which ones? The military is certainly not the proper tool to battle the problem of youth crime, nor is the military the correct solution to the problem of contagious disease. The range of appropriate military responses must be narrowed. With the broader definitions of national security and threat established, the question changes from theoretical to practical. The military "ought" to protect from threat, but just what level of protection is necessary, practical, or reasonable? A review of the environmental security literature will begin to illuminate this question more fully.

End Notes

¹ Formal deterrence theory offers penumbral support for the concepts of national security used in this dissertation. For additional information see Brody, 1946; Kahn, 1961; Schelling, 1966; Huth, 1988; George and Smoke, 1974; Russett, 1974; Jervis et al., 1985.

CHAPTER 3
MILITARY AND ENVIRONMENTAL THEORY
AND REVIEW OF LITERATURE

Traditional national security, game theory, logic of collective action, and tragedy of the commons literature are very useful to this project. Security as a broad question has been addressed, and the claim that environmental security is a significant part of national security has received some initial support. Nonetheless, this general literature is not enough. I need to explore additional areas of literature, looking specifically at the role of the military, the legacy of the military and the environment, and environmental security. Taken together, this literature, combined with that presented in Chapter two, form an adequate foundation for my explorations of the military and environmental policy.

I begin with an examination of the role of the military. As will be echoed in several of the data sources later in this volume, the question of whether it is *ever* “appropriate” for a military to become involved in “non-traditional” functions is a subject of some disagreement. Opinions vary.

I suggest that these debates center on the obligations of a government to its people. What does a government owe? And what are the obligations of a military force to the society that maintains it? In the previous chapter I suggested that the historic record supports the concept that people have come to expect more than a Hobbesian leviathan from the regime empowered over them. People have come to expect more from their government than a simple security.

-The Role of the Military-

What is the "proper" role of military forces? What actions *should* an armed force be asked to take within a society and what actions should be prohibited? Additionally, as the military changes and adapts over time, may some important non-warfare issues migrate into the sphere of appropriate military action? As noted in the introduction, the questions of "civilian" roles for military forces are not easily answered. The literature does offer some illumination, however.

Several scholars have written on the role of the military in a post Cold War era. Donald M. Snow (1994) observed that a significant trend affecting the national security environment "has to do with the growing importance of a number of transnational issues which have the effect of broadening conceptions of what constitutes national security" (103). A characteristic of a number of these issues, he notes,

is their non-military character: they do not resemble traditional vital interests in the sense that they are problems over which the nation is or should be willing to go to war. Rather, they are problems that cannot be solved independently by nation-states and which, if they are not solved, pose threats to the quality of existence within states. Environmental degradation is the most dramatic case in point... (107).

Snow suggested that non-traditional functions such as peace keeping, drug interdiction, and environmental action are likely to be awkward areas for the military, at least initially. Yet expectations within the public for increasing government services may, he hints, steadily push militaries in the direction of greater involvement. There is evidence to support Snow's assertion. Recent cooperation between the US Border Patrol and military drug dog units is but one real-world example of such change (Air Force News Service, 1995).

Charles C. Moskos and James Burk (1994) note that we have entered a phase they call the "postmodern military," with the Cold War behind and uncertainty ahead. National institutions, the military included, are snared in "postmodern society," which is distinguished from modern society "by the transition from certainty to radical uncertainty

about the meaning or purpose of central roles and institutions” (145). They were less clear on precisely how “certain” the modern world was.

Moskos and Burk noted the changes in military missions in recent years. Missions which in the past were strictly limited to traditional war fighting (on a global scale if necessary) have changed. The need to deter the Soviets is gone, and an old need, to be ready to fight small localized skirmishes, has returned to dominate modern military planning. In addition, the authors noted the recent role of the military in dealing with such events as famine, “restoring domestic order in Los Angeles” (150), and other peacetime missions. “What these missions share in common,” said Moskos and Burk, “is a new emphasis on non-war fighting *military* missions [emphasis mine]. Indeed, the term ‘military humanitarianism’ has been used to describe the emergent roles of the armed forces” (150). This implies that my suggestion of expanded military environmental missions is not a fundamental departure from old behavior patterns, but rather fits into an evolution of military functions.

This increased non-traditional involvement may have unanticipated ramifications. Robert L. Holmes (1994) suggested that due to such missions the military is becoming, at least in the United States, a more respected and trusted component of society. He stated that the increased involvement of military forces in nonmilitary functions has been at least partially responsible for this development. “We are witnessing in the United States,” he claimed, “an almost imperceptible assimilation of military values to the approach to social, political, and moral problems, both domestically and internationally” (187).

My military service began with entering the ROTC program at the University of Michigan one year after the fall of Saigon. I felt first hand the anti-military sentiment present at least on college campuses at that time. Over the next nineteen years I experienced a dramatic change in the attitudes toward military personnel. The legacy of the Viet Nam War seems to have been replaced with the legacy of the Gulf War. This new view seems to have accepted the military professional back into the mainstream of

acceptable behavior. The soldier who was once viewed as a baby killer in the jungles of South East Asia now garners respect and trust. This was dramatically demonstrated when during a Gulf War briefing to the press about an ongoing attack on Iraq, then-Chairman of the Joint Chiefs Colin Powell told the press that he couldn't go into details for security reasons, but the press should just "trust me" (Powell 510). They laughed, but they did take the general at his word. This was a seminal moment in the relationship of the US military to society. General Powell's single comment marked the end of the Viet Nam era for the US armed forces. The concept of a "military solution" no longer seems automatically abhorrent.

The implications of such a change are particularly significant for this dissertation. If the public, and through them their elected representatives, felt the military was an institution which was not to be trusted, then the acceptability of using military resources to mitigate environmental problems would be greatly reduced. As the evidence supports increased faith in the military, the basic hypotheses are not undercut.¹

Moskos (1977) had a great deal to say about the changes he saw taking place in the United States military. He believed the military itself has moved from an institutional perspective to an occupational one. That is, the military officer of today is less likely to think about the military as a "calling" than as a "job." There is, Moskos suggested, a lack of vision in military minds today.² Officers were once motivated by altruism, by goals of national service, but today an increasing number of military personnel are more concerned with career advancement and job satisfaction. If true, environmental missions might be more acceptable to the uniformed service personnel themselves. If viewed as an occupation, the employer can reasonably alter the duties required. If the armed forces were viewed more as a calling, there might be increased resistance to any "non-warrior" duty.

I believe Moskos is correct up to a point, and that this trend is at least partially due to reduced certainty in the minds of military officers about just what the military is

supposed to be doing. This irresolution goes beyond those in uniform, with both national leaders and ordinary citizenry often unsure of what the military ought to be doing. This doubtfulness is clearly shown in the two examples of Bosnia and the Oklahoma City Bombing. There are many, both in and out of government, with misgivings about employing United States military forces in the former Yugoslavia, a *military* type of mission thousands of miles from US shores. Yet there were no significant concerns raised by the military personnel from near-by Tinker AFB engaging in a variety of *nonmilitary* rescue-recovery-security functions in the heartland of America.

While Moskos' work preceded the collapse of the old Soviet Union, I believe the disintegration of the US military's post-W.W.II foe has exacerbated such "lack of enemy" concerns, both within the armed forces and within broader society. I posit that the apparent acceptance by the Pentagon of many roles in disaster relief, riot control, and drug interdiction may be in part due to a desire to perceive a clear mission, or set of missions, for the military. Such acceptance may also be due in part to a desire to fully employ an expensive, and largely inactive, portion of the government.

If this is the case, expanded environmental efforts are consistent with the desire for clearer goals and vision as well as a fuller use of resources. A military committed to cleaning up its own backyard, and assisting where it can with environmental challenges outside the DOD could assimilate some of this goal-seeking behavior into clearer vision of an overall mission of national service.

-The Military's Environmental Legacy-

There is not an abundance of scholarly literature dealing with the military and the environment. There are a number of reports on the damage armed forces have caused to the biosphere. In addition, some literature discusses the role of the military in environmental protection and restoration. On the whole, both bodies of work tend toward the polemical. Nonetheless, there is useful information to be gleaned from this collection

of writing about how the military and the environment have, and have not, gotten along. I group the literature into four broad categories: war, war preparations, military toxins, and finally the role of the military in environmental security.

-War-

In war, the goal of military force is not specifically the killing of enemy troops, but rather the rendering of an opponent unable to resist. Any weapon that impedes an enemy's ability to react is a potentially useful military tool. Some militaries long ago added "environmental warfare" to their inventory of weapons. Most broadly defined, almost any weapon is "environmental." Bombs disturb the soil and kill wildlife, and tanks crush vegetation under steel treads. This definition is, understandably, too sweeping to be useful to this scholarship. Therefore for the purposes of this dissertation I will simply define environmental warfare as acts committed by a military in which environmental components are directly targeted in order to injure an enemy. Thus Saddam Hussein's opening of the oil spigots would fall within the definition of environmental warfare, while his use of artillery would not.

History contains many examples of environmental manipulation deliberately performed as part of war. As early as the second-century BC, Roman armies sowed salt into the fields of Carthage to poison the soil. In medieval times, soldiers laying siege to a city would toss dead animals into the town's water supplies (Audubon 1991, 88).

Arthur H. Westing (1984) analyzed the possibilities for such environmental "combat" in the modern era and concluded that environmental warfare "could, at least in principle, involve damage-causing manipulations of celestial bodies or space, the atmosphere, the land, the oceans, or the biota (terrestrial or marine)" (3). He further noted that such actions are all currently illegal under international law. But as will be illustrated shortly, such legal prohibitions have limited utility in times of international crisis. He concluded that "one can only hope that moral, legal, common sense or other

restraint will prevent techniques of environmental warfare of today or tomorrow from exacerbating our growing dilemma" (10).

This very direct impact of military action on the environment was dramatically demonstrated in the Persian Gulf. Michael G. Renner (1991a, 27) called the Gulf War with Iraq among the most "ecologically destructive conflicts ever." The conflict demonstrated "that wars and environmental protection are incompatible" (27). The air pollution generated during the time of the oil well fires was roughly equal to ten times the air pollution generated by all United States industrial and power-generating plants combined (28). The volume of oil dumped into the Persian Gulf "roughly equals the largest [oil spill] in history—the Ixtoc well blowout in the Gulf of Mexico in 1979—and is 10 times the size of the Exxon Valdez accident" (30).

Renner noted, as did Fischer (1991), that the use of the environment as a weapon of war is illegal under international law. An amendment to the 1949 Geneva Protocols prohibits:

means of warfare that are intended or expected to damage the environment and, in consequence, jeopardize the health and lives of the civilian population (Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, 1977)

Such agreements present profound challenges to enforcement. While most nations will generally comply with international treaties to which they are signatories,³ the situation changes when nations are at war. The need to be victorious militarily (or at least not to lose) is quite strong, and environmental considerations are largely ignored during armed conflicts. United States military policy is, in general terms, to respect the environment whenever and wherever possible (Widnall 1994, 38). Gratuitous environmental destruction is not allowed, although military leaders recognize that Renner was essentially correct in his assessment of the incompatibility of modern warfare and environmental protection.⁴

The consequences of environmental warfare can be pronounced and often global. When Saddam Hussein set fire to hundreds of Kuwaiti oil platforms the air pollution was noted thousands of miles from Kuwait. Once the shooting stops, environmental warfare in modern combat may cloud the differences between winners and losers.

Indeed, the war's ecological impact extends far beyond the battlefield, blurring the distinction between the combatants and countries that were not party to the conflict and had no say in its course (Renner 1991a, 33).

Renner concluded with a call for a strengthening of international law dealing with environmental warfare, although he acknowledges the limited utility of such an action. He notes that in future wars, industrial targets may present too tempting a target to ignore simply for environmental reasons. The only real solution, he contended, is to avoid war in the first place.

Eric A. Fischer (1990, 37) echoed Renner's concerns. Fischer noted that President Bush waived the requirements of the National Environmental Policy Act (NEPA) during the Gulf War in order to allow the military to test weapons and systems without engaging in the environmental testing procedures normally required. This waiver was used twice, in rather innocuous ways, once to conduct a minor test of an explosive and once to re-route air traffic at a military base. Fischer worried that had the war gone on for a longer period of time, additional and far more damaging testing might have been conducted. Fischer suggested that the environmental warfare used by Saddam Hussein was little different (except in scale) from the United States' uses of chemical defoliants in Viet Nam, and the "forced" deforestation (due to economic displacement of peasants) which resulted from the U.S. invasion of Panama.

-War Preparations during Peace Time-

Military-environmental problems do not exist only when the bullets are flying. Indeed, some scholars have maintained that the majority of environmental damage done by a military is done during the training and planning for war.

The problem of clashes between military operations and environmental quality during peacetime is not a uniquely American problem. It has been estimated that six to ten percent of global air pollution may be due to world-wide military operations (Finger 1991, 221). Finger concluded that such planetary environmental problems are in large part due to the special relationship between nation-states and their militaries. A corporation can be compelled to clean up its act, but militaries are not generally forced to comply with environmental regulations unless their failure to do so results in a greater national security threat than does noncompliance (223). Finger concluded that the military-industrial complex is largely responsible for global pollution, and that the only solution is the "dismantlement" of the "industrial-military complex" (225). This view is naive. The world is not yet peaceful enough to allow for the dismantlement of traditional military forces and their support system. Finger's assertion that militaries are a major global environmental problem, however, seems well supported by the evidence he offered.

These writings clearly suggest that regardless of intention or desire, environmental degradation during active combat or preparations for combat is both inevitable and widespread. Today the environmental destruction caused by war and preparations for war is both deliberate (e.g., defoliation, oil dumping, igniting oil wells) and inadvertent (e.g., destruction of fragile desert flora by driving tanks). Moreover, with the scale of weapons and technology available to warfighters today, environmental damage may extend far beyond the borders of the active combatants.

-Military Toxins-

Few areas of military environmental problems have attracted as much public attention as the question of toxins. The nature of military operations is such that dangerous and volatile chemical agents are used regularly. From powerful carcinogens to "red" (nuclear) waste, the military has, or has had, it all. Seth Shulman (1992) conducted an in-depth study of toxic contamination at military sites nationwide. He pointed out that

most people associate the problem of toxic waste only with corporate industrial giants like Union Carbide, Exxon or Du Pont. In fact, the Pentagon's vast enterprise produces well over a ton of toxic wastes every minute, a yearly output that some contend is greater than that of the top five U.S. chemical companies combined. To make matters worse, the military branch of the federal government has for decades operated almost entirely unrestricted by environmental law (xiii).

Speaking of the Rocky Mountain Arsenal specifically, but the entire military toxic waste problem in general, Shulman states that

ironically, in the name of defending our national security, [military toxics] created a different kind of threat—to our land, water, and air, and to our health. It is a threat that the arsenal, like the military as a whole, has only barely begun to confront (xv).

Shulman detailed a variety of environmental problems due to military toxins, at sites as widely spaced as New Jersey, Nebraska, California, and Washington. His overall conclusion was that by invoking a questionable definition of national security, the military did a disservice to the United States. While true, this observation was made with the advantage of knowing the Soviet Union had collapsed, and the world was in less danger of a traditional global conflict. It is naive to suggest that the military of the post-W.W.II era was villainous without framing the issue in the context of the time. Absent the current scientific awakening to the current dangers to the biosphere, and with a Soviet Premier who wished to "bury" the west, a less enlightened environmental policy by the military seems quite reasonable, if regrettable, in hindsight.

Beginning in the early 1990s, the military did begin to do a better job of dealing with its toxin problems. In a chapter called "The Pentagon Gets Religion," Shulman noted that the Air Force had begun an important environmental program. He cited a statement by then-AF environmental chief Gary Vest, who "divides the Pentagon's environmental problems into three parts—cleanup, compliance, and prevention—corresponding respectively to the department's past, present, and future" (125).

Michael Renner (1991b) suggested that the end of the Cold War has been a key factor in the exposure of military misuse of toxic chemicals. Prior to the collapse of the

Soviet Union, a cloak of secrecy was draped over military chemical use in the name of national security. Now the cloak is removed, and the picture is not pretty. Renner cited the GAO as listing the DOD as the largest producer of toxic wastes in the United States, with half a billion tons produced each year. Ninety-seven military bases in the United States are on the Superfund list, a number that some advocates believe could easily be doubled (1991b, 19). Renner also documented the massive contamination at Department of Energy (DOE) sites around the country. Many of these facilities (e.g., Rocky Flats in Colorado, and Hanford in Washington) were engaged in the manufacture of components of nuclear weapons. Thus these sites are "very hot" with radioactive waste, and will require exceptionally careful handling. The same criticism leveled at Shulman above is appropriate for Renner. Context and time frame have a way of muddling a decision that, decades later, may be judged wrong. The basic purpose of this dissertation is to recognize and accept the limitations on decision making, and to use the information available to make an informed choice which will, hopefully, be judged appropriate in years to come.

The costs of toxic cleanups at DOD and DOE sites around the nation are staggering. Renner cited the DOD Inspector General report that nuclear decontamination alone may run \$200 billion, with "regular" toxic waste cleanup costs in the \$100 billion to \$200 billion range (1991b, 24). United States Air Force bases in Western Europe require an additional expenditure of \$400 to \$500 million for repair of ground water contamination. These are remarkable numbers in a time of national governmental belt tightening. Renner concluded that "unless humanity can find less violent ways of settling disputes, the fundamental incompatibility between the environment and the military will continue to confront us" (1991b, 25).

While acknowledging the profound environment problems on many military facilities, Michael Tennesen (1993) had a somewhat different view than that of Shulman or Finger. Tennesen perceived a change in attitude within the Pentagon in recent years. "[P]rodded by federal laws, the Department of Defense has encouraged a cultural shift

that makes nurturing the environment and wildlife a priority rather than a happenstance” (14). He chronicled several military facilities where increasing environmental awareness has had very positive results.

For example, many military bases have become important wildlife preserves. Tennesen noted some 94 federally listed endangered or threatened species are found on military lands (16). Military bases are generally better patrolled than comparable public lands, and therefore are subject to less abuse, less poaching, and less damage (16, see also Stevens 1996). This is not to say that the military is without problems, but Tennesen cited the conviction of three base engineers at the Aberdeen Proving Grounds for environmental crimes involving the illegal dumping of toxic materials as evidence of the cultural shift in DOD (17). He further notes that the tools available to military wildlife managers are often far better than those available to their civilian counterparts. Thus biologists at Ft Irwin received helicopter support to study the egg laying habits of desert tortoises, a tool unlikely to be available to most scholars (18).

In an interesting conclusion, Tennesen worried that the largest threat to the species that occupy military lands may be the *closing* of military bases, a process now fully underway. He is concerned that without the stewardship and the tight control offered by the military, plants and animals on former military bases may fall victim to “condominiums and malls” (19).

George H. Siehl (1991), a staffer at the Congressional Research Service, wrote on the role of military training and DOD stewardship of the lands entrusted to it. Siehl notes the problem of trying to train realistically and yet still trying to protect the environment. He stated that DOD has shown a willingness to include environmental considerations in training, but that defense planners sometimes need reminding of the environmental considerations that need to be included. He traced the evolution of training as it mirrored the changing battlefield. For example, the area used in a typical Civil War battle was measured in the hundreds of acres, while today’s battlefields are measured in the tens of

thousands of acres (16). Thus as the complexities of warfighting grow, so too do the challenges of integrating realistic and useful training with environmental preservation.

-The Military and Environmental Action?-

Most of the authors cited above clearly pointed to the damage that can be done to the environment by militaries when only a narrow view of national security is employed by planners of military operations. This narrow view may be understandable and even defensible when placed in the context of the time of the decisions in question, and the information available to the decision makers.

It is also clear from these writings that environmental issues are clearly part of the larger security equation. But it is not self evident that it makes sense for military resources to be employed in environmental activities beyond the normal range of military operations. In this section I explore the published work of those who have suggested that the role of the military in environmental matters should be viewed in a broader context.

Kent Butts (1993) argued there are clear opportunities and obligations for the DOD. Butts is a retired Army officer with a Ph.D., now on the faculty at the Strategic Studies Institute. He noted that in 1991 "environment" was included for the first time in the *National Security Strategy of the United States* (NSS) as a factor included in the definition of traditional national security. Under President Clinton, the 1993 NSS declared environment to be linked "decisively" to the economic element of power (v). Butts wrote:

[t]he inclusion of the environment in the NSS demonstrates popular national and international awareness of the environmental dimensions of conflict, growth and development, health, and political stability. Environmental issues such as clean air, desertification, and natural resource access have a cross-border component that has contributed to international conflict (v).

Butts suggested that DOD outreach programs targeted at less developed nations (LDCs) can reduce environmental problems in those nations, thereby reducing the chances of traditional military conflict, possibly involving United States resources (vii). He noted that

such assistance is often cheaper than the larger-scale military operations that sometimes follow.

Butts also asserted that DOD should be involved in environmental activities due to the unique capabilities of the organization. In particular, he pointed to DOD's ability to bring "national level resources to bear on state and local environmental problems" (ix). The breadth of experience in crafting technological solutions within DOD is not found in any other sector of American society, he contended.

In addition, Butts noted the "size and power of DOD make it a significant environmental security resource" (ix). He noted the 3 million DOD employees worldwide, the annual budget near \$300 billion, and the direct control over nearly 30 million acres of land holdings, and concluded that the existing military structure can bring these resources to bear at little additional cost. "Much of DOD's potential contributions come from existing programs and can be realized with relatively small costs and **command emphasis**" [bold his] (ix). He concluded:

- DOD can make significant contributions to environmental security without compromising combat readiness,
- most programs that would contribute to environmental security are inexpensive,
- environmental activities by DOD would be well received by the public,
- security assistance programs make sense because they can support biodiversity, conservation, and environmental improvement while maintaining military-to-military contacts in strategically important regions, promote political stability, and minimize potential need for major Somalia-like operations in the future.

Butts' judgment was that, along a number of dimensions, it is wise for DOD to become involved in expanded environmental efforts. He believed DOD should focus on day-to-day compliance, cleaning up past problems, and offering environmental services outside the traditional military setting when such offers do not impact combat readiness. Butts did

an excellent job in summarizing the importance of environmental security and the role DOD resources, such as the Air Force, can play in this broader definition of national service.

The role of the military commander in environmental affairs was examined by Merrit P. Drucker (1989). He noted the reasons why military commanders must have respect for the environment are different during war and during peace. Yet these vastly different situations still impose on the commander the same requirement to treat the environment with respect. Drucker wrote:

I argue that military commanders have professional responsibilities for the environment in both peace and war. Peacetime responsibilities arise out of the commander's general responsibilities as a agent of the state. Wartime responsibilities are part of the commander's responsibility to protect noncombatants and to protect an environment that is the inherently valuable heritage of mankind. Commanders must assume some risk to protect the environment (135).

This argument is an interesting one, in that Drucker maintained a military commander has the job of environmental protection *as part of his or her duty*. Often such environmental actions are seen by those in and out of the military as "additional duties," at best tangential to their primary duties. Drucker suggested they are central. There are significant implications of this argument for this dissertation. If Drucker is correct, environmental protection is not a new task, added to already overworked organizations. Rather, it is part of the core obligation of a military professional. There is evidence that he is correct. As will be seen in the interviews in Chapter 5, many military officers do embrace this notion today, as does the senior civilian leadership of the Air Force. The case studies in Chapter 6 also will reflect the ethic that environmental excellence is today just part of the job.

-Environmental Security-

The above arguments are persuasive if one accepts the notion that environmental degradation does in fact pose a true national security risk. But does it? Can an even more compelling case been made for the assertion that environmental security is directly related

to traditional national security? Norman Meyers is a widely read author on environmental science. He has served as a consultant to the United Nations, the World Bank, the Smithsonian Institution, and other notable organizations. In *Ultimate Security: The Environmental Basis of Political Stability* Meyers (1989) makes a strong case for the direct tie between environment and security. He noted an important dual nature to the relation between environment and security. Often the environmental problems creating the strife will be well known and obvious. On other occasions, however, the environmental roots of the conflict will be hidden from view.

The potential security ramifications of such issues as deforestation, desertification, global warming and other well known large problems is seen with relative ease. If nations loose their ability to feed their people due to farm lands becoming non-arable, tensions increase. In areas such as the Middle East water, allocations and diversions are clearly potential sources of military conflict. Meyers wrote:

[a]s too many people make too many demands on too few farmlands, water stocks, and other necessities of daily life, they increasingly resort to force to ensure their share...In a world of growing shortages, there will be no shortage of further examples of environmentally inspired violence—whether high profile or low key, local or widespread, distant or next door, recognized as environmentally driven or not (7).

Meyers clearly and unequivocally suggested that military conflict is often now, and will increasingly become, a function of ecological degradation. He noted that in the Sahel region of Africa “not a single government survived the droughts of the 1970s and 1980s, several fell twice over, and a few, like that of the Sudan, are moving toward a third collapse” (19).

In many instances, however, the environmental underpinnings of the political and military strife may be indistinct. Meyers noted the potentially subtle changes in world grain markets created by global climate change. Nations such as Ukraine and Russia could in fact find their crop growing potential *increased* by a gradual moving north of the best

grain growing weather patterns. India and Pakistan could find their ability to produce food crops improved and impaired respectively (19). Clearly those two nations need little more in the way of stimulus to generate increased hostilities.

Meyers provided case studies to support his views which include regional examples such as the Middle East, Ethiopia, the Sahel region, The Philippines, the Indian Subcontinent, and Central America. Global examples included population pressures, ozone depletion and global warming, biodiversity losses, and environmental refugees. In sum Meyers believed "security interests are under siege from environmental threats" (226). He made a compelling case that from the standpoint of traditional defense theory, environmental concerns matter. Global, regional, and local environmental challenges offer potential nexuses of conflict for civil war and transborder disputes.

-Conclusion-

Those who have written on the military and the environment fall roughly into two camps. Authors such as Renner and Finger generally see the military as an environmental negative. In this view militaries and military operations are by definition bad for the environment. This body of literature is by and large distrustful of the military and seems to ascribe at best thoughtless, and at worst sinister, motivations to those in uniform. The second group of scholars seems to understand the damage war and war preparations can do to the biosphere and its inhabitants, but also believes there are opportunities for environmental enhancement by utilizing military technology and personnel. Authors like Kent Butts seem to see the military to be, at least potentially, a very useful tool in environmental repair and preservation.

Which group seems closer to the truth will vary with issue, time, and context. Nonetheless, the authors reviewed in this chapter clearly show the dangers of a military that had little regard for ecological concerns while hinting at the potential usefulness of a military engaged in sound environmental pursuits. Scholars who are inclined to support

expanded DOD environmental action and those inclined to oppose it both make strong cases. Norman Meyers offers strong evidence to support the concept that national security contains an important environmental security component with potential military ramifications. Thus the link has been made between military operations and national security and the concept of environmental security and the military's obligations and duties. I now turn to my data collection in order to examine the question more closely, and to begin the process of creating a usable model.

End Notes

¹ See Chapter 5 interview respondents Hair, Smith, Weaver, Denver, and Gordon for a further illustration of the increased faith in the Defense Department.

² A number of factors contribute to this trend. For a fuller discussion see Charles C. Moskos, "From Institution to Occupation: Trends in the Military Organization," *Armed Forces and Society* 4, no. 1 (1977); Frank R. Wood, "At the Cutting Edge of Institutional and Occupational Trends: The U.S. Air Force Officer Corps" in *The Military: More than Just a Job?* Moskos, Charles C. And Wood, Frank R., eds. Washington D.C.: Pergamon-Brassey's Press, 1988.

³ For a fuller discussion of treaty compliance, see the excellent article "On Compliance" Chayes and Chayes.

⁴ This conclusion is based on discussions with a variety of military commanders.

CHAPTER 4

ARCHIVAL DATA

Using data from several sources provides multiple means of assessing the truth of research conjectures. In the next three chapters I explore archival data, report on interviews, and review case studies. The data will document the increasingly important role environmental concerns play in today's military policy making.

This chapter contains three forms of archival data. The first is a history of Pentagon environmental spending using DOD final budget authorization levels. I analyze DOD-wide budgetary data, as Air Force-only data are not available over the time period studied. Additionally, I am compelled by data limitations to use only the *final* budget numbers, not the perhaps more insightful budget *requests* from the Air Force for environmental spending. Nonetheless, an interesting picture of the military's environmental concerns evolves. The environmental budget rises sharply over the time period studied.

Second, I examine the record of Congressional testimony by Air Force leaders, with an eye toward both the subjects discussed and the frequency of testimony. Environmental concerns have increased as a subject of Congressional testimony over time, and Air Force environmental policy makers appeared before Congress with increasing frequency. The data show further evidence of the ascendancy of the environmental agenda within the military.

Finally, I review the regulations, statutes, and policy statements that provide direction for Air Force environmental efforts, in an effort to learn what the "marching orders" really were and are. I examine federal law and Air Force regulations to illuminate

the official policy positions of the federal government and the Air Force over time. These data also show the increasing importance of environmental issues. I now turn to an analysis of DOD environmental spending.

-The DOD Budget-

If the Air Force has, either voluntarily or involuntarily, undergone a fundamental change in environmental attitudes, funding levels for environmental efforts should have increased over time. As in the private sector, most military environmental problems require repair, prevention programs, and/or restoration, and such programs are not often inexpensive. Thus if the DOD has truly gotten serious about the environment, then funding should have increased.

The military's own rapid growth during the Reagan administration illustrates how increased funding often follows increased governmental interest. The recent growth in military environmental programs and their associated budgets attest to the increased saliency of environmental issues within the DOD. I shall examine this trend in detail. I begin with budget data for the past 10 years.

As noted above, it is challenging to cull from the federal budget the proper indicators of environmental spending. There are several different budgetary figures that could be used in this type of analysis. The military budget can be decomposed into a variety of categories including personnel, military construction (milcon), and operations and maintenance (O&M), each having environmental implications. Unfortunately, funds often flow from program to program and are therefore difficult to compare accurately from year to year. There is no single, obvious, logical choice of budgetary category to use in this research.

Initially I planned to use the Office of the Assistant Secretary of the Air Force for Environment (MIQ) funding levels across time. According to LTC Mark Hamilton of MIQ, these figures would have failed to present an accurate picture, however. He noted that as major programs often were scattered across agencies, any single agency's set of budgetary figures could give a mistaken impression of growth or contraction (Hamilton 1995).

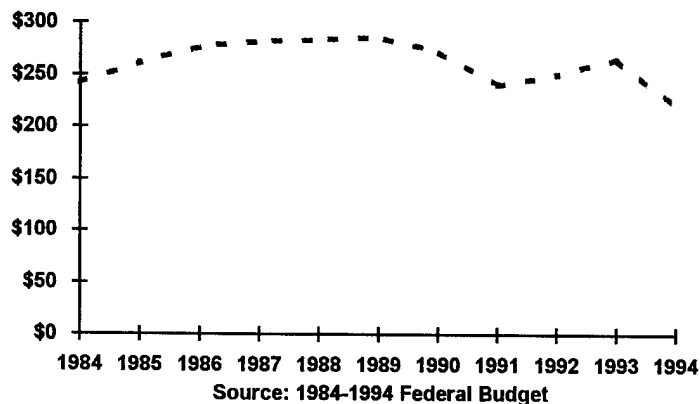
In response to these concerns, I employed a broader measure of environmental funding: Gross Budget Authority figures for environmental restoration as a portion of the general DOD budget. This fiscal-year by fiscal-year accounting of the levels of environmental spending authorized by Congress, adjusted for inflation, permits some reasonable inferences to be drawn regarding the environmental commitment of the military. Environmental restoration is part of the broader O&M budget, the central portion of the DOD's daily operation.

It is not entirely clear that any increase in funding should be construed as an indicator of a heightened environmental commitment by Air Force leaders. All such increases demonstrate is that the political situation was conducive to increased environmental spending. But that is sufficient for our purposes here, which is to measure whether environmental concerns were becoming more central to Air Force planners *regardless* of what their personal beliefs may have been. As LTC Hamilton noted in my interview with him, the MIQ office will do whatever it can with the budget it is given. Thus if funding increases, the Air Force environmental commitment increases concurrently. If funding levels are reduced, said Hamilton, the environmental effort would be the maximum allowed by the fiscal limitations. These funding levels are, therefore, an indicator of Air Force environmental capacity, not resolve. Recall that the central question of this dissertation concerns the appropriateness of non-traditional environmental action by the military. Consequently, environmental funding levels must show growth and

increasing commitment if the military is to be viewed as becoming increasingly committed to environmental excellence.

Overall DOD budget figures for the ten year period examined in this dissertation are contained in figure 4.1 below. The data have been adjusted for inflation, and is in billions of dollars.

**Figure 4.1 - DOD Budget Authorizations,
Adjusted for Inflation**

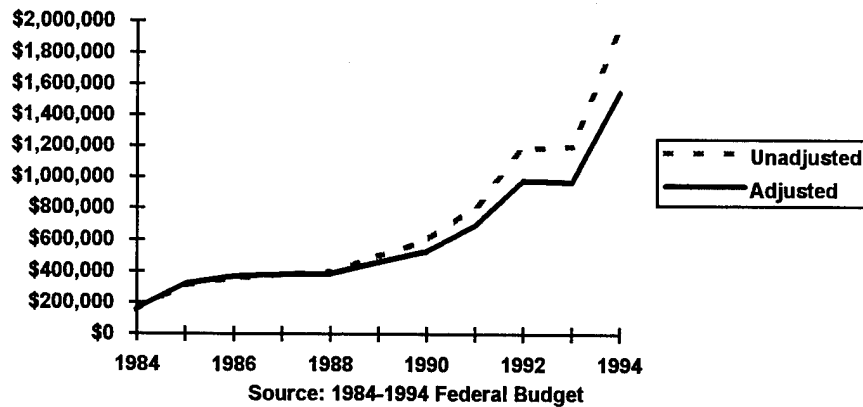


The data indicate that overall military spending rose slowly for the first portion of the time period, reaching a maximum in 1989. After that time defense spending varied, with an overall downward trend.

Figure 4.2 shows the DOD budget figures for environmental restoration for the ten year period from 1984 through 1994. I include both the actual budget numbers as well as authorizations adjusted for inflation. The figures are in thousands of dollars. The figure shows a steady rise in environmental spending by the DOD over the time period under study. Indeed, the spending level increased 566 percent, from \$150 million in 1984 to nearly \$2 billion in 1994. This is a very significant increase. Over the same ten year

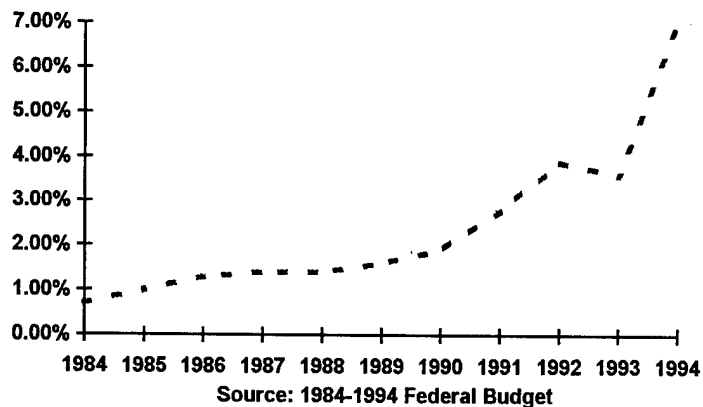
period, overall DOD budget levels increased only slightly more than seven percent (*Statistical Abstract* 352).

**Figure 4.2 - DOD Environmental Budget Authorizations,
Unadjusted Dollars and Adjusted for Inflation**



A measure of the relative significance of this increase in environmental spending can be culled from figure 4.3 below. When measured as a portion of total DOD spending, environmental outlays show a steady and dramatic growth. This spending is still a tiny portion of overall DOD expenditures, but environmental programs are clearly undergoing a rapid expansion within the overall Department of Defense Budget.

**Figure 4.3 - DOD Environmental Spending as
a Percent of Total DOD Spending**



DOD budget figures show support for the thesis that environmental concerns have become more central to policy makers and planners. In a ten year period, DOD environmental restoration spending increased nearly ten fold. Beginning with the Bush administration, under the direction of Secretary of Defense Cheney, Pentagon environmental programs began to take on increased importance and budgetary power. Under the Clinton administration, environmental restoration funding in real terms increased dramatically. This budgetary increase is consistent with the comment made to me by then-Assistant Air Force Secretary for the Environment Gary Vest in 1992 that there was only one real "growth industry" within the shrinking Pentagon budget — the environment.

Environmental efforts, measured in dollars spent, increased in dramatic fashion over the time studied. The data are thus consistent with the claim that environmental issues have risen significantly on the agenda of military planners. In order to examine that claim more specifically, I now turn to Congressional testimony by senior Air Force policy makers.

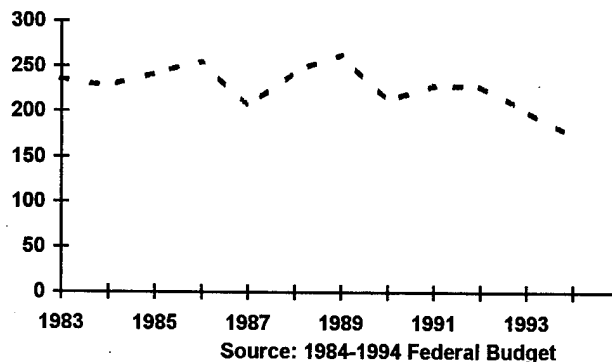
-Congressional Testimony-

The formal dialogue between the Air Force and the Congress provides an additional means of gauging the significance of environmental concerns to the military. I hypothesize that if environmental concerns are truly increasing in policy significance, then the number of Congressional hearings dealing with Air Force environmental issues and witnesses will increase. To test this hypothesis, I examined the complete record of all hearings before both the House of Representatives and the Senate for the period 1983-1994.¹ I examined the number of hearings when a witness was identified as an Air Force

representative, as well as the number of times when the subject was related to Air Force environmental concerns.

During the years under consideration, there were a total of 2,716 witnesses' appearances before Congress with a DOD affiliation. The data do not allow easy disaggregation to determine the number of separate individuals, and many can be assumed to have had multiple appearances. This is not a significant problem, however, because the aggregate number provides an indication of overall congressional interest in the DOD. This interest is what is significant to this study, not the particulars of who spoke how many times. Total witnesses before Congress with a Department of Defense affiliation ranged from 263 in 1989 to 173 in 1994. Figure 4.4 shows the total DOD witness range for 1983 to 1994.

Figure 4.4 - Total DOD Witnesses



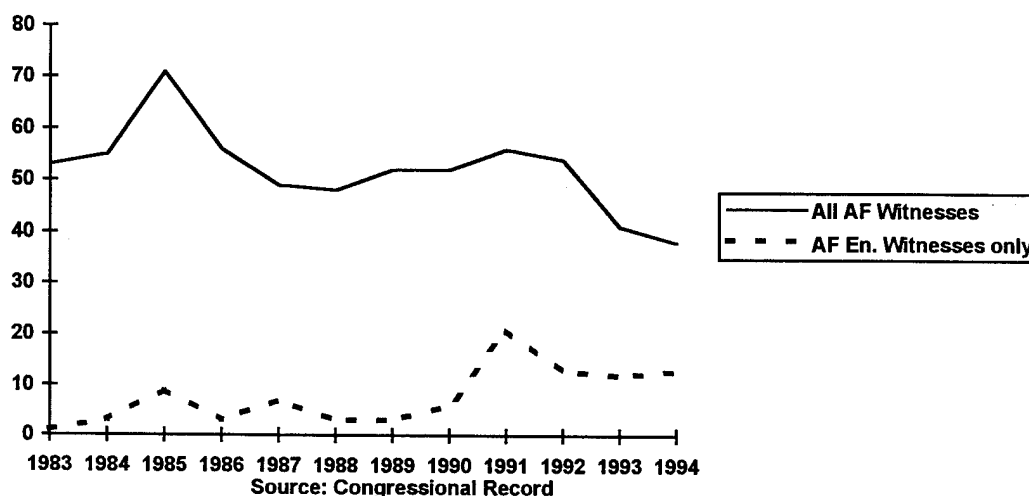
The aggregate shows a variable but generally down sloping trend in total witness appearances. Thus no dramatic overall swings seem to be taking place in the number of defense-related witnesses called to testify before the Congress.

When looking at environmental matters alone, the picture changes. From 1983 to 1994 there were 625 witnesses before Congress with an Air Force affiliation. On 93 occasions, those witnesses dealt with environmental subjects as the focus of their testimony. If my hypothesis is correct, annual data should show the number of times Air Force environmental witnesses testified before Congress rising with the passing of time.

This increase should correspond to the concurrent increase in budgetary authority noted in the last section. These twin expansions are closely tied to each other, as increased funding and increased Congressional interest commonly are associated.

The by-year breakdown of all Air Force witness appearances before House and Senate Congressional committees, in graphical form, follows:

Figure 4.5 - Number of Air Force Witnesses



As figure 4.5 shows, the total number of Air Force witness appearances per annum was fairly constant across the time period under study. If anything, the data reveal a slight downward trend. The highest number of Air Force witnesses occurred in 1985 with 71, while the lowest was 41 in 1993. The peak value in 1985 corresponds to the large military buildup under then-President Reagan.

When the environmental witnesses are extracted from the larger pool of Air Force witnesses, an interesting trend develops. While the overall trend for the number of Air Force witnesses remained nearly steady to slightly declining, the number of times the hearing dealt with Air Force environmental concerns *rose*. This supports the assertion environmental concerns were rising in the minds of at least some policy makers during the time period in question.

A variety of environmental topics were attended to in these hearings. The available data set does not contain verbatim transcripts of any hearings before Congress. Thus it is not possible to determine from the electronic records the exact flow of discussion. Generalizations can be derived, however, from the abstracts of witness statements contained on the CD-ROMs.

Predictably, a number of environmental witnesses testified regarding the ecological consequences of "milcon" or "military construction." The environmental impact of large-scale Air Force construction projects can be quite large. Both the size of Air Force land holdings, and the toxic nature of many national security programs, contribute to valid environmental concerns regarding milcon spending proposals.

Interestingly, a number of hearings focused on global warming concerns, and other global change issues. Of particular concern to the Air Force, and the subject of much discussion at various hearings, was the issue of CFCs. The Air Force has made great strides in reducing CFC use, and in crafting replacement chemicals. However, the day to day use of CFCs and other ozone-depleting chemicals (ODCs) is an ongoing problem for Air Force planners. Real world examples of the Air Force's ODC reduction efforts will be seen in the case studies in Chapter 6.

An additional test of my hypothesis on Air Force environmental interest involves the witness appearances of Gary Vest and Thomas McCall. Mr. Vest was the first Deputy Assistant Secretary of the Air Force for Environment, and Mr. McCall's immediate predecessor. Mr. Vest had a long tenure in that office. Prior to his being named the first Deputy Assistant Secretary for Environment, Mr Vest played the role of chief Air Force environmental planner under a different title. His appearances before Congress stretch back to 1983. In 1993, Mr. Vest was promoted to an environmental coordination post within the broader DOD environmental office, with oversight over all the military services. Mr. McCall has only held the MIQ position since that date, and has only made a few limited Congressional appearances in that role.

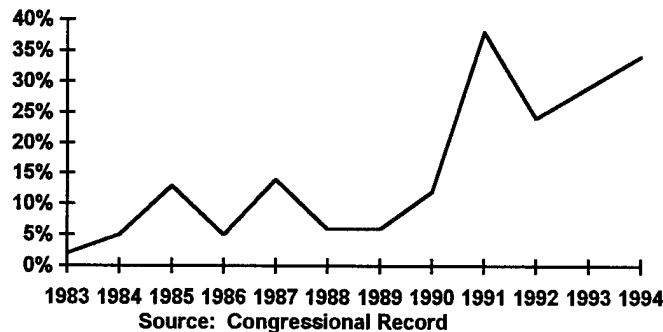
The chart shows, over time, a rise in appearances before Congress of these senior Air Force environmental officials. While small in total number, the witness appearances do show a rise in Congressional interest in the senior Air Force environmental official during the time period studied. The data are as follows:

Figure 4.6 - Dep. Asst. Sec AF Appearances



The data show a significant jump in the early 1990s, a time when environmental concerns became far more central to military planners, according to persons I interviewed (see Chapter 5).

Figure 4.7 provides an additional test. Aggregate data can mask subtle trends. To determine more precisely if environmental concerns have become more central to senior leadership and the Congress, I extracted from the entire population of Air Force witnesses only those whose testimonial topic or organizational affiliation indicates an environmental subject. If environmental concerns have become more central to policy makers in Washington, Figure 4.7 should show an increase in the proportion of total witnesses who testified on an environmental subject. The figures do, in fact, show exactly that.

Figure 4.7 - AF Environmental Witnesses (% of total)

Environmental concerns *have* become more important to the Air Force and the Congressional committees dealing with Air Force matters over the ten years of available data. The Congress, the President, the DOD, and the Air Force are serious about environmental concerns. Whether desired or not, environmental matters became increasingly salient to senior Air Force policy makers over the time studied in this sample.

- Regulations and Guidelines-

Military environmental policy is forged at several levels. Federal law lays out various general policy requirements, while DOD and Air Force regulations provide more specific guidance. State and local laws and regulations can also influence military environmental policy. The variation in local laws often creates disparities in the enforcement requirements levied on the military (as detailed in Chapters 5 and 6). First, I provide an overview of the most important laws, regulations, and guidance dealing with military environmental problems

The National Environmental Policy Act (NEPA) remains today one of the single most important pieces of environmental legislation ever passed by Congress. NEPA, and its several revisions, changed the way federal agencies manage themselves and their environmental problems. NEPA provided an overall environmental structure within which

the military (as well as the rest of the government) was expected to operate. Thus NEPA helped raise environmental consciousness significantly. The actual implementation of environmental policy fell to other DOD and Air Force regulations, which will be discussed shortly.

Perhaps the most significant impact of NEPA on the military was the requirement to produce environmental assessments (EA) and environmental impact statements (EIS). These very public documents mandate open meetings and widespread input. NEPA requires an EA be conducted prior to commencing any project with potential environmental implications. If the EA determines there is no significant environmental impact, the NEPA obligation of the federal agency has been met, and the project may commence. Frequently, however, some environmental impact will be found. NEPA then requires the far more detailed EIS to be completed. The EIS is a tool for examining the total environmental impact of the proposed action, and for creating policies and programs to minimize or eliminate the ecological damage.

The significance of these public requirements on the military is difficult to overstate. Under NEPA military organizations were, for the first time, required to assess publicly what the environmental impact of various military operations might be. NEPA allowed public access and comment on a wide variety of federal environmental decisions, including those made by the military. The goal of NEPA was to:

...declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man...(NEPA, sec 2).

Thus national law declared the goal of ecological quality, and did not exempt any governmental organization from that call to arms.

What one might call the true "spirit" of NEPA can be found in section 101, under the title "Declaration of National Environmental Policy" where, among other things, it is stated that the federal government shall:

use *all practicable means and measures* including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA, sec 101 {a}) [emphasis mine].

This declares in unequivocal terms that the various components of the federal government have a responsibility to the nation to do whatever they can practically do to provide environmental assistance. The specific legal obligations of NEPA were actually quite minimal, but the main goal was to promote environmental consciousness throughout the government. Environmental awareness became a mandatory component of federal service. The National Environmental Policy Act remains a cornerstone of federal environmental policy, and central to DOD and Air Force environmental efforts.

With NEPA as an underpinning, the military writes specific regulations to deal with the environmental challenges present in military operations. The Air Force has a variety of regulations, technical orders, guidelines, and orders dealing with environmental subject matter. I will now review the most significant of the Air Force environmental guidance.

Due to recent changes in Air Force philosophy, the regulation situation is somewhat confusing to those outside the military. For many years higher headquarters organizations (i.e. the Pentagon) dictated Air Force policy in detail. Local units were allowed to modify slightly the specific details of the regulation to reflect local conditions. But, beginning in the early 1990s, the new Air Force Chief of Staff (the senior four-star general) directed a major modification in the regulatory process. Under General Merrill McPeak, the concept of higher headquarters-directed regulations was nearly abolished, in favor of much simplified general guidance. Local units were then expected to fill in the details of the policy in a way that made sense for local conditions. The newer style of guidance is today the overall injunction for all Air Force members. Since data for this

dissertation are drawn from both time periods I will examine both the old and the new regulations concerning military environmental policy.

The old environmental directive, Air Force Regulation (AFR) 19-2, entitled "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," was in effect for the first seven of the ten years of budget data used in the earlier section. AFR 19-2 gave a sense of the direction the Air Force wished to take environmentally and was for many years the basic Air Force environmental canon. In its numerous sections, the regulation spoke in detail about how Air Force managers would meet the requirements of NEPA.

In general, the regulation echoed the goals of NEPA, declaring good decisions as the goal, and that the Air Force will rigorously enforce the requirements of NEPA. It spelled out what precisely must be contained in military EISs, and directed that EISs would be clear, to the point, and not cluttered with unnecessary information. The heart of AFR 19-2 was the policy section, which outlines why the regulation was written. It declared the Air Force will integrate its environmental efforts with other federal agencies and the public, and will use the NEPA process to find acceptable alternatives so as to avoid or to minimize environmental damage from military actions. In addition, the regulation stated that the Air Force will

use all practicable means, consistent with the requirements of [NEPA] and other essential considerations of national policy, to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment (AFR 19-2, 1500.2).

Thus the actual Air Force regulations dealing with the governing of environmental programs declare the importance of *enhancing* environmental quality when possible.

The basic spirit of AFR 19-2 is continued by its replacement, Air Force Policy Directive (AFPD) 32-70. This document is the current policy of the Air Force, and takes the form of a direct order to both military and civilian members of the Air Force, signed by

the Secretary of the Air Force. While quite brief by old and more bureaucratic standards (a mere 11 pages), the AFPD is direct and to the point on what the Air Force must do environmentally:

Achieving and maintaining environmental quality is an essential part of the Air Force mission. The Air Force is committed to: cleaning up environmental damage resulting from its past activities; meeting all environmental standards applicable to its present operations; planning its future activities to minimize environmental impacts; managing responsibly the irreplaceable natural and cultural resources it holds in public trust; and eliminating pollution from its activities wherever possible (AFPD 32-70, 1.1).

The guidance states that the Air Force will follow national environmental policy, and that commanders at all levels are responsible for full compliance with both national and Air Force environmental policies. The directive specifically declares that "all Air Force employees, to include military, civilian, and contractor personnel, are accountable for the environmental consequences of their actions" (1.2). This nests nicely with the arguments of Drucker (in Chapter 3) that military commanders have a military duty to protect national resources.

The directive states that an Air Force Environmental Quality Program will be created, based on "four pillars: cleanup, compliance, conservation, and pollution prevention" (1.3). These pillars are viewed within the Air Force command structure as direction to clean up the errors of the past, comply with the rules of today, and plan for a future with greatly reduced environmental contamination due to Air Force activities.

AFPD 32-70 orders rapid identification of past environmental problems, an open and unbiased cleanup process, compliance with federal, state, and local environmental statutes and extending those guidelines to Air Force activities world-wide, conservation of natural and cultural resources, and a reduction of pollution to as near zero as is feasible. In a significant pronouncement, the directive states that environmental concerns and costs will be accounted for in computing hazardous materials (hazmat) life-cycle costs. Thus

environmental concerns must be included in the planning stage of an operation, not merely as an afterthought. This concept underlies much of the successful aspects of current Air Force environmental policy, as will be seen in the case studies of Chapter 6.

AFPD 32-70 concludes with a detailed list of the statutes and international protocols to be followed and implemented by the Air Force. These include the Clean Water Act, the Clean Air Act, the Endangered Species Act, the Montreal Protocols, SARA, and others. In this way the Air Force ties itself to the requirement to obey all the environmental laws of the nation in an open and public manner. This is, in my view, a demonstration that the concerns of Mathias Finger noted in the previous chapter are unfounded, at least in this country. The military in general, and the Air Force in particular, today do *not* seem intent on hiding noncompliance with environmental laws behind a questionable facade of national security.

In addition to the overall directive, a number of other Air Force publications provide somewhat more specific instruction on how to accomplish a variety of environmental ends. There are "Air Force Instructions," or AFI, (essentially regulations) that cover in greater detail the manner in which environmental budgeting will be done, the levels and manners of environmental restoration, as well as air quality, water quality, solid and hazardous waste, storage tanks, environmental compliance assessment, interagency and intergovernmental coordination for environmental planning, natural resource management, cultural resource management, and pollution prevention.

At every command level, from the Pentagon to the local base, the Air Force requires creation of "environmental protection committees" (EPC) whose task it is to oversee the portion of the Air Force environmental program within their jurisdiction. These committees are directed to:

ensure a systematic, interdisciplinary approach to environmental quality and integrate this approach into planning and decision making. [These committees will] act as the primary executive steering group for all

environmental cleanup, compliance, and conservation and pollution prevention (AFI 32-7005, 4.1).

The importance of these committees has risen greatly since I served on an older version in 1990 at the Air Force Academy. Then, the committee met twice yearly to discuss the limitations of base recycling programs and pondered sources of funding for tree planting. Today these committees are more significant, charged with oversight of hazmat emergency procedures, reviews of local environmental policy, facilitating and coordinating environmental efforts, and more. The evolution of these committees is further evidence of the change in attitude and commitment within the Air Force on environmental matters.

An additional demonstration of Air Force resolve is found in the current environmental budgeting guidance. Air Force environmental spending is divided into more traditional "recurring environmental compliance requirements" such as ongoing hazardous waste disposal, permit fees, testing and sampling and "non-recurring environmental compliance requirements." This later funding is to be used to fix past non-compliance, preventing future non-compliance, and to move beyond mere minimum compliance in the future (AFI 32-7001, 3.). This guidance explicitly directs that Air Force resources will be used to fix what has been done wrong, prevent future errors, and enhance the environment beyond legal minimums. The Air Force environmental program is funded by rescissions from Operations and Maintenance (the main day-to-day operating pool), military construction, aircraft procurement, missile procurement, other procurement, military personnel, research, development, testing, evaluation, military family housing, and defense business operations fund (AFI 32-7001, 3.2.1). These programs represent the fundamental core of the warfighting and people programs of the United States Air Force. To tap into these programs to fund environmental efforts is to accord ecological issues a role comparable with the most significant Air Force missions.

A final Air Force publication that illustrates the evolution in Air Force environmental thinking is the *US Air Force Handbook to Environmental Quality*,

authored by the Air Force civil engineering component charged with environmental oversight. In the introduction, the Secretary of Defense's Pledge to the environment reads

In concert with the expectations of the President, the Secretary of Defense, as leader of the largest Federal agency, has fully embraced the tenet that "The Department of Defense is...deeply committed to a new role as defender of our environment. If we do not begin to do a better job of defending our environment today, we may not have what we need to defend our nation tomorrow" (Handbook, 1).

This statement strongly supports the argument made in Chapter 3 which tied national security to environmental security. This connection is more explicitly stated in the introductory comment from the Deputy Under Secretary of Defense for Environmental Security:

The mission of environmental security is to integrate environmental concerns into our national defense policies...from ensuring responsible performance in our operations at home to deterring regional conflicts caused by scarcity or denial of resources to mitigating threats such as ozone depletion or loss of biodiversity that can lead to international instability and global degradation (Handbook, 1).

The Handbook notes that the DOD has over 550 installations, in every state and territory, accounting for nearly eighty percent of major federal facilities. The Air Force alone manages over 9,000,000 acres of land, including 700,000 acres of managed forests with 1,100 miles of streams and rivers (Handbook, 5). With such resources, the Handbook points out, come significant responsibilities for proper management. The Handbook also tracks environmental responsibility from the top of the chain of command to the bottom. The responsibilities of the Secretariat, the Air Staff (the uniformed senior staff), the environmental office and other organizations are detailed.

The final set of responsibilities detailed in the Handbook belongs to local commanders. In the previous environmental era, colonels and generals who commanded bases were largely removed from personal responsibility for the environmental conditions of their bases. Now those officers are held personally *and criminally, if necessary*

responsible for the actions taken under their command. Thus a career can be dishonorably ended by an environmental error as surely as by a lapse in security or safety.

The Handbook details the required actions for Air Force personnel, reflecting the four AFPD 32-70 pillars of clean up, compliance, conservation, and pollution prevention. It outlines what must be done regarding air and water quality, hazmat management, solid wastes, storage tanks, wildlife, noise, ODCs, cultural preservation, and others. The Handbook clearly expects Air Force personnel, both uniformed and civilian, to be proactive in dealing with environmental matters.

Taken as a whole, the history of NEPA, AFR 19-2, AFPD 32-70, various AFIs, and the Handbook support the view that the Air Force has the tools, motivation, and personnel needed to deal with a variety of environmental problems found within the current military structure. These documents also suggest a strong environmental ethic within the Air Force today.

-Summary and Maxims-

The budgetary data show a consistent and sustained increase in environmental funding over the time period studied. This growth suggests an increasing importance of environmental issues to those crafting the Air Force budget. The Congressional testimonial record shows an increase in appearances by environmental Air Force witnesses, suggesting military environmental concerns have become more salient to Congressional leaders. Finally, the regulations and instructions clearly show an Air Force-wide commitment to environmental excellence, often beyond the mere letter of the law. As is clearly spelled out in the regulations, Air Force personnel are collectively and individually responsible for environmental compliance. Thus the Air Force has declared the issue significant, and removed any cover behind which non-compliance could be

hidden. The weight of evidence in this chapter shows that today's Air Force is committed to making environmental compliance a central part of day-to-day Air Force operations.

Taken collectively, these data suggest three maxims for Air Force policy makers. Recall that the goal of this dissertation is to extract a set of maxims for policy makers to use in evaluating the appropriateness of using the military as an environmental tool. The three maxims below provide a basic framework for the more policy specific maxims which follow in Chapters 5 and 6. Taken together, the maxims allow policy makers to craft informed environmental decisions. The archival data in this chapter suggest if there is a commitment to act, and the funding to support action, the Air Force can be an important environmental actor.

Maxim 1

- Other things being equal, the more significant the threat to national security that national civilian leadership believes environmental issues to be, the more likely it is that the military will be used environmentally.

For the military to become involved, two key civilian actors must first create a setting in which the military feels comfortable engaging in non-traditional actions. The President and Congress must convey to the military leadership the sense that non-traditional missions are an acceptable part of the Pentagon's duties. This acceptance is to a large measure already in place, although support for particular missions may ebb and flow. The President and Congress did not object, for example, to the using of Air Force personnel from nearby Tinker AFB during the rescue efforts following the Oklahoma City bombing. Nor were objections raised to the military's relief efforts in Florida following the devastating Hurricane Andrew. Thus the question of support for the basic *concept* of non-traditional missions does not break new ground. Without at least tacit Congressional support, however, no new environmental initiative by the military is likely to be successful.

This is not to say that there must be a Congressional mandate *a priori* of the military's becoming more environmentally involved. Congressional leadership may be quite willing to "sign on" to an insightful and well-planned military environmental program designed within the Pentagon. In an off-the-record interview with a senior staffer on the Senate Armed Services Committee I was told that the Senate would respond positively to Air Force environmental initiatives, but would be unlikely to direct such an expanded mandate of national service actions themselves.

The military is not likely, however, to be willing to engage in significant environmental programs without an indication of support from Washington policy makers. Thus if Congress shows it believes environmental security to be linked to traditional notions of national security, the military will be more willing to take on such activities. Should the Congress demonstrate that it does not accept a nexus between environmental security and national security, it is unlikely that any significant non-traditional military environmental programs will be proposed or adopted by the Pentagon.

Maxim 2

- If Air Force leadership believes environmental problems are significant to the military and represent a threat to national security, then that leadership will consider non-traditional environmental programs as reasonable within the Air Force mandate.

The statements by the Secretary of Defense and the Under Secretary of Defense for Environment cited above support the assertion that the conditions of this maxim have already been met. Regardless, this maxim does not *require* that Air Force leaders have a deep personal commitment to biodiversity or rain forests. Rather, the senior leadership must believe that regardless of their own *personal* opinion on spotted owls or redwoods, environmental concerns matter in today's Air Force. Thus all that is required is for the commanders to believe that environmental issues are important, and represent a threat to national security.² Never the less, the evidence in the interviews of Chapter 5 and the case

studies of Chapter 6 will suggest that environmental concerns have been taken as core values at all levels of the military.

A small example of this mindset is the recent trip by an Air Force technician to the headquarters of the "Yankee Air Force" at Willow Run Airport, Michigan. The Air Force had donated an old B-52 bomber to the Yankee Air Force's museum. The plane, built in the 1950s, contained a number of gauges and dials which the technician carefully checked with a Geiger counter. He determined which "glow in the dark" gauges emitted higher than background levels of radiation. He then carefully removed them for shipment back to the Air Force. No visitors had ever been permitted in the cockpit while touring the museum, yet the Air Force felt it appropriate to recover the antiquated gauges (Hunter 1995). This attention to details is indicative of the degree to which Maxim 2 above has been incorporated into the mettle of the United States Air Force today.

Maxim 3

- If the Air Force is to address non-traditional environmental problems, then the Air Force budget must be funded to permit such programs without significant compromise of traditional mission elements.

It is unrealistic to expect the Air Force to engage in major environmental repair projects without Congressional and administrative efforts to fund them. The ability of the military to absorb additional costs is not unlimited, and the DOD has been required to do so on a number of occasions including, for example, the ongoing humanitarian relief efforts in Bosnia and Iraq. Environmental crisis mitigation can, on occasion, be done without a priori budget action. But too frequent or too lengthy environmental tasking without reimbursement will have a deleterious effect on traditional military readiness. The military must have sufficient funds to train realistically for *traditional* war fighting if it is to be an effective force. If environmental taskings are allowed to deplete the military's "cash

reserves," training and maintenance will, by necessity, be reduced. This would certainly result in diminished combat proficiency should a traditional war fighting need arise.

The archival evidence presented in this chapter offers significant support to the theoretical conjectures made by the author. Taken as a whole these three data sets paint a picture of increasing environmental awareness, concern, and action. The Air Force has become engaged in the environmental security question, and accepts the tie between environmental concerns and national security in the more traditional sense.

The budget history of environmental spending over the last ten years clearly shows a dramatic and sustained increase. Environmental restoration spending has undergone a sustained increase. More and more DOD resources were brought to bear on environmental concerns from 1983 to 1994.

The Congressional testimony record demonstrates an increased concern with environmental matters by Congress and the Air Force. Both the subject of Congressional testimony and the number of visits by Air Force environmental policy leaders show an increased salience of environmental affairs within the minds of those dealing with the military.

Finally, the written record of federal statute and military regulation shows a decreased toleration for environmental degradation as part of military operations. The federal law directs the military to comply quickly with environmental law, and the military's own regulations direct the armed forces to lead the way on environmental compliance. It is clear from the regulatory history of the Air Force that environmental matters are to be considered central to all military operations.

Archival records are, however, only one type of data. Regardless of the budgetary numbers, the Congressional record, or the regulatory requirements, environmental protection by the military rests in the hands of those dealing with the issue day-to-day. It is equally true that expanded Air Force environmental efforts must, if they are to be

successful, be judged affordable, significant, and reasonable by key policy makers and leaders. Therefore, Chapter 5 presents data gathered in a series of interviews with policy makers and other elites, in the hope that such insights will further clarify the key questions of this dissertation.

End notes

¹ This data set is very nearly the same ten years covered by the budgetary data in the section above. The records consist of the subject and date(s) of the hearing, a complete list of all witnesses (listed by name and affiliation), and a detailed abstract. These data were extracted from the complete CD-ROM record of all Congressional action for the time period in question. The record also provides the Congressional Information System (CIS) number for reference of the full text on microfiche.

² See Chapter 5 interviews with McCall, Hamilton, Swint, Seely, and Turner for a fuller discussion of the environment as a national security threat.

CHAPTER 5

ELITE INTERVIEWS

In this chapter I will explore "what the elites think." The interview subjects were selected in an effort to gather a wide range of opinion on the role of the military and the environment. They included both military and civilian Air Force policy makers and support personnel, a White House scientific advisor, congressional staff, an EPA official, a broadcast journalist, and senior officials of non-governmental organizations (NGOs) from a range of political and policy perspectives, environmental activists, and educators. Each respondent either holds a position with significant environmental responsibility or has become expert in some area of environmental management through professional or private personal endeavor.

The respondents represented a range of age and experience, with the 83-year-old David Brower of the Earth Island Institute the oldest and 26-year-old Jerry Taylor of the CATO Institute the youngest. Nearly all the subjects were college graduates, with over 50 percent holding doctoral degrees. Without exception the respondents were energetic during our conversations and impassioned in their views.

In general, although not unanimously, the respondents supported expanded Air Force environmental activities, albeit with varying caveats. Only two interview subjects rejected the notion out of hand. I was surprised by the degree of support from within the military and the government at large, and by the degree of support from environmental activists. I had anticipated resistance from traditional bureaucratic actors and suspicion from those within the more traditional environmental movement. While there was some of

each, nearly all respondents voiced support for at least the theoretical construct of expanded military operations.

Collective actions and prisoner's dilemma theories are useful constructs in framing the various responses given by the experts. My notion of "juxtaposed collective action" is useful in understanding the transfer of military technology to the civilian world, and is explained in Chapter 2. Briefly restated, in the juxtaposed collective actions argument I claim that when the government has developed a new product or process to meet its own critical needs (in this case, a new environmental technology to deal with a military environmental problem), it is in the interests of all parties to encourage private-sector free riding on the new body of knowledge. There are times, I argue, when a collective-actions scenario is a positive sum game for all players.

The Prisoner's Dilemma seems to be an appropriate model for several respondents' views on potential interactions between the military and other environmental actors. A distrust of the other player, the logic of defection, and the shadow of the future all seemed part of the responses of several subjects. Several of the respondents (e.g., Gordon, Gillcash, Taylor, Smith) seemed to feel they were in a multiple iteration game, with an opposing side wishing to "win." All the participants were, of course, acting with incomplete information. Thus they were in, at best, a bounded rational actor situation. This incomplete information resulted in assumptions that other players would defect. Some elites, therefore, found themselves playing PD when they may have been the only people in the game. The PD model is still quite useful, however, as most of the time these players do not realize the other side is not also playing PD.

There are four specific reasons for including elite interviews. First, the general agreement among respondents suggests the basic premise of this dissertation is correct. The subject pool contained a broad range of people, yet most generally supported expanded environmental actions by the military. While the data are not empirical, the degree of consensus among a variety of environmental authorities buttresses the assertion

that the military can be an important environmental actor. This judgment is normative, and is therefore less robust than other measures. None the less, the weight of elite opinion suggests the research is properly grounded.

Second, individual interviews will serve as examples of my theoretical suggestions of ongoing collective actions and PD games made above. Had I restricted my study to archival data and/or case studies alone, I would have arrived at a less complete understanding of the behaviors likely to be involved in environmental decision making. By being able to introduce and use game theory, I am able to understand more correctly the policy process, and more accurately craft maxims.

Third, the interviews served to educate me about the current state of the world from a variety of perspectives. Thus discussing the appropriateness of expanding military environmental programs with those from both sides of the issue was more illuminating than merely studying an existing case. I was able to ask each elite to evaluate the opinion and assertions of other interview subjects, and thereby gain increased insight into the rigor of various opinions. This opinion was often bolstered by citations to traditional scholarship confirming the views of the various elites. Additionally, I was able to supplement my knowledge of my case studies by consulting with respondents far more expert than I. For example, I was able to determine that Wurtsmith AFB was generally typical of closing bases, and was therefore a reasonable case for inclusion in Chapter 6.

Finally, the elite opinion was central in the formation of several maxims. For example, by asking experts in environmental engineering the degree to which technology played a role in environmental mitigation, I was able to assert that technological need should play a role in determining the appropriateness of military environmental involvement. This led directly to maxims 6 and 9.

Unlike many areas of social science research, there are few definitive and absolute answers for the questions of this dissertation. Two individuals may hold "expert" opinions which differ. Varying views on what are the underlying conditions, the assumptions made,

and normative orientations may lead elites to disparate opinions. The views and opinions of policy makers, activists, military leaders, and others are often based on life long experiences with the issues of concern. Thus, the reader will find in the elite opinion that follows a *range* of views. Each is valuable, and must be evaluated from the perspective of the respondent.

Interviews were conducted face to face during visits to Washington D.C., the United States Air Force Academy, the Windstar Foundation Annual Conference, and Wurtsmith Air Force Base. Additionally, telephone interviews were conducted with respondents at various locations around the country. Several respondents were interviewed more than once, often by way of both in-person and telephone discussions.

A standard protocol was used as a framework for a focused interview with each subject in an attempt to gather a base level of information that would be comparable from one respondent to the next (see Appendix A). As is appropriate in elite interviews, however, I allowed the conversation to flow with the wishes of the respondent. In each case I was able to ask my basic questions as well as additional exploratory questions generated by the subject's responses. The respondents were asked: what environmental concerns they felt were most pressing; what limited their own and their organization's ability to be more effective; the role of their organization and them within it; and several questions on the military and the environment. I was both surprised and pleased by the openness and cooperation of virtually all the respondents. Nearly all the interviews went past the estimated time of twenty-five minutes, usually due to the respondent's longer and more energetic than expected response to the questions.

It is impractical to present a detailed transcript of each of the 19 interviews. Therefore in this chapter I present a brief synopsis of each interview, followed by an attempt to gather together the salient points of commonality as well as the points of disagreement among the respondents. The complete list of on-the-record interview subjects and the dates of each discussion is contained in Appendix B.

With the subject's permission, most interviews were recorded on audio tape. Each subject was advised that he or she could direct the recording be terminated at any time, and any material gathered from that point onward would be "not for attribution." Several respondents did so direct, and added interesting and significant observations without the tape recorder running. This information will be incorporated into this document without attribution or citation.

It is important to ask at the outset why the reader should care what these particular respondents think. There are two answers, one theoretical and the other more practical. On the theoretical level, democratic theory suggests that when a representative government makes decisions, a wide spectrum of policy options should be examined, and dissenting views should be aired. Indeed, this vetting of opinions was viewed by the Founding Fathers as one of the key mechanisms by which liberty was secured (Madison 1961).

On a more practical level, each of the respondents from whom I gathered data represented constituencies with both expert opinion on, and insight into, the issues at hand, as well as influence and the ability (in varying degrees) to influence both public and private opinion.

The military respondents, both uniformed and civilian, are most directly aware of the capabilities and limitations of both military personnel and hardware. Executive and legislative branch respondents are familiar with the policy process, as well as the political climate into which any proposed policy must travel. Bureaucratic organizations, such as the Environmental Protection Agency, offer insight into the civilian side of environmental management, with which any military program must connect. Activists often have detailed information of the policy process from a point of view outside the government. In addition, these individuals can often mobilize public opinion to support or oppose any particular governmental policy. Such mobilization can have a significant impact on the

policy process. The media certainly can influence government decision making, and so including a media representative in the sample is appropriate. Finally, other parties, such as potential "competitors" from the private sector, could be feel direct impacts of any significant military environmental policy change, and should therefore be considered in the decision making process.

-The Military-

Thomas McCall

Thomas W.L. McCall Jr. is the Deputy Assistant Secretary of the Air Force for Environment, Safety, and Occupational Health (SAF/MIQ). Under that lengthy title, McCall functions as the Air Force's senior environmentalist and occupational safety and health expert. His official Air Force biography states that he:

establishes policy for, and oversees, worldwide Air Force environmental, occupational safety and health, base comprehensive planning, natural resources, disaster preparedness, explosive ordinance disposal, fire prevention and protection, air base performance and operability, community economic impact, and interagency and intergovernmental coordination matters. He also has extensive involvement in a wide range of operational infrastructure matters such as airspace use, air-to-ground weapons ranges and munitions storage (SAF/PA 1995, 1).

Within the Pentagon and the Air Force, Mr McCall's organization is known by its military acronym, MIQ.¹ A civilian, Mr McCall carries the protocol equivalent rank of a three star general. He reports to the Assistant Secretary of the Air Force for Manpower, Reserve Affairs, Installations and Environment (SAF/MI), who in turn reports to the Secretary of the Air Force (SAF). Prior to coming to the Pentagon, Mr McCall served as a senior official in the EPA.

Mr McCall described his functions as educator, consensus builder, standards setter and policy director. He saw the biggest environmental challenge before him to be "showing that [the] environment supports other sectors of society rather than detracts from it." Within the Air Force he stated that good environmental practices help sustain readiness, help us be a good neighbor to people both on and off our bases, and are a driver to help lower cost in the Air Force's support structure.

Mr McCall suggested that the role of the military in environmental concerns should be along several lines. First, the Air Force needs to comply with the requirements of the society in which we live. The Air Force must, he said, find ways to meet the environmental standards with which the rest of society must live. Secondly, Mr McCall spoke of the huge investments and sunk costs in Air Force technical areas such as research labs, product centers, and partnerships with government-owned-contractor-operated facilities and government contractors. He believed there were direct applications that can be moved out of the military labs and into society. In addition, he believed the Air Force should do a better job of bringing ideas in from the civilian world and incorporating them into Air Force thinking.

One of the major challenges to doing his job better, Mr McCall indicated, was the diverse array of sources of information across the Air Force and the military as a whole. There are many organizations interested in environmental concerns, each with its own agenda and operation. These information streams (or "stovepipes" as they are often called within the Pentagon) are usually divergent, with distinct audiences. Data that are gathered by one organization may be processed and reported to a particular constituency, while another constituency that would like to have the information is bypassed. Within the Air Force environmental community, this is often demonstrated by the lack of effective communications between the MIQ establishment (a civilian organization) and the Air Force Civil Engineers (a military organization).

Mr McCall believed that there would be times when it will be in the best interests of the US for the military to become involved in international environmental concerns. What makes up "defense," he noted, can vary with time. He offered the use of the military in drug enforcement actions as an example of how policy makers can and do redefine the concept of defense. Whether environmental security is a component of traditional national security is a matter of definition, Mr McCall offered. As Congress and the President vary the charter for the armed forces, so will they vary the significance of environmental security in the national security picture. He believed that a particularly significant role for the military may be in interactions with our allies. Examples of this concept currently underway include a recent agreement to assist Belarus with the cleanup of former Soviet nuclear missile bases and the United States Navy's leadership role in dramatically reducing ocean dumping of plastics.

Mr McCall believed the military was not in and of itself a major source of environmental problems, and it is doing a good job overall in dealing with the problems it does have. The military does need to do a better job in pollution prevention, a process that requires education to help decision makers understand that compliance is in their budgetary self interest. His own budget, he felt, was adequate to keep from putting people at risk. He seemed resigned to the budgetary struggles, stating that he would construct the most effective program he could with the resources he was given.

The role of government is to serve the people, Mr McCall felt. You deliver services to the people that they think the government should deliver, at a price that is reasonable, in a way that is responsive. You ask the public as much as possible for advice, unless you are in a national security situation. Government should be as transparent as possible, he believed. Government should also recognize its limits, and it is now confronting the need to craft a fundamentally different way of doing business.

Mr McCall's views were similar to those of a number of the respondents I interviewed. The job of the military is to defend, and Mr McCall embraced the broadened

definition of national security offered in Chapter 1. Defense is a vague term and must respond to the ongoing evolution of the concept of threat, also outlined earlier. It is not insignificant that a senior leader in the Pentagon holds this broader view of military function.

Lieutenant Colonel Mark Hamilton, Ph.D.

LTC Hamilton is the Chief of Staff in Mr McCall's office. His duties entail the organization and day-to-day operation of the MIQ staff. He holds a Ph.D. in chemistry, and has been involved in environmental activity since he joined the Air Force.

LTC Hamilton believed there was a trend in industry and in the Air Force to see environment and environmental concerns in a broader light, incorporating areas beyond a narrow scope of clean water, clean air, and biodiversity. The trend now includes such things as occupational health, with the health and safety of personnel in the workplace a major concern. To meet readiness requirements, LTC Hamilton pointed out, the workers must be healthy and safe. This includes both civilian workers in defense facilities in the United States, but also military personnel when they deploy to places like Somalia, Bosnia, or the Persian Gulf. Thus LTC Hamilton saw human health as a central environmental concern of Air Force planners. He pointed to the "Gulf War Syndrome" suffered by many veterans of the Gulf War as an example of where the military has not done as well in predicting and dealing with environmental and occupational health issues as would be desired.

A major problem confronting the Air Force, stated Hamilton, was the challenge of integrating the variety of "stovepipes" that are generating environmental data. Echoing Mr McCall, LTC Hamilton expressed frustration that data he needs may be available elsewhere but he was unaware of it. Each organization has developed its own information streams to supply data to its particular clients, making crossover difficult. Due to this

problem, MIQ has endeavored to standardize the way information is transferred across organizations. The highly technical nature of the environmental problems confronted makes this coordination quite challenging.

MIQ's effectiveness is limited, LTC Hamilton believed, by the hierarchical nature of the Air Force. For example, the medical community may come up with a great idea dealing with occupational health, but that information remains within the medical community. In addition, other organizations may resist "outside" ideas because they don't understand them. The problem of "NIH" or "not invented here" bias also can contribute to ideas being rejected prematurely.

LTC Hamilton also noted the well known problem of civilian-military interface. The staff working under the Air Force Chief of Staff must assess the often-competing directions from the military chain of command and those of the civilian side (in this case MIQ). As a result, communications flow across the chains of command, rather than up through them.

A final barrier to effectiveness noted by LTC Hamilton was what he termed the "new reality of the budget environment." There will be less money to do everything within the Air Force, environment included. This was a new way of thinking, Hamilton believed, as recent military history has been one of stable or growing budgets. The Air Force must become "light on our feet" and become able to respond rapidly to the EPA, Congress, and other actors.

LTC Hamilton believed the overall mission of the military is to defend the United States. As a result of that, he saw two "sub-goals." The first was that we not do anything that compromises the readiness of our forces. That includes such things as protecting military ranges for training, keeping an eye on the "shop floors" to ensure that we are not exposing our workers to chemical contamination, and making sure military personnel and their families live in housing that is safe and healthy.

A second sub-goal is that if we are here to defend the United States and the American people, we shouldn't be doing anything to hurt them. That means we address the military's role in atmospheric releases, dumping, exposing children to lead, and similar issues. As LTC Hamilton noted, there will be times when we must make a risk-based decision. For example, we do need to pollute the air in order to fly our planes.

This is not a trivial point. The primary mission of the Air Force, traditional defense, mandates energy intensive activities, some with significant environmental ramifications. Unfortunately, too often the debate about the military and the environment turns strident and narrow minded. Any sense of middle ground is lost. My own experiences in both the traditional military world and in environmental organizations is illustrative. Following my speech to the Windstar Foundation in 1991, I was asked a number of questions. Most in the audience seemed to understand the need to balance the duties of the military between competing demands. A few, however, demanded that the military terminate all environmentally harmful activities, regardless of the national security implications.

LTC Hamilton saw a strong relationship between national security and environmental security. He was concerned, however, that in recent years the Air Force has gotten away from the bigger picture of whether a particular substance or activity poses a significant health or environmental risk, and are now bogged down in the details of whether we are meeting the letter of environmental legislation. This view will be echoed by interview subjects from the EPA and from the Air Force Academy. LTC Hamilton is troubled that environmental concerns are being increasingly seen as strictly *legal* questions, and not *health* issues.

When asked about the military going beyond traditional military functions and assisting on environmental concerns, LTC Hamilton's only concern was the money. You get funded for what your mission is. If the Air Force is to take on additional environmental responsibilities, it must be funded for that. He noted that placing the

military in the role of providers of non-military functions creates an expectation in the minds of those receiving the service. Thus what is today's "above and beyond" becomes tomorrow's expected behavior.

When asked if there were particular environmental problems where help from the military would be especially useful, LTC Hamilton suggested that emergency environmental response was one such area. This is due to the military's organization, transportation, manpower, and resources. He noted that there were times when you have environmental emergencies, such as spills of extremely toxic chemicals, where the civilian community may have a hard time dealing with the challenge. The military, he noted, could come in and take care of the problem. He believed these responses should be short term, limited, with definitive ends in sight. LTC Hamilton's observations are largely validated by the case study of Chernobyl in Chapter 6.

In addition, LTC Hamilton believed the civilian world should take greater advantage of the research done by military laboratories. Air Force clean-up technologies and epidemiologic controls in the workplace are two examples where the experience of the military could be put to good civilian use. Issues that are still somewhat exotic in the civilian world (e.g., does exposure to cadmium really pose a health risk?) have a long history in both military laboratories and defense contractor facilities. The military can, he stated, be of great use in such areas. This suggestion nests nicely with the juxtaposed collective action concept of Chapter 2. LTC Hamilton's comments suggest the utility and cost effectiveness of allowing civilian society and industry to become free riders on the basic R&D efforts of the military.

LTC Hamilton did not object to the Air Force marketing its excess capacity. He did not believe the Air Force should pay for this out of current readiness funds. While not done for profit, such activities beyond traditional defense should be paid for by those requesting the assistance.

The military is not, in the view of LTC Hamilton, a major source of widespread pollution. Although there are places that are wretched, they are not generally wide spread. The Air Force problems were generally localized and not profoundly dangerous. The Air Force is doing the environmental job it has the money to do. Overall, he seems to believe that the Air Force is doing a good job with the resources available.

When asked if military operations were by definition bad for the environment, LTC Hamilton stated that that was a poorly phrased question. A better question, he suggested, was "Is the military any worse for the environment than other businesses?" The answer, he believed, was no. The Air Force flies, drives, and operates as cleanly or better than most industries in the United States.

The role of government in LTC Hamilton's view was to embody the will of the people. The government has a responsibility to identify issues to the people and then respond to the wishes of the people. Government should not be passive, but should propose.

Colonel David O. Swint, Ph.D.

Colonel Swint is Professor and Chair, Department of Civil Engineering, at the United States Air Force Academy. In this role he oversees the education of cadets destined to serve as career civil engineers in the Air Force. In addition, Colonel Swint helped craft and now supervises an environmental engineering academic major. He holds a doctorate in engineering mechanics from Michigan State University, and is a registered Professional Engineer. His military career includes "hands on" civil engineering, teaching, and service in Viet Nam.

Colonel Swint believed there were significant environmental problems facing the nation and the world today. Deciding which problems were most pressing and which were less significant has become a more difficult task, especially since the 1994 election. As the

military responds to the directions of the President and Congress, it is less clear today where the line is between environmental problem and acceptable practice. Thus the military finds itself in less certain territory, pressed by a White House largely committed to aggressive environmental policy, and a Congress eager to reduce federal environmental controls and programs. Colonel Swint believed there was "a balance there somewhere between how far do you go and at what expense?" There is some threshold past which an environmental situation should not be allowed to extend because of a mission, security, or other concern. He noted that the military and the society at large have already seen the benefits of applying an environmental policy. Cleaner air is inherently better than dirty air, and protection of the ozone shield is in our national and global interest. Thus the Air Force's leading efforts on developing a replacement for the ozone-damaging Halon 1211 is a good example in Colonel Swint's opinion of the ability of the military to serve the environmental security interests of the United States while engaging in environmental practices that serve the greater societal good. Colonel Swint's views offer further support to the theoretical constructs of broadened national security and threat in Chapter 2.

Colonel Swint viewed the role of the military (in non-warfare matters) as similar to the role of the National Aeronautics and Space Administration (NASA). In space technology, NASA's task was to develop and demonstrate technology. By acting as a "proof of concept" organization, NASA was able to push technological development. Once such technology has been actualized, Colonel Swint believed it appropriate to avoid entering into the actual "operations and maintenance" cycles. Colonel Swint did not believe in military domination of environmental efforts where private sector forces could perform the same functions. When practical, the private sector should take care of environmental problems. He did, however, see an important role for the military due to the frequent entanglement of national security and environmental concerns.

According to Colonel Swint, the military *should* be willing to become involved in non-traditional environmental concerns when such involvement relates to Air Force

mission concerns. Thus the use of transport, satellite telemetry, risk assessment and management for non-military environmental concerns could enhance both military readiness and environmental protection. Colonel Swint further noted the value to the private sector of spin-off technologies from the government at large and the military in particular (see bioslurping and bioventing in Chapter 6).

Colonel Swint rejected the traditional definitions of "threat" as no longer applicable. Threat now "circles the globe," with every country a potential hot spot, many with direct US national interests. Thus he argued if the United States' interests are served by keeping the world as peaceful a place as possible, this nation must respond quickly in time of crisis, to include ecological crisis. Orbital imagery and other data gathering on a global scale rely on technology that enhances both military readiness *and* environmental quality. The same satellite system that monitors troop movements can monitor whale movements, the same "ferret" system that listened to Soviet military radio traffic could be employed to listen to deployed ocean temperature monitoring systems. Colonel Swint believed a synergism can be generated by use of military technology and expertise that has the potential to enhance the environment and the military. In particular, military technology can allow high-level decision makers to evaluate crisis situations rapidly and precisely. Even if the military does not become directly involved in environmental cleanup, the data provided by the military may prove critical, enabling others to employ environmental clean-up measures more effectively.

As Colonel Swint noted, not all the military expertise was in uniform. The ingenuity and ability of military contractors could be very useful in mitigation of environmental damage. Most environmental studies on military bases are conducted by contracted employees. Such a system is cost-effective, he believed.

Funding remains a funding problem in environmental cleanup, but Colonel Swint asserted that if the current political climate continues, environmental funding will continue.

The military is strongly committed to proper environmental stewardship and will remain so until directed by civilian authority to change objectives.

Colonel Swint is a senior colonel in the Air Force, with over thirty years of active duty. I was therefore somewhat surprised by the degree to which he embraced an evolving definition of national security and threat. His view on the appropriateness of an expanded view of the Air Force mission suggests the new "environmental ethic" of the military has reached deep within the senior ranks.

Lieutenant Colonel Gregory E. Seely, Ph.D.

LTC Seely is an Associate Professor of Civil Engineering at the United States Air Force Academy. He holds bachelor's, master's, and doctoral degrees in civil engineering from the University of California, Berkeley. He has served as a civil engineer at the base level, as well as a command environmental engineer and as a chief of bioenvironmental engineering. He is a Registered Professional Engineer. LTC Seely is an expert in hazardous waste management and risk assessment, wastewater treatment, and environmental engineering design.

Water issues, including surface and ground waters, were of environmental concern to LTC Seely. He stated that while he was strongly interested in the environment, he was not what many would consider to be an "environmentalist." He believed that science and fact should underlie environmental concerns, and that at present what are believed to be facts and science may merely reflect increased human ability to take data with greater accuracy. This view results in LTC Seely's skeptical position on the reality of more ethereal problems such as global warming and ozone depletion.

Air Force civil engineers were limited by organizational structure in the opinion of LTC Seely. The lack of access of environmental personnel to base commanders has been a long term problem: the environmental engineer must go through several layers of

bureaucracy to reach the commander with environmental information. LTC Seely noted that things are better in this regard now, largely due to the increasing awareness that military commanders were now held civilly and criminally responsible for the environmental practices under their command. There has been a fundamental change in the attitudes of Air Force engineers in the last two decades in LTC Seely's view. Environmental matters have ceased to be "a roadblock" and have now become "what you have to do." This is an interesting observation when compared to the view of his direct superior, Colonel Swint. While they differ sharply on the degree of environmental damage that exists and the level of challenge facing the military, both readily accept the central nature of environmental issues to current military planning.

LTC Seely believed the military can and should be involved in non-traditional environmental functions when those activities are mission-enhancing. If the activity can be used as training and doesn't cost anything, it may be appropriate for military resources and personnel to be involved. He noted that civil engineers have often performed training in the form of constructing facilities and fixing problems for the civilian community.

According to LTC Seely, the basic environmental goal of the military should be to commit no violations of environmental laws and regulations, and when possible to move beyond the minimum standards. Additional activities can be undertaken when such missions make sense and don't hurt the basic combat mission of the US military. Resources and money, he believed, will limit the range and depth of non-traditional environmental activities by the military.

One environmental activity that the Air Force does well, said LTC Seely, and that might have non-military ramifications is the Environmental Compliance and Monitoring Program (ECAMP). The ECAMP process is a base-wide inspection by an outside agency of all environmental impacts of a military facility. Such a top down review is effective in identifying problems and strengths. Importantly, the ECAMP process causes all environmental problems to be viewed "in the sunshine." Thus if a decision is made to

ignore an environmental problem that is deemed to be minor and inconsequential, that decision process is open to public review and critique.

The implication of this comment is that such a process might have non-military uses. This is not to say that the military's ECAMP is superior to a civilian program of similar scope and aim. Rather, the data suggest that what sets the military apart, and makes it more effective in many cases, is the acceptance of the ECAMP program as an integral component of the decision-making process *from day one*. Here the claim is not that the particular military program is best (although the military program is very successful), but that the ethic of always having a strong program is very significant. I posit that a *system* of ingrained analysis could be used in industrial and other private-sector applications.

LTC Seely believed that the Air Force was not a major source of environmental problems, although it depends on the definition of environmental problem. He noted that the Air Force is a major industrial complex with the potential to produce significant environmental damage. In some respects, the Air Force had been similar to other American industry over the last two or three decades, in that the Air Force has tried to conduct programs in accordance with what was required at the time. In hindsight, the laws and regulations were inadequate, and thus the Air Force has suffered from the same environmental problems as other industry. But as of today, LTC Seely believed the Air Force was "extremely responsible" on environmental matters and has accepted the responsibility for what has been done in the past. The military has operated much more openly on environmental matters than has industry, to include such actions as massive records searches to find where on bases being closed toxins were ever stored. Private industry, he suggested, is much less likely to maintain such records or to be willing to point a finger at itself for past transgressions.

In LTC Seely's judgment, the military was more part of the solution than it was part of the problem today. He pointed to the efforts of the Air Force to increase

environmental expertise (to include, he noted, the funding of this author's doctoral studies) as evidence of the seriousness with which environmental issues are handled by the Air Force today.

LTC Seely's opinion was that military operations were not, by definition, bad for the environment. The defense industry is an industry, similar to other sector of commerce such as the automotive industry or the commercial airline industry. The military does drive land vehicles and aircraft, and therefore has similar problems to these industries. The military, however, is no worse and is generally better.

The role of the government was, in the view of LTC Seely, to protect the people using the knowledge and insight unique to governments. The government must make sure that "Big Brother Industrialist" doesn't run over the common folk. The government owes the people responsible, efficient policy.

Major Michael Turner, Ph.D.

Major Turner is an Assistant Professor of Civil Engineering at the United States Air Force Academy. He holds masters and doctoral degrees in environmental engineering, from the Universities of Cornell and Texas, respectively. He served as a base environmental engineer prior to his assignment to the Academy faculty. He is expert in air and water pollution technology, to include bioremediation of soils and groundwater.

Major Turner believed there were a number of potentially serious environmental problems facing policy planners. Ozone depletion, global warming, and other potential threats to health pose threats, and Major Turner believed that no one really has a good handle on just how large or how threatening these problems are. Bureaucratically, Major Turner was concerned about the EPA's legislative process on military actions. He was troubled by the way the EPA defines "how clean is clean." Historically, military standards have been based on health impact, as he believed they should be. The risk assessment

process, however, is not being done well. He noted that the environmental engineering community and the toxicology community have yet to get together to craft quality risk assessment guidelines. Thus the legislative and regulatory bodies are unable to create precise specifications for removal and control of contaminants.

This difficulty illuminates the complexity created by the broadened definition of national security discussed earlier. When threat was narrowly defined in terms of bombs and rockets, military planners had little difficulty in determining the threatening nature of aggressive behaviors. The more subtle yet significant threats posed today by toxic ground water plumes, for example, may be far more challenging to assess.

As an example, Major Turner spoke about the Installation Restoration Program (IRP) project underway at the Air Force Academy. This DOD-wide environmental program is the military's version of the Superfund, run in cooperation with the EPA, the Pentagon, and local authorities. At the Academy the rifle and pistol range was identified as having, not surprisingly after thirty years of military firearms training, a lead contamination "problem." The man-made hill directly behind the targets contained tens of thousands of spent bullets. This was, by the definition of the existing regulatory authority, an unacceptable situation requiring a remedy.

Under the risk assessment guidelines in effect the Academy was required to "sift the soil" to remove the bullets. Major Turner pointed out that the range was still in use, and that additional bullets would be fired into the hill in the future. In addition, a series of tests on the ground water in the area showed that there was no lead contamination, meaning that the lead from the bullets was not leaching into the soil, but rather was remaining intact. Thus the decision was ultimately made not to sift the soil.

This inconsistency and lack of clarity in environmental administration of the IRP are neatly demonstrated in an identical problem facing the rifle range at the now-closed Wurtsmith Air Force Base. During the base closure process, the State of Michigan's environmental personnel noted the same lead problem as was found in Colorado and

directed that the soil be sifted prior to turning the area over for civilian purchase, despite the encapsulation of the lead in the form of bullets. The Air Force was obligated to comply before allowing the Oscoda Rod and Gun Club to buy the land--- that they intend to use for *their own* rifle range! A more rational approach, understanding of local conditions, is needed.

Major Turner believed budget and expertise were the main limitations on military environmental effectiveness. While there are increasing numbers of military environmental engineers, the Air Force still must rely on private contractors to an extent that disquiets Major Turner. He would prefer the military be more self-sufficient, and therefore more timely and effective in responding to environmental problems. In addition, the environmental assessment (EA) process is cumbersome and highly detailed. As an example he noted the time he certified a "finding of no significant impact" (or FONSI) for the installation of a stop sign at an on-base intersection. The environmental assessment process required that he list three alternatives and the relative environmental impact of each. Major Turner saw only two alternatives, either put up the stop sign or don't put up the stop sign. In this he was violating the regulatory requirements of the EA process.

Major Turner believed that the environmental role of the military is and should be the responsible stewardship of military acreage, and should be in the forefront of "demonstrating good environmental conscience." Those in the military must recognize that the armed forces have to clean up the residue of traditional military functions. The major thrust of military environmental attention should be to the future and the prevention of environmental problems of military origin, stated Major Turner. The military must fix the problems of the past and must resolve not to do additional damage in years to come. It is much cheaper, Major Turner noted, to prevent than to clean up.

If the military has an expertise that could be of use in mitigation of environmental problems outside the military, Major Turner believed it appropriate for the military to become involved. We should share what we have learned with the non-military

community. As examples he pointed out the military's advancements in cleaning solvents that do not contain CFCs, and other basic military research programs that offer spin-offs in non-military applications. Major Turner's views buttress the juxtaposed collective action suggestion made earlier. The suggested spin-offs would represent useful free ridership.

Major Turner viewed the Air Force's environmental history as similar to other industries. In the past the military has been a significant source of environmental damage. Now, however, the military is moving more rapidly than industry in the direction of environmental responsibility. The military is doing an adequate job in dealing with its environmental problems today, and will continue to do so as long as the military is funded and directed to do so.

Thomas G. Gallogly, MS

Mr Gallogly is the Chief of the Environmental Flight at the United States Air Force Academy. He is in charge of all Academy environmental programs, and oversees such activities as base recycling, composting, hazardous materials, environmental assessments, natural resource programs, and environmental planning. He works within the base civil engineering structure, an organizational location consistent with nearly all environmental programs Air Force-wide. These programs will receive a more detailed examination in the Academy case study contained in Chapter 6.

Mr Gallogly is an engineer by training, holding an MS in environmental management, as well as an MBA in production and operations management. Prior to coming to the Air Force Academy, he was director of all Air Force environmental programs in the state of Alaska, to include spill response and flight training operations. Thus he has had a wide ranging environmental experience within the Air Force.

Mr Gallogly was troubled by the way in which environmental problems were prioritized and put into a proper prospective. He noted that the Council on Environmental

Quality conducted interviews with scientists and with citizens generally, and found little agreement on which problems were most environmentally significant. Public perceptions, he felt, do not match the scientific reality. Thus political pressures, and not scientific imperative, tend to direct environmental spending. Mr Gallogly thought the vast amounts of money spent on removing asbestos, for example, that was already safely contained and sealed (and thus of little danger to anyone) was indicative of the dominant pattern of environmental policy. Recent scientific studies (see Reynolds 1992; Gold, Garfinkel, and Stone 1994) support Gallogly's contentions.

Limitations on funding and staffing (both in numbers and in expertise) concerned Mr Gallogly. High turnover and staffing limitations have made the implementation of quality environmental policy more difficult, he said. In addition, he believed there remain pockets within the Air Force where environmental personnel, and environmental programs, are still viewed as an impediment to the "real" Air Force mission. He did believe that there was an increasing awareness of the utility of maintaining environmental quality on military lands. The ability of the military to conduct training outside military reservations is enhanced when local populations believe the military has done a good job of environmental protection on its own ranges.

Mr Gallogly believed the role of the military in environmental matters should be largely the same as what should be expected of industry. He believed the military should protect the resources entrusted to it, and to follow the goals and objectives of environmental laws. He did not believe the military should try to get ahead of everyone else, as it may not be the military's role to develop new technologies to, for example, clean up toxic waste. He noted, however, that often the EPA and industry abdicate the leadership role, and the military ends up taking the lead. He suggested that colleges and industries should be given grants to fund developments.

The military should not, in Mr Gallogly's view, be limited in action to a very narrow range of war-fighting activities. He noted that, for example, military ranges

preserved for operational maneuvers have become important wildlife preserves. Thus the military has an important responsibility to maintain and protect such resources.

Mr Gallogly believed the common thread of success in Air Force environmental programs is having a definite objective. Specific goals, such as protecting a habitat, complying with base closure guidelines, or cleaning up a particular site, allow for "a target to shoot at" and for a clear understanding of success or failure.

The military can be an important factor in non-military environmental problems, Mr Gallogly believed. He noted that during his tenure in Alaska, the Air Force and other military organizations cooperated in a pilot program for the storage and delivery of oil containment booms for oil tanker spills. This capability has yet to be exercised, but offers an example of the kind of military-civilian environmental cooperation that is possible and desirable. He did, however, see a danger when a civilian population becomes too dependent on the military. The trauma associated with closures of bases, ship yards, and similar military facilities demonstrates the dangers of becoming too closely tied to military operations, that are, by definition, ephemeral. As noted in the preface, the issue of the DOD as a social welfare organization is a complex one.

Mr Gallogly believed the "old" military was a significant source of environmental problems. The military of the Cold War created many hazardous waste sites, and military research and development drove some industry to engage in environmentally damaging behaviors. A narrow definition of national security and threat allowed the US military and its industrial partners to hide environmentally damaging activities behind a veil of secrecy and security. Here he foreshadows similar comments and concerns by Brower, Denver, and Gordon.

This activity, he believed, was now in the past, and the military was not currently a major source of environmental problems. Overall, the military was doing a good job in dealing with environmental problems, especially since many of the laws dealing with environmental matters are not designed to understand military operations and needs.

Mr Gallogly did not believe that military operations were by definition bad for the environment. The military was not significantly different than other industrial sectors of the economy with similar missions. He noted that the military was actually a better steward of its lands and resources than most industries engaged in similar activities. As an example, he noted that the damage done to fragile deserts by tanks pales in comparison to the damage done to the deserts by legions of four-wheel drive off road vehicles in the name of recreation.

Mr Gallogly saw his organization's role as being a facilitator for the rest of the Academy's environmental efforts. With the expertise and talent in his organization, he believed he can teach and offer opportunities, but the basic duty of environmental protection falls on all military and civilian personnel at the Academy. This view echoes the comments of Mr McCall and his vision of SAF/MIQ. Where Mr McCall looks at the entire Air Force as a constituency, Mr Gallogly looks at the community that is the Air Force Academy.

Mr Gallogly saw the role of government from an economist's perspective, with a governmental duty to regulate commons issues, and to provide defense and infrastructure. The government owes the people a societal framework within which private interests and industry can arise to serve particular needs. An active government is needed in order to grow with the people and their needs. An overactive government makes things too cumbersome, and is to be avoided.

The Environmental Protection Agency

Marilyn Null

Ms Null is 14 year EPA veteran currently working in Mr McCall's office at the Pentagon. In a program which many governmental organizations share, her services have

been "loaned out" to the Air Force for a six-month period. Her first twelve years with the EPA were spent in the Denver region office, where she was heavily involved in military base issues in Colorado, Utah, and South Dakota. There Ms Null focused on the relationship between regulatory agencies and military organizations. She co-created a joint training program in 1992 designed to "build more effective working relationships between the Air Force and the EPA" (Null,1). She therefore has a unique and valuable point of view, able to see the strong and the weak points of each organization. She was enthusiastic about speaking with me, and excited by the notion of expanded Air Force environmental efforts.

An environmental issue of concern to Ms Null was ground water supplies. Ground water is a limited resource, and Ms Null believed we are reducing it too rapidly. She was also very concerned about the amount of time and resources being put into other "problems" with minimal risk. Due to the political pressures placed on the government by local communities (communities that are often unnecessarily scared, Null noted) the EPA and the government spend time and resources to repair problems that are fairly minor from a scientific point of view. As an example, she noted that air contamination is often less dangerous than other forms of pollution, but that vast amounts of money are spent in monitoring tiny fluctuations in the levels of relatively benign chemicals. At the same time, the government fails to address larger, but less politically potent, problems such as toxic plumes leaching from old dump sites (see Anderson and Leal 1991; Gold, Garfinkel, and Stone 1994). The challenge to decision makers Ms Null suggested was to find a way to make effective decisions that include not only the "stress factor" of a problem, but also the real risk presented by a problem.

The effectiveness of the EPA was limited by several factors in Ms Null's opinion. The first factor she volunteered was "the law." She believed her ability to be effective and efficient are limited by her agency's often awkward legal requirements and regulations. She also believed she was hampered by limited resources, including people and money.

With regard to her own work with federal facilities, Ms Null believed her effectiveness was limited by the lack of enforcement tools. It was not in the military's tradition, Ms Null noted, to allow "outsiders to muddle around in its business." National defense has traditionally been a closed world, where environmental concerns were not of significance.

Ms Null believed the military has a structure in place that could be utilized much more effectively in environmental compliance. The command-and-control system, the access to resources, and the knowledge and skills to deal with technical problems makes the military, she believed, a potentially powerful force in meeting environmental challenges. She believed we ought to use the military to do much more of the work that can be done on environmental problems. She believed that such actions would be the efficient and effective use of United States resources.

The rapid deployment and response abilities of the military should be used, Ms Null believed. The structure and command-and-control features of the military can "make things happen." This position is consistent with the broader conception of national security espoused in this work.

There were several tools and talents found in the military that Ms Null felt would be useful in the environmental area. The ability to conduct wide-ranging sampling and the capabilities of military laboratories were two areas in particular where increased environmental activity by the military would be especially efficacious.

The military, by virtue of its size and the nature of its activities, was a significant source of environmental problems, according to Ms Null. Specifically, the mixed waste found at military (and DOE) facilities, the jet fuel contamination of soils, and the nuclear waste problems of military facilities present a daunting challenge to environmental compliance. The size of the military and the traditional mission of military forces creates many environmental problems.

The military was, however, "getting there" in terms of its environmental compliance. There was, Ms Null believed, some resistance from the military to comply

with EPA practices for environmental problems. Ms Null noted that when a problem is found, contaminated soils for example, the military response is to say "let's dig it up, deal with the problem rapidly." Such action is urged before a full determination has been done about how much dirt, how contaminated it is, and so on. The military need to be in "action" can cause things to be done too quickly, and the result is well meaning, but ineffective, environmental action. The case study of Chernobyl presented in Chapter 6 suggests the military can be an important actor in environmental disaster, but also illustrates the concern raised by Ms Null.

Military operations were not inherently bad for the environment when managed properly. The military has a very wide variety of problems to deal with, but on the whole Ms Null judged that the military was "far ahead of many industries in their pollution prevention programs."

Ms Null noted that prior to becoming involved with the military and its environmental efforts, she had a distrust of the military, a view common (she believed) in the EPA. This concern, as will be seen, exists elsewhere as well. When she began to work with DOD personnel, she came to the conclusion that military people were interested in environmental matters, and when educated were active.

The role of the EPA is enforcement. The organization is to ensure that environmental laws are enforced and complied with. In addition, the EPA provides technical support and assistance. Ms Null saw her role as team building and assisting people in pooling resources and building consensus with respect to enforcement and compliance. This pooling could and should include, she noted, the unique talents and tools of the military.

The role of government, according to Ms Null, was to serve the people. Unfortunately, the government is really a bunch of special interests wrapped into a large bureaucracy, Ms Null stated. Government owes the people protection from both military

attack and environmental attack. The government owes accountability, and an active government does not present a danger to the country.

The White House

Murray W. Hitzman, Ph.D.

Dr Hitzman is the American Association for the Advancement of Science/SLOAN Executive Branch Fellow. Following a year of work in the legislative branch, he is now serving a one year fellowship in the Office of Science and Technology Policy (OSTP). The function of the OSTP is to gather, collect, and make available to the President and the administration science and technology information, so that the administration can craft what it wants in science and technology policy. Dr Hitzman holds a PhD in geology and geochemistry, and worked for Chevron Corporation for several years where he focused on mineral deposits and environmental concerns. He served as Chevron's general manager in Europe prior to coming to Washington. His overall duties included planning and supervising large-scale projects such as mining petroleum. Last year Dr Hitzman worked on the staff of Senator Joseph Lieberman (D-CT), and with the Environment and Public Works Committee. His White House duties are to provide analysis and advise the President's Science Advisor, who reports directly to the President.

Dr Hitzman was personally most concerned today about waste management and waste cleanup. From a technical point of view, he was particularly concerned about contaminated ground water, a problem common to many military facilities.

He believed his organization was limited by several factors. He suggested that due to the large size of government, communication across the bureaucracy presents significant challenges to getting the work done. It was hard, he noted, to maintain the

necessary personal contacts with the many organizations. A great deal of Dr Hitzman's time was spent in trying to create and maintain communications networks for his boss.

The role of the military in environmental protection begins, Dr Hitzman believed, with the military's own sites, and keeping them clean. A second major area was the collection of DOD laboratories. This includes both the safe operation and cleanup of laboratory resources, as well as the development of technical resources for use in pollution protection. He hopes other governmental labs as well as the general public will profit from developments made in military laboratories.

Dr Hitzman was not troubled by the notion of the military becoming involved in non-traditional functions. He believed the question was somewhat moot, because he believed the military was already heavily involved in such activities. He noted that the military owns its sites, its labs, and its lands. Unless the government legally changes the responsibilities of the military (and exempts the armed forces from environmental compliance), the military will be compelled by the force of current law to engage in environmental compliance activities. The military has, he pointed out, a legal responsibility.

Dr Hitzman believed there were environmental problems for which assistance from the military would be useful. He noted that the military could be of use in waste management, as well as global scale issues such as climate change. The military has platforms that other parts of the government does not have, and the data from these platforms could be critical to solving various environmental problems. An example of such a platform is the ATOC, a Navy system of underwater listening devices. This system was designed to detect and track Soviet submarines. The same microphones can, however, track Sea mammals and gauge Sea temperatures by measuring the speed of sound through the Sea.

Dr Hitzman also believed the rapid deployment abilities of the military and the remote sensing capabilities of the armed forces could be used effectively to aid in

environmental efforts. He believed the military a significant but not major source of environmental pollution. He did note that many of the large cleanup problems were often defense related although not strictly DOD problems. He noted the example of the DOE and the radioactive or "red waste" left over from the Cold War. Dr Hitzman rates the military's overall performance on environmental issues as "pretty good." Military operations do not have to be by definition bad for the environment. He also believed that the military could be an important international partner on environmental concerns. He mentioned both the interface by the US military with counterparts around the world, as well as the military's ability to respond rapidly to international environmental crises.

The role of government was, Dr Hitzman believed, to let people come to their full potential. The government should facilitate, should be active in the helping of people. While any government presents dangers, the people can change the government if it desires. The government owes the people honesty.

Dr Hitzman's views are of interest for two reasons. He clearly was speaking what he believed was the policy orientation of the current President, and he repeatedly referred to the goals of the President, the Science Advisor, and the staff. Yet Dr Hitzman also has an extensive background in the petrochemical industry. That he would so fully embrace expanded environmental efforts by the military is thus doubly significant. While the current administration might have been expected to support programs that aid the environment, to have an oil company scientist concur so readily was somewhat surprising. Yet perhaps it should not have been, as the military oil boom delivery system discussed in Chapter 7 would most directly benefit petroleum producers.

The Congress

Robert Gillcash

Mr Gillcash is the military legislative aide to Senator Christopher Dodd (D-CT). He is responsible for national security policy within Senator Dodd's office, and is the key advisor to the senator on military, space, telecommunications, and base closure issues. Senator Dodd's leadership role in Democratic politics makes Mr Gillcash's role particularly important. Several respondents independently suggested speaking to Mr Gillcash, believing him to be a staffer of significant influence on Capitol Hill on matters relating to defense policy. Mr Gillcash began his national service as an Air Force officer, serving with the author on the political science faculty at the Air Force Academy. In 1991 Senator Dodd asked Mr Gillcash to leave active duty and to assume his current responsibilities.

Mr Gillcash was personally most concerned about air and water quality as environmental issues. In his view, Congress's ability to be effective on environmental issues was limited by two main factors. First, he believed the scope of the problem was quite large, too large in fact for any one actor in the policy process to have a big impact on the problem. Secondly, Mr Gillcash believed the mechanisms on the legislative side are such that there are many competing interests. Thus any issue has interest groups on all sides, with each pushing a particular set of views. The result was that by the time the policy is crafted, the legislation is "whittled down into something only barely resembling your original intention." This Madisonian problem of faction varies with size and influence of interest groups, the number of actors, and the necessity of coalition building and the requisite compromise and accommodation. Mr Gillcash noted that regardless of

the firmness of one's opening position and resolve, the legislative outcome will be less than was initially desired.

According to Mr Gillcash, the role of the military on environmental matters was on several levels. First and foremost, bases and other military installations are tenants, and should remember the "guest" status. In addition, the military has a responsibility as a representative of the federal government. For these two reasons, the military must be environmentally responsible in its own actions.

Mr Gillcash was generally supportive of the idea of using military resources on non-military environmental problems, but with significant caveats and limitations. In general, he believed the military should be limited to a rather narrow range of war-fighting functions, for both fiscal and philosophical reasons. The military budget is too tight to handle additional environmental spending requirements. Additionally, he said the Constitution was clear on the duty of the government to raise armies to defend the nation, but that the military mandate does not extend too far beyond that. However, Mr Gillcash was willing to entertain ideas of using military resources when it was cost-effective and also had no adverse impact on military readiness. He did believe that there are areas where military resources could be used; for example, engineering resources could be used to help a local community deal with an environmental problem shared by both a local community and a base. Where environmental activities, such as the delivery of oil containment booms to grounded tankers, potentially enhance both combat readiness *and* environmental quality, Mr Gillcash supports such actions. Such actions, Mr Gillcash stressed, must be narrowly defined. He does not support spending military resources on new environmental hardware or missions, but when existing capability and previously gathered information can be used to support environmental concerns, he is generally supportive.

In his view, the military is not, for the most part, a significant source of environmental problems today, and is currently doing an adequate job in dealing with

environmental issues. As evidence, he cited the willingness of the military to set aside environmental funding during the ongoing Base Realignment and Closure Commission process (BRACC). The military had, as its entering BRACC position, that all environmental problems would be cleaned up prior to turnover, regardless of the cost. This willingness to erase completely all environmental concerns on base closure was a dramatic demonstration of the military's environmental resolve, according to Mr Gillcash.

The opportunity exists for the military to be a significant environmental partner with other nations. The US military's role should be, however, limited to leadership and demonstrations of environmentally sound practices, and not the function of proselytizer.

The role of the senator's office was, in Mr Gillcash's view, to be one voice of a hundred in bringing forth issues and ideas of concern. The staffers must be facilitators of policy making so that legislation can be "made to happen." In addition, the office serves as an illuminator of concerns and issues, bringing public attention to bear on significant issues.

Government has certain basic areas of responsibility. There exists both a necessity to play a part in generation of revenues and oversight on spending, as well as an oversight of programs which the government has established in the best interests of the nation. The government must ensure that a high level of quality is provided in those programs it offers the people. In addition, the government must ensure order is maintained, although there will always be debates about the level and vigor of such actions.

Mr Gillcash believed the government owes the people fair and honest representation, equal and open access, and a sense of a greater good being accomplished at the least intrusive level of governmental activity.

Not surprisingly for a former military officer, Mr Gillcash's views were generally consistent with those of several military respondents and other governmental officials. The primary mission of the military, as stated in Chapter 1, is the traditional defense of the

US and its national interests. When this mission is accomplished, Mr Gillcash accepts the utility of the utilization of any excess capacity to serve environmental ends.

The government workers interviewed, both uniformed and civilian, support a broader definition of national security. These respondents also support a more comprehensive definition of threat and the role of the military, to include expanded environmental functions. This, I conjecture, is rooted in the philosophy in national service at the core of these respondents' belief systems. All believed the government owed the people hard work, effective representation, and efficient use of resources. Under this set of obligations, government workers see an environmental role for the military as an appropriate adjunct to traditional national defense duties. The government should, above all else, serve. Increased military environmental responsibilities were found to be consistent with this view.

Interest Groups

Fred Smith, Jr.

Mr Smith is Founder and President of the Competitive Enterprise Institute (CEI), a Washington D.C. think tank. The CEI is active in a variety of economic and environmental policy issues. Mr Smith's biography stated that the CEI works

...to educate and inform policy makers, journalists, and other opinion leaders on market-based alternatives to regulatory initiatives and engages in public interest litigation to protect property rights and economic liberty.

CEI has been referred to in the national media as a right-wing think tank, but it could be more fairly called hard-core libertarian in outlook. Mr Smith has achieved a measure of prominence within the environmental debate, and has appeared on such programs as the MacNeil Lehrer News Hour, Crossfire, 20-20, and has had editorial

publications in the Wall Street Journal, the Washington Times. He has authored contributions to a number of books on environmental and free market subjects. For five years during the Carter administration, Mr Smith served as a senior policy analyst with the EPA.

Mr Smith holds an economist's view of environmental problems, and advocates private sector/market force solutions. The government has, he believed, a fundamental problem not found in the private sector. In business, mistakes are capitalized upon by one's competitors. In the public sector, no such mechanism serves to mitigate poor policy choices. This argument lies at the heart of Mr Smith's views and judgments. Mr Smith saw privatization of resources as the key to resource protection and management. For example, he argued that private ownership encourages technological fixes, conservation of scarce resources, and overall environmental quality. He argued that private ownership would cause scarce resources such as redwood trees and whales to be highly valued, and therefore protected by far-sighted investors.

Mr Smith believed the approach of the Air Force should be much the same as the approach of a large corporation. The Air Force should endeavor to own the property in which it operates and uses in a primary way. It should have buffer zones around its more "obnoxious activities (e.g., waste disposal, bombing runs)." It should also seek to use high technology to monitor flows (of pollution) from its property to adjacent property. The Air Force should seek ownership over groundwater aquifers it must use, and "wall off" the aquifer from neighboring water supplies.

The environmental problem that concerns Mr Smith the most was the failure to adopt the institutional framework outlined above. Specifically, he was frustrated by

the failure to extend to the environmental field the tools, the institutional arrangements, that have made it possible to do so well in the economic sphere, [and by] the presumption that environmental policy is political policy and therefore the refusal to change the institutional paradigm by which we address environmental problems.

Without a market, Mr Smith argued, you don't really know if the needs of the people are being met. We can't know what we should be doing environmentally without an institutional framework that allows people to express preferences. You can't accomplish much without private property. Socialism doesn't work in the environmental field, Mr Smith noted, any better than in any other field.

Mr Smith believed it would be very dangerous for the military to extend its operations into non-traditional areas. The danger is based in competition. Do we want, Mr Smith asked, for the military to be the ones providing services such as satellite communication? Bureaucracies were not designed to meet needs. Companies must be open to doing what the customer wants, or they don't survive. It is very hard for any bureaucracy to respond to the subtle nuances of market needs.

There was, he believed, a technology transfer role for the military. For a period of time, the technologies and talents developed in the military will need to be transferred to the market place by the military. This role was, however, minor and brief.

Mr Smith believed that government was a major source of environmental problems today, and the military was part of that overall problem. This was largely due, he believed, to the actions of the government from 1870 and on, where the government reduced the rights of property owners to prevent the intrusion of government-generated pollution onto private property. The hundred years of government encroachment on private property rights allowed the military to damage its sites to the point where most military bases are now Superfund sites. Part of this problem was due to the inherent nature of military operations. Yet the military has been more responsive than many governmental organizations (such as EPA). The military has been more disciplined than other social welfare organizations. In particular, the military has a stronger record of compensating displaced private property owners than other government departments.

Mr Smith saw his organization as a "change force." CEI is attempting to explore alternatives, to develop the moral and intellectual arguments for the changes, and examine

what were the impediments to those solutions being adopted. He describes himself as a classic liberal libertarian. He saw the best government as that which governs least. Government is necessary, but always dangerous. The challenge of our society is how to create a "leviathan that is always hobbled." The government owes the people restraint, and to say "that's not our role" more often.

Mr Smith was a very strong supporter of allowing market forces to drive nearly all aspects of society. He believed, for example, that insightful entrepreneurs will stop deforestation absent governmental interference, by recognizing the future value of a stand of old growth forest. His view of national security was far narrower than all but one of the other respondents. Mr Smith saw the military's role strictly in terms of warfighting. His rejection of any environmental role for the military stems from an overall certainty that government as an entity is simply unable to do nearly any job as well as those with vested property rights. He was not anti-military, but rather anti-government.

Jerry Taylor

Mr Smith's views were echoed by Jerry Taylor, the Director of Natural Resource Studies for The Cato Institute. In this role Mr Taylor oversees the environmental studies sponsored by his organization. Unlike many think tanks, The Cato Institute does not employ a staff to conduct research and analysis. Instead, it funds scholars and others around the country to do research from their local base of operations. Jerry Taylor is the sole employee of the Natural Resources Studies division. The political philosophy of The Cato Institute is largely libertarian, with the view that the reach of government should be very limited. Mr Taylor was in agreement with this view of the world.

Mr Taylor's standards for what was and was not an environmental problem, and what steps (if any) should be taken, were economic cost and human inconvenience or injury. If a "problem" does not cost dollars and does not hurt humans, it was not really a

problem. For example, Mr Taylor noted that deforestation was not a problem, as timber prices are down, meaning, he explained, that supply must be adequate.

When asked about which environmental problems he was most concerned about personally, Mr Taylor offered a very interesting reply. He stated that there were no significant environmental problems in the developed world, with the possible exception of non-point source pollution. The only significant environmental problems exist, Mr Taylor argued, only in less developed nations (LDCs), where such problems have their root in the "grinding poverty" of their economic system. problems that were very easily curable, such as poor sanitation, Mr Taylor noted, kill 8-9 million women and children per year. Mr Taylor noted that these problems were due to bad economics and not due to poor regulation. "The planet is in far better shape than anyone in the environmental movement is willing to concede and even better than most people or politicians realize."

Mr Taylor strongly opposes any non-traditional use of the military. He felt that the military should be small, and dedicated to the specific purpose of warfighting. He did not feel it serves anyone's purpose to have a military "leviathan" operation that was involved in dozens of activities that have nothing to do with what they were set up to do. Mr Taylor thought such expansion would be wrong for a number of libertarian reasons, but also due to his belief that such activities would reduce the military's warfighting skills, which could result in high costs in times of war. He did not believe there were any environmental issues where assistance from the military might be useful or appropriate.

The military was not, in Mr Taylor's view, a major source of environmental problems. He argued that this was true because there were not any really serious environmental problems. Unless you wish to build a home directly on some of the contaminated soils of military bases, there was no real problem for people from the military. He argued that military pollution sites do not threaten anyone.

Military operations were neither profoundly good nor bad for the environmental, Mr Taylor argued. He felt that the environmental impact of military operations was

“minuscule,” but not zero. Thus military operations were by definition bad for the environment but not in any important way.

When asked about the dangers an active government presented Mr Taylor quoted George Washington, saying that government is like fire: a dangerous servant and a terrible master. The only job government was supposed to have is to protect individual rights. Some 200 years later, Mr Taylor believed that government has “run amuck” and was engaging in income redistribution and policing society. Today’s government bears no resemblance to what the founders intended. Mr Taylor concluded that “government presents the most profound and most direct threat to people anywhere on the planet.” The most dramatic body counts in history, he noted, have been caused by government (e.g., Stalin, Pol Pot). In our country the independent streak in the American people has prevented such dramatic abuse here. Mr Taylor stated that the New Deal of President Roosevelt was modeled on Mussolini’s Fascist system of economic organization. Government is dangerous.

Mr. Smith and Mr. Taylor represent an interesting alternate view to the modal position of respondents. I believe the significant point of departure from this set of views to that of those who support expanded military environmental efforts comes from alternate views on the role of government. When asked what the government owes the people, the majority of the respondents had no trouble listing a number of collective goods ideas such as security, opportunity, freedom, clean air and water, and others. With this view of government, it is not a significant departure from ones’ belief system to support the concept of expanded military environmental programs. But when ones’ view of the role of government is more restricted, such roles make little sense. The libertarian view holds that government owes the people only a very few collective goods, with traditional defense and liberty the usual examples. Beyond that, the libertarians say, the government owes little beyond staying out of the way. Thus the difference of opinion is rooted in

philosophical divergence on the structure, functions, and obligations of government, and not the particulars of military environmental policy.

Jay Hair, Ph.D.

Jay Hair was for 14 years the head of the largest private environmental education organization in the world, the National Wildlife Federation (NWF). Dr Hair also is serving a two-year tenure as president of the World Conservation Union (IUCN), and has been named President Emeritus of the NWF. At the time of this interview Dr Hair was still the president of NWF.

With an annual budget in excess of \$100 million and 4 million members world-wide, NWF is an active player in crafting environmental policy. Dr Hair has testified before Congress on many occasions, and served as a member of a special advisory committee to the United States Trade Representative for the North American Free Trade Agreement (NAFTA), where he advised on the environmental consequences of free trade. Under his leadership NWF has engaged in an outreach program with business, and has sought to become what Dr Hair's biography describes as a "common sense conservation organization." He holds a doctorate in zoology. Dr Hair has been a friend of the author for several years.

The environmental problems that most personally concern Dr Hair today were at two different levels. First he was concerned about the overall loading of the biosphere with chemical pollutants, ranging from the release of carbon dioxide to the host of chemicals used in industrial processes. The second level was development and how it affects the viability and functioning of ecosystems, to include both terrestrial and marine environments.

Dr Hair thought his organization's ability to be more effective was limited by the budget. In addition, Dr Hair felt that it was difficult to create a "consistent vision" of what

has been the environmental success stories of recent years balanced with those problems which were yet to be solved. The problem is trying to define in realistic terms what these problems mean to people in terms of their quality of life in everyday terms. His working relationship with Congress has also been an obstacle recently, impaired by what he calls the "angriest, nastiest, most arrogant Congress this nation has ever seen."

Dr Hair was one of the few non-DOD people with whom I spoke who had military experience, having served as an Army officer in Vietnam. There were, in Dr Hair's view, several roles the military can play in environmental protection, as well as several points of concern. He noted the military's history of dealing with "unpleasant materials" in the past such as nuclear waste, a variety of toxic chemicals, and an assortment of ordnance. All these substances have profound environmental consequences, both in terms of their use and of their storage and safe handling. The military could in times of crisis help directly, and in other times transfer the knowledge and technology to the private sector. This suggestion nests well with the juxtaposed collective action argument.

Dr Hair believed the DOD has a responsibility to conduct its affairs in a manner which is environmentally responsible. In addition, he believed that the DOD facilities that have large tracts of land are special. As noted in the introduction to this dissertation, an unintended consequence of the Cold War and the associated military structure was the fencing off of some 90 million acres of military range lands. Dr Hair believed that these lands represent very valuable and important resources of open space that need to be managed for both national security needs and natural resource needs. Dr Hair noted NWF's efforts recently to identify special environmental resources on bases listed for closure. NWF is attempting to help maintain the environmental niche that the DOD no longer oversees on these former military bases.

Dr Hair would not be troubled by expanded DOD environmental efforts, and stated that he was, for example, one of the strongest proponents of the Army Corps of Engineers taking on a much stronger role in the administration of the Superfund.² He

quoted the former head of the Corps as stating that his goal was to make the Corps the "Corps of Environmental Engineers."

In addition, Dr Hair would like to see the military continue to be proactive in environmental matters and the management of natural resources under DOD jurisdiction. The talents and tools of the military could be particularly useful in remote sensing and military technology applications. The ability to examine and map effluent flows into water supplies, for example, would be "enormously good." Dr Hair saw an advantage to DOD by articulating to the American people how investment in defense technology is benefiting civilian quality of life. DOD environmental efforts should not, in his view, be limited only to base cleanups.

The military was a major source of environmental problems in Dr Hair's view. Some of the most significant environmental problems in the United States were due to nuclear waste problems at DOD facilities and DOE locations with DOD links. He believed that in the past four to six years DOD had made significant improvement in handling environmental matters. Dr Hair believed that DOD understands now that some of the most difficult environmental toxics are nuclear waste and other military waste chemicals, and that now DOD is dealing with them.

In his view, military operations were not by definition bad for the environment. Like any activity, if taken to the extreme, or not managed carefully, military operations could be harmful. But in general, such activities need not be damaging.

Dr Hair went on to say that he thought the military could be an important international environmental partner. He believed there was a whole new series of organizing principles that are coming into use now with the end of the Cold War. These new organizing principles have "as their nexus" the environment. These principles range from dealing with major environmental problems like flood control and waste management to subtler issues of sustainable development. In all those areas, Dr Hair saw that we would be well served as a nation to use our current military capacities. The United States

should strive, not to be the worlds remaining "superpower," but to be the world's "superfriend." He believed that we should use the enormous capacity of the military to assist us in reaching a better world.

This view is appealing, but may be more emotional than substantive. It is unlikely in an era of budget reductions and a Republican Congress that the military will undergo any significant transformation of function from traditional security. I would oppose such a conversion, and believe environmental missions are acceptable only after established national security obligations are met.

The role of government is to set rules and regulations, to provide for national security. The government should set requirements and expectations, but not to mandate the means by which they are going to be achieved. Dr Hair believed the marketplace should decide on strategy. This view is a blend of the more libertarian views expressed by earlier respondents and the broader view of government mentioned by others. This reflects, I believe, the necessary merging of environmental idealism with Washington reality. If a lobbyist wishes to achieve policy goals, he or she can be neither too far ahead nor too far behind the institutional orientation of the Washington establishment. Dr Hair's 14 years within the Beltway taught him that the politics of the environment often muddle the science of the environment.

Nancy Azzam

Nancy Azzam is a member of the United States delegation to the International Whaling Commission (IWC). She holds the position designated to represent to the IWC the views of the dominant US environmental interest groups. In this role, Ms Azzam must balance the demands of an energetic and often disparate constituency. She has conducted negotiations with whalers from Japan, Norway, Iceland, Denmark, and the native peoples of Barrow, Alaska.

Ms Azzam has been on the Board of Advisors of the Windstar Foundation since 1976. She also serves as the conservation chair of the American Cetacean Society, and works with the "Free Willy Foundation." Ms Azzam has been a friend of the author for several years.

Ms Azzam was greatly concerned about degradation of the oceans by human activity, including dolphin mortality in tuna nets, fishery depletion, and whale stock reduction. Ms Azzam strongly supports expanded DOD environmental efforts. She felt the military and the impact of the use of military technology could be of particular use in two key oceanographic areas, tracking pollution and counting whales. Whales are best counted from the air. Ms Azzam noted that the major source of discord between whaling and non-whaling nations was the debate over the true size of whale populations. Currently some volunteer pilots are engaged in survey activity, but on a much smaller scale than is needed.

The utilization of scheduled military training and operational flights strikes Ms Azzam as an especially synergistic use of taxpayer dollars. Both sides might gain significantly, beyond what their own individual actions might bring. This would be a very literal example of "free riding," with environmental staff from potentially several different IGOs, NGOs, and government departments riding along to make the count. This situation would be a nice fit with the alternative collective action argument made earlier. Routine training, re-supply, and maintenance missions would perform a double duty to both traditional military needs and environmental improvement. Additionally, many whales are now radio tagged, and could be tracked from military aircraft. Ms Azzam believed such surveys could also be incorporated into a satellite ocean imagery program.

Ms Azzam believed the military should be engaged in a wide array of non-military activities. "It's our tax dollars that have given [the military] the technology [which] would be useful on environmental issues."

The military was a significant source of environmental problems in the past, the Navy in particular in terms of ocean dumping of waste materials. Currently however, Ms Azzam felt the military was doing well on environmental matters. Military operations do not have to be inherently bad for the environment, except in such things as bombing practice. If restricted to practice ranges and honestly reported, military operations should not be necessarily bad.

Ms Azzam felt the military could be an important international partner on environmental matters, as the military has the resources, knowledge, and technology to divert other countries from environmentally unsound practices.

The role of government is, in Ms Azzam's view, to be mentors, leaders, representatives of the people, and teachers. The government should "show the right way" by teaching and representing. The government owes the people truthfulness and accountability.

David Brower

It is no overstatement to say that David Brower is one of the most significant activists in the history of the American environmental movement. Now in his eighties, Mr Brower maintains a tireless schedule of speaking and working for environmental quality. He is currently the Chairman of the Earth Island Institute. Mr Brower joined the Sierra Club in 1933, and became its director in 1952. Under his leadership the organization grew from 2,000 members to 77,000 members. In addition to Earth Island Institute, Mr Brower founded Friends of the Earth, The League of Conservation Voters and others. Highlights of his many awards and honors include his twice garnering a nomination for the Nobel Peace Prize, and nearly a dozen honorary degrees. The most recent of his over-twenty books is the thought provoking *Let the Mountains Talk, Let the Rivers Run* printed on paper made from grasses.

Mr Brower believed quite strongly in the appropriateness of expanded and energetic military environmental work. In his autobiography *For Earth's Sake: The Life and Times of David Brower* he devoted several pages to the idea that the military should be required to rebuild that which it must in war destroy. In the interview, Mr Brower expanded on that idea to suggest that the military can and should quickly expand its efforts to help environmentally, beyond repairing the destruction of war, to many new areas where the armed forces' technology and expertise could be useful.

The greatest environmental concern to Mr Brower today was what he viewed as an unending growth in population and resource use. He noted that the population of the United States has, in the last 50 years, used more resources than all the rest of the world in all previous history. This has resulted in significant equity problems, and a world where the 378 billionaires in the world (with over 200 in the United States alone) have more collective wealth than do the poorest two billion people combined.

Interestingly, Mr Brower felt a major limitation on the effectiveness of his environmental interest groups (as well as most environmental groups) is a lack of broader coalitions and cooperation between environmental groups and other parts of society, including the military. A Prisoner's Dilemma scenario with resulting limits on cooperation, communication, and trust seems to model Mr Brower's view of the situation. As various factions compete for resources, membership, and influence, opportunities for cooperation and environmental improvement are lost.

This situation is not healthy for the groups or for the environment. All actors in the policy process need, Mr Brower stated, to look to overall outcomes of decisions, and not minor details. For example, Mr Brower noted that economists were able to "cost" a tree in terms of its value in pulp or boards. They were not, suggested Mr Brower, able to cost out the value of carbon dioxide storage, oxygen production, soil protection, water filtration, and beauty.

Mr Brower stated that he did not see any aspect of the military's operations that can not include what he calls "the other part," the notion of restoration. He argued that the large budget and special skills of the military present great opportunities to more fully use DOD budget dollars. He believed, based on discussions with a former Secretary of the Army and several retired generals, that the military could and should embrace higher levels of environmental awareness.

The United States military could be an important international partner on environmental concerns in Mr Brower's opinion. He made the analogy to the movie and stage play *West Side Story*, in which the cop on the beat was trusted by all sides to do what is right. Mr Brower believed the United States military could have a similar role in providing trusted advice and work in other nations.

The goals of Earth Island Institute and the other environmental organizations with which Mr Brower is associated are simply "to keep the earth habitable" and to put a "completely new priority on restoration." He noted that when he began writing on environmental concerns in 1934, the word "restoration" did not appear. Only in the last five years has he himself begun to see restoration as critically important. Prevention alone is not enough, he believed, we must also repair.

Mr Brower's support for a program of international cooperation, with the United States leading, is an illustration of a possible real world tit-for-tat strategy within the PD game. He noted that nations were not able to trust each other in the process of growth and extraction, and must work very hard to grow and extract additional resources. Mr Brower believed the United States must reach out to cooperate with others for the sake of future interactions. With the US taking on the role of a cooperative actor who forgives defection, environmental cooperation is more likely within reach.

Mr Brower put his own role within this organizational structure rather poetically. He saw his own function, now that he is in his ninth decade, to "stick around and bitch." He felt his role was to help others learn to "cost the earth" and "cost the future" in

economic terms. He stated that we as a culture were very good at calculating monetary costs and benefits from traditional investments, but we do a poor job at evaluating the costs of decisions to the earth itself, and to our own future.

The government owes the people, in Mr Brower's view, a chance to be recognized as people. Mr Brower observed that in order to be elected to high office today, a candidate needs to have, or have access to, great wealth. Thus the government is dominated by those with great affluence. An active government does not present a danger to the people. He felt that a government that is not "indentured" will be a good one.

The Media

Rolland Smith

Mr Smith is a journalist with KNSD, the NBC station in San Diego, with over thirty-five years of television news experience at both the local and national levels. He has long been deeply involved with environmental issues, both as a reporter and as citizen. His reporting credits include being the sole journalist invited to participate in the 1985 "Live Aid" concert, anchoring the global telecast to 107 countries and an audience estimated at 2 billion. He anchored "Our Common Future," a five hour special on the environment with world leaders and performing artists. Mr Smith also hosted the first environmental broadcast from the then-Soviet Union entitled "Earth Alert: A Global Forum." He has won nine Emmys for excellence in broadcasting. He is also a close friend of the author.

Mr Smith was particularly concerned today with the issues of deforestation and biodiversity. He believed that the ability of government, interest groups, and business to deal effectively with environmental problems was hampered by lack of vision, concern,

and resources. The lack of vision, he suggested, was shown in the inability of most public and private policy makers to see beyond one's own generation. A longer view is needed.

Overall, Mr Smith was supportive of DOD's environmental efforts, within limits. He was not precisely sure what role he felt the military should play in dealing with environmental challenges but did believe the military can serve as a useful example of doing things right. The military should seek to clean up its own environmental pollution, and then lead the way in maintaining a quality environment. The military should, he believed, demonstrate both the ability to wage a war of might (traditional armed conflict), and the ability to wage a "war" on the environmental challenges he felt threaten our planet's future. He would like to see the military make use of its special tools and talents to assist in environmental crisis such as oil spills. Mr Smith believed the quick reaction time and unique talents of the various military services renders them particularly useful in such crises.

Mr Smith did not believe that the military was a particularly egregious source of environmental problems, but was not satisfied that the armed forces were doing all that they should to remedy environmental ills. The sheer size of the military, with the technology, personnel and resources that it entails, means that DOD could be doing more environmentally. He believed that the military could be an important partner with other militaries around the world, particularly in leading by example. He would like to see the world's militaries come to understand the role they could play in a "war" against environmental degradation.

The government owes the people a variety of services, in Mr Smith's view. In particular, the government should administer the laws that are the core of our national system. In addition, the government must be willing to change as the needs and desires of the citizenry evolve and develop. An activist government presents some dangers, but he noted that in the past governments have been active in some areas, while remaining less active in others. This strategy is what Mr Smith believed makes sense in terms of

environmental concerns. He supports a strong, active role for government on environmental issues, and a less active role in others.

The Activists

The next two interviews were with environmental activists who are more well known publicly for their work within the entertainment industry. Both individuals have, however, turned much of their private time to aggressive environmental lobbying and activism. Each heads environmental organizations designed to educate and illuminate. These organizations target government, industry, and the public through a variety of environmental programs. Their views on the questions in this dissertation reflect years of grass-roots organizing and concern.

Dennis Weaver

Dennis Weaver is a well-known actor and an activist on environmental matters. His energies have been primarily directed toward alleviating hunger and toward energy use awareness. He was the recipient of the 1986 Presidential End Hunger Award. Mr Weaver was active as a citizen participant of the UNCED conference in Rio, and speaks to numerous groups around the globe on environmental issues. In 1994, Mr Weaver founded the 501(3)C organization the *Institute for Ecolonomics*. This foundation combines an interest in ecology with an understanding of the need to utilize market forces and venture capital in developing technologies that are environmentally friendly. The Institute sees a central nexus between environmental concerns and economic issues. Mr Weaver's biographical background sheet stated that:

[F]or every environmental or economic problem, the solution already exists in the mind of an inventor, innovator or entrepreneur. The goal of the Institute is to find them, support them, and connect them to those with the

expertise to bring those solutions to the market place. In other words, to create an environmental industry...jobs that do not destroy the place we live (Weaver, 4).

Mr Weaver felt that a major impediment to solutions to environmental problems was the difficulty inventors face in getting new ideas and solutions tested. Good ideas don't get a full public airing, and thus fail to earn a market share that would make the technology commercially viable. In this area he was enthusiastic about the involvement of the armed forces. Such involvement would best come, he believed, on two levels.

First he believed that the insight and inventive power of the military could be used more fully on environmental issues. Specifically, the military solutions to military toxics, air quality, and other environmental problems may have wider public utility, and should be used by more than just those in uniform. The nation was threatened by such problems, he believed. This view echoes that of several others who concur with a broader definition of national security.

Secondly, Mr. Weaver believed the military could be an important validation tool for environmental technologies invented by civilians. If the armed forces demonstrated the utility of some new environmental technology, venture capitalists would be more willing to invest money than they would in some unproved commodity.

Philosophically, Mr Weaver believed the DOD should expand its scope and vision on environmental affairs greatly. He felt such a policy could both enhance national security and provide a very important public service. He stated that the military has demonstrated, in the form of disaster relief, its ability to serve people at levels beyond simple combat. Mr Weaver believed the military should "contribute to the preservation of not only environment, but our society, our economy, and everything else."

Mr Weaver said that the world was becoming more peaceful, and as the world enters a time when there will likely be less major conflict and major war, there is going to be more "free time" for the armed services to contribute in a positive way to national well-being. The most important thing, in Mr Weaver's view, was desire—the desire to serve,

the desire to help, the desire to work. He believed that the military should be encouraged to desire to assist society at levels other than armed conflict.

Mr Weaver was of the opinion that markets and the military could and should work together, and that the military could be an important partner for markets on environmental matters. When asked if military environmental efforts might displace potential environmental entrepreneurs who could do the job more cheaply, Mr Weaver stated that the two should cooperate. Rather than battle over resources, the two "sides" should cooperate. For example, perhaps the military can demonstrate the utility of the technology, and transport it to a crisis area, where private actors could take over.

The military was no greater cause of environmental problems than any other similarly sized industrial organization in Mr Weaver's view. Military operations were also similar, in that they were not inherently environmentally destructive. Military maneuvers and war games may represent one area where the military is environmentally destructive.

Mr Weaver believed the military could be an important international environmental partner. He believed it possible that a network of military agencies could be established among the nations of the world to exchange environmental ideas and technologies. He believed this was particularly true in formerly communist nations. Within these countries the people have an understanding of what a military is, but have no experience with either the concept of profit or with entrepreneurs. Thus the military may prove to be more easily accepted, at least until the people begin to understand what market forces and profits can bring in terms of prosperity. As with other respondents, Mr Weaver's comments fit the theoretical notion of an iterated PD, where the military can, by cooperating, motivate other players to engage in ongoing patterns of cooperation.

Mr Weaver believed the role of government is to secure the well-being of the people, and to ensure basic freedoms. These include traditional freedoms such as noted in the Bill of Rights, but also freedom of choice, freedom of desire, of education, from hunger, and others. The government owes the people honesty and truthfulness, and to

represent the people from their conscience. Representatives must serve from their convictions, and not be swayed by money or lobbyists. An activist government presents a danger when too much power is concentrated at the top, potentially reducing the freedom of the people.

John Denver

Widely known as an entertainer, singer, and actor, John Denver is also quite active in environmental matters. In 1976 he co-founded The Windstar Foundation, an environmental education interest group based in Snowmass, Colorado. In addition to Windstar, Mr Denver was a co-founder of The Hunger Project and served as a UNICEF representative touring African nations stricken with draught and famine. Most recently, he founded Plant-It 2000, an organization that is engaged in a massive tree planting effort nation-wide.

Mr Denver served on The President's Commission on World and Domestic Hunger under President Carter, and was awarded the "Presidential World Without Hunger Award" by President Reagan. The National Aeronautics and Space Administration awarded Mr Denver its Public Service Medal. He has testified before the International Whaling Commission, and several committees of the United States Congress on various environmental subjects. The son of a career Air Force officer, Mr Denver is himself a pilot and understands both the structure of the military and the technological capacities of the Air Force. He has been a friend of the author for several years.

There was no single environmental problem which Mr Denver felt was most critical today. Rather he suggested that the "big picture" was needed, examining the environmental problems of today as a part of a whole. This entirety implies that the manner in which humanity is living on this planet is not conducive to a healthy environmental future for both the human and non-human inhabitants of the earth.

Environmental organizations have almost universally not been as effective as they should be, in Mr Denver's view. These organizations can usually hope only to be an educational tool and to provide a measure of inspiration to motivate people to do the small things they can do individually, as well as the somewhat larger things that can be done collectively.

The military should be more aware of what the institution of the military is doing to the environment, especially in terms of mitigating past ecological mistakes. Mr Denver also believed the organization, discipline, technology and great capability of the military presents an unprecedented opportunity for the armed forces to expand their role and address these immense environmental problems. Mr Denver believed the moment may be at hand for the military to begin to fight a war "against an old way" that was "irresponsible [and] detrimental" and for a new way that aims at a sustainable and healthy environment. The "organizational ability, manpower, discipline and technology really makes the military perfect to take on a number of things, with handling environmental emergencies foremost." Not only is the expansion of military activities beyond traditional warfighting acceptable to Mr Denver, he suggested that "looking forward to a greater flexibility and a wider range of capabilities for the military has to do with [the military's own] future and sustainability." The military that was trusted to deal with momentous issues of war and peace anywhere in the world should be trusted to act properly with any mission, including environmental ones.

The particular tools and talents of the military could be very useful, Mr Denver felt, in assisting national, state, and local governments in the monitoring of pollution. The ability of the military to conduct aerial reconnaissance of suspected sources of pollution, for example, would enhance the local governments' ability to monitor their own "back yards," and to compel compliance with environmental regulation.

In the past the military has been a major source of environmental problems. Mr Denver noted that the ignorance that often precipitated environmental damage by the military in past years is today no longer an excuse for continued ecological errors.

The armed forces could be an important international environmental partner for foreign governments and militaries. Mr Denver believed the increasingly interconnectedness of the international system dictates that all possible tools for building cooperation and friendship should be used. He suggested the existing military infrastructure of technology and expertise could be an important factor in the efforts to strengthen international environmental and non-environmental ties.

Mr Denver felt the roles of environmental organizations were largely educational, supportive, and motivational. He viewed his own role as using the celebrity generated by his musical work to motivate and educate people through his musical efforts, interviews, and discussions.

The role of government in Mr Denver's view was to evolve with the times, and to organize and watch over the collective whole of the people it represents. Within that "in a world that is growing smaller and smaller is the responsibility of developing relations between all other governments to the benefit of both parties." The world is no longer, in Mr Denver's view "you or me," rather it is by necessity "you and me" today. This is clearly tied to the theoretical notion of both tragedy of the commons and the prisoner's dilemma. The idea of a world in which the nation-states are becoming more closely dependent upon each other suggests that solutions need to be found to conflicts that reward both parties. Mr Denver pointed out the dangers of an unrelenting pursuit of resources before competitors can get them, which echoes the concerns of Hardin. The underpinnings of PD theory suggest that in the multiple iteration world there are solutions for long term cooperation, a key goal of government in the view of Mr Denver.

The government owes the people a "peaceful and healthy environment full of opportunity," and the government is created to make that work. When done properly, the

people then give back to the country as part of a cycle that strengthens both the people and the government.

Mr Denver viewed an active government as necessary to keep pace with rapidly changing times. There are dangers with such activity, but there is always danger in growth and change. But such growth and change are an "absolute constant" and the government should keep up with the changes.

Potential Contractors

Bruce Gordon

One area deserving exploration in this study is the possible conflict between private environmental concerns and the military in the mitigation of ecological problems. Several respondents suggested that market forces are nearly always more efficient than are government organs. This concern was raised in theoretical form in Chapter 2, and receives a real-world evaluation from the next respondent. If the Air Force were to embrace an expanded environmental mission, it is reasonable to assume that some portion of that new role will include flying. And flying is the business of Bruce Gordon.

Mr Gordon is Executive Vice President and Chief Pilot of LightHawk. LightHawk is an environmental education and scientific research organization that attempts to raise environmental awareness and gather data through flying. LightHawk uses light aircraft to perform a variety of environmental missions. LightHawk pilots fly two main categories of missions. LightHawk flies scientists and environmentalists on data collection and survey missions, and policy makers and activists on missions to document and illuminate environmental damage. LightHawk has flown a number of Members of Congress,

including then-Speaker Thomas Foley over the clear-cut regions of the Pacific Northwest. The organization has taken members of media and local governments over the sites of proposed dams. It has flown officials over sites of illegal timber harvests and gold mining in Costa Rica, and LightHawk has tracked endangered porpoises in the Sea of Cortez. In 1988 LightHawk pilots documented the clear cutting of several forests that the U.S. Forest Service insisted were still standing. Information and awareness gathered from LightHawk flights was instrumental in the passing of the Colorado Wilderness Act. Mr. Gordon was invited to attend the bill's signing by President Clinton.

Mr. Gordon is a master mountain pilot. He carries instructor commercial pilot ratings for multi-engine flight and float plane operations, and has over 6,000 hours of flight time. As an active professional pilot flying regular environmental missions, Mr. Gordon's views on the utility of using military resources for similar missions was quite useful. Mr. Gordon is active in the Windstar Foundation, and has been a friend for the past several years.

Mr. Gordon was especially concerned environmentally about deforestation, water quality, and the loss of biodiversity. In his hundreds of flights over the denuded forest lands of the United States, and both Central and South America, Mr. Gordon has seen first-hand the degree to which timberlands have been laid bare. He felt such trenchant action leads inevitably to reductions in the quality of the aquifer and widespread species extinction. He was quite passionate in his belief that such lumber harvesting is quickly exhausting the natural capital of the ecosystem.

Like many 501 (c) 3 charitable organizations, LightHawk is largely limited in its effectiveness by funding. LightHawk receives roughly fifty percent of its operating funds from corporate grants, thirty percent from private individuals, and ten percent from reimbursements, and is "twenty percent always short." LightHawk is a small organization, with twelve full time staffers, 125 volunteer aircraft owners and pilots, and four LightHawk-owned aircraft.

Mr Gordon was cautiously enthusiastic about an expansion of military operations into environmental areas. He volunteered that his organization would be greatly helped by cheaper access to satellite imagery, as mapping environmental problems from small aircraft is inherently quite expensive. He also felt that the military's ability to respond rapidly to emergency situations, such as oil tanker spills, would be useful environmentally. He was not troubled by the notion of the government cutting into his business, nor was he worried about the relative inefficiency of the public sector vis-a-vis the private sector. He felt the problems were large enough to need both types of responses, both governmental and private sector.

Mr Gordon did, however, voice concerns about the possible dangers of involving large governmental organizations in environmental projects. He believed the current political climate was such that there was a danger that more "environmentally-unfriendly" forces within the current government could subvert an environmentally expanded mission the military undertook. He was deeply distrustful of the new Republican majority in Congress, and felt that view was shared by many within the traditional environmental community. He pointed out, as an example, the identification of his organization. LightHawk used to be called "the environmental air force" but has now dropped the appellation due to concerns within the organization that it was in danger of being stained by the association with the words "air force." As a result of this collection of concerns, Mr Gordon felt expanded military environmental actions may, at least until some environmental credibility is gained, be viewed with great suspicion by the traditional environmental movement. He stated that he did believe the problems were problems of perception, and may be overcome with increased communication between environmentalists and the military, and demonstrations of the military's commitment to environmental quality. Just as communications in a PD game can promote an improved outcome, communications between the military and environmental organizations can enhance to chances of cooperation and environmental betterment.

Mr Gordon was not troubled by the concept of expanded military environmental actions. He felt, however, that the destructive tendencies of major industry, and a basic skepticism of the government, combined to undercut acceptance of such conduct within the traditional environmental community. He noted that when government has become involved in such matters, "it just hasn't worked." He believed science, within government policy making circles, had been relegated to a subservient position to political expediency. He was concerned that military environmental activities would be captured by "the politicos" who would subvert the process for political gain. This was not largely a concern about the military in particular, but about the government as a whole. Mr Gordon did strongly believe that national security was threatened by environmental concerns, and believed that the "environmental security as a threat to national security" argument was in theory correct.

Mr Gordon was somewhat libertarian in his view of government. He believed the government needs to provide important resources and regulation, but only at the minimum level needed to provide a basic standard of living. The government owes the people "value for the tax dollar" and should provide quality education, health care, and environmental protection, among other things. An active government can be dangerous to the people in that it creates and formalizes bureaucratic structures that become overbearing, inefficient, and enduring.

Mr Gordon's views suggest additional support for the theoretical construct of the PD game offered in Chapter 2. The traditional environmental community and the military, in his view, are two actors who can see future payoffs as highest if cooperation were possible. By working together, the military could gain by supporting the national security of the United States (via increased environmental security), while the environmental community could gain by realizing the goal of an improved environment.

Both, however, fear defection from the other. Should environmentalists make a deal with the military and the military subsequently defects, the environmentalists would

have lost resources, time, and credibility with other activists, not unimportant stock in the NGO world. The military also has reason to fear defection, as investment in national security gone awry means that the downsizing military has a reduced ability to fulfill its basic function of national service. Thus both "players" keep the other at arms reach absent increased certainty about future iterations of the game. The method suggested by Axelrod to mitigate such situations, the Tit-for-Tat method, offers hope of a solution. In fact, this TFT method has, I believe, already actualized some success. When extensive communication between players is added, the PD loggerhead is greatly eased. Thus the Prisoner's Dilemma theory earned additional support from real-world applications.

-Summary-

The Military

Uniformed members of the armed forces are, in general, personally supportive of expanded DOD environmental efforts. They expressed an overall willingness to take on such a mission as the President and Congress direct. The larger DOD staff, to include uniformed and civilian, indicated that they would support expanded environmental efforts by the military, but were unlikely to push for dramatic change in that area themselves. LTC Hamilton's comments were representative, when he stated that the military environmental office in which he worked would do the maximum possible with the resources they were given. There was no significant military concern about the appropriateness of expanded environmental efforts, but rather concern about resources and commitments. If the military were to be tasked with additional environmental missions, the DOD representatives seemed to believe the work could be done effectively and efficiently by the military.

Limitations on the scope of military environmental operations were generally viewed by military personnel as being largely financial and practical, not philosophical. If such missions are required, the Pentagon must be funded for them. It is unrealistic, in the

view of these respondents, to expect additional mission capability from the military without commensurate budgetary authority.

The view of those within the armed forces of the military's mission was one of service to country. The respondents believed environmental missions, for example, would be appropriate if the country needed the military to do it.

Military members generally felt the military itself was doing a good to excellent job in dealing with environmental problems today. Several respondents noted past military-induced environmental damage, but were pleased with the current direction of military environmental policy. In general, the military respondents did not feel military operations were inherently bad for the environment. The role of the government is to protect and serve the interests of the people in the view of the military interviewees. The government owes the people honest hard work and protection from dangers, similar to what these individuals view as the obligation of the military to the people.

Military members were responsive to the theoretical construct of environmental security as part of national security, and generally felt the military could make a significant difference in a variety of environmental woes. A broadened definition of national security and threat, as proffered in Chapter 2, is consistent with the intellectual orientation of most interview subjects. National interests were judged to evolve over time, and the mission of the military was reasonably assumed to require evolution as well. Thus those who would be directly charged with carrying out additional environmental missions such as crisis control, pollutant mapping, and technology transfer believed in the appropriateness of such missions a priori.

The Executive Branch

Both the representative from the EPA and from the White House staff were enthusiastic supporters of the concept of expanded DOD environmental efforts. Each pointed out the dangers of turf wars with other government agencies over funding and

mission, but each also approved of DOD as an environmental partner with other government agencies. The rapid response capability of military forces was pointed to as a particularly useful area of military involvement. These respondents suggested that it would be cost effective to use the already existing capabilities of the armed forces, such as airlift and orbital imagery, for environmental projects. The current administration would, they believe, support the concept of expanded military environmental activities.

There is a mistrust of the military and its motives, at least within the EPA, that may mitigate the effectiveness of early military environmental efforts. This comes from a concern over turf and budgets within the EPA. It is reasonable to assume that such concerns would also exist in other federal organizations with a piece of the environmental pie, including the Department of Energy, the Department of the Interior, and others.

Military operations can be bad for the environment in the view of these staffers, but are not inherently so. Current DOD environmental efforts are viewed as both sincere and effective. The military is doing an adequate job today on its own environmental problems according the executive branch respondents. Exceptional progress has been made from what was in years past a very bad situation. The generally cooperative relation between the current White House and the DOD on environmental matters may be a "snapshot" of an ongoing applied PD game, with both players in a stage of mutual cooperation.

The role of the government as viewed from the executive branch is one of service to the people's needs, and honesty in words and actions. Allowing people to reach their full potential, and removing roadblocks to success is a primary mission for government.

The Legislative Branch

During the course of one on-the-record, and two off-the-record, interviews with congressional staffers, a different view of military environmental efforts emerged. The staffers were not enthusiastic about any additional missions being given to military forces.

The consensus was that if environmental missions could be conducted within the existing force structure, and with no additional funding, such missions were acceptable. But if dramatic increases in budgets were needed, Congress was unlikely to fund them. This view was not, I believe, a reaction to military environmental programs, but rather was part of a larger negative view on any governmental growth. When the scope of military environmental programs was narrowed to those that could be accomplished *within* the existing military structure, congressional support for the concept rose significantly.

The competing interest groups doing battle within Congress may, in the view of the respondents, limit the willingness of Congress to mandate military environmental programs. One off-the-record staffer stated that she believed Congress would approve of the military creating its own environmental programs and policies with a broader focus, but that there would be little chance of getting any significant legislation through the Congress on that subject. Thus she suggested that any broadening of military environmental efforts, of which she personally would approve, could only be done by reorganization within the military itself, and not through any statutory response by Congress. She noted that such reorganizations were entirely legitimate, as any government organization can and should reshape itself as needed to provide better service.

The military itself was generally viewed in a positive light by the congressional respondents. The role of the military is viewed as that of traditional protector and guardian. Military operations are not necessarily bad for the environment, and can be seen as necessary for the environment. Failure to protect the United States in traditional military ways would, in the view of many members of Congress, place the environment at risk as well.

The government owes the people honesty and hard work, say the staffers. The government must ensure that it spends taxpayers' moneys wisely and frugally. The government must provide high quality programs to serve the people's needs, and oversight of those programs to ensure quality.

The responses of the congressional staffers were, unfortunately but predictably, often fuzzy or inconsistent. When asked if they would support the use of military technology and expertise to serve environmental purposes, the response was generally supportive. Yet when asked if the military should expand its national security efforts into environmental security, the response was often negative. The environmental security equals national security argument is not well accepted on Capitol Hill. This view represents a potential trouble spot for expanded DOD environmental efforts, if such efforts require additional funding to complete.

Interest Groups and Activists

The opinions of the members of the interest groups interviewed can be neatly divided into two categories: strong opposition and strong support. The representatives from the CATO Institute and the Competitive Enterprise Institute were strongly against any expansion of any government program. Their political views were firmly libertarian, and philosophically opposed "big government." Their objections to expanded military environmental efforts was not specifically against the military expanding environmental activities, but rather that the military was doing any environmental activities at all. Private market forces are better suited to deal with such problems through a strong system of private property rights.

Regulation and bureaucracy are, in the view of these individuals, the enemy of efficiency and quality. Mr Taylor went a step further when he suggested that there were no environmental problems per se, but rather some economic problems with environmental ramifications. Fix the economic situation via market forces, and the alleged environmental problems go away. Thus the issue of the military and the environment is simply moot. The role of government in this view is to provide for the citizens only those few things that they can not provide for themselves. National defense is the classic example used, but

in this view only a very small military force is needed, with very specific traditional military functions.

The above view was not widely shared within the respondent pool. The other interest group respondents were often at the other extreme of the spectrum. Nearly all enthusiastically supported the notion of broadened military environmental programs. Several suggested that it was quite wrong that the military had not *all ready* engaged in such an expansion of mission. The huge sunk costs of the existing military structure were pointed to as reasons for expansion of military environmental activities. As the military already has bought and paid for a vast array of technological innovations, equipment, and personnel expertise, several respondents stated that the military was not really doing its job of national service if it did not do more environmentally.

As might be expected, this second portion of the interest group interviewees viewed the role of government differently than the first. The role of government is to provide services to the people and to serve them honestly and aggressively. The second group of respondents viewed the government's mandate to serve the national interest in a much broader context, with a wide array of policy options seen as appropriate.

Others

The views of the representatives of the media and of potential contractors highlighted an important aspect of the question of military environmental programs. Each was aware of the vast technological and managerial capabilities of the United States military. Each saw the military as a potentially useful partner with other environmental actors in the mitigation of ecological problems. Both also expressed the belief that the broader media and environmental communities might well be distrustful of the military and its intentions should expanded environmental actions be undertaken. The legacy of the Viet Nam era still weighs heavily on those in the media and in environmental groups, with the often seen disregard for both the truth and the environment by the military in that time

evident in the opinions of today. Both viewed the relation between the government and environmental interest groups as similar to a non-cooperative PD, with little opportunity for cooperation.

Both respondents were cautiously optimistic about the role the military might play in future environmental concerns based on a degree of familiarity with current military environmental programs communicated by the author. Military operations may not today be inherently bad for the environment. Both respondents indicated support for the concept of utilizing the military's tools and talents in broader ways, but cautioned that acceptance will take time.

The role of the government is to serve the people honestly. The role of those outside government is to keep a close eye on the government to ensure they are being well served. Government should be no larger than is necessary to provide required services, although both suggested that the view of how big is too big will vary significantly from person to person. These positions offered an interesting intermediate point of view between the libertarian and the proactive extremes.

Analysis

A surprising level of consistency was demonstrated across the interview subjects. Only two of the individuals rejected any significant military environmental activity out of hand. As noted, the representatives from the CATO Institute and the Competitive Enterprises Institute both renounced any expansion of any governmental activity beyond that which is absolutely necessary to provide a few basic constitutional obligations. Each of the other respondents embraced the idea of expanded military environmental efforts with varying degrees of enthusiasm.

The common concern for those within government was the degree to which military environmental activities could be conducted without interfering with traditional military obligations. Those outside government often saw environment missions as

consistent with traditional military functions and responsibilities. Thus a consensus developed around the notion of the military becoming more environmentally involved, with the differences on the appropriateness of military environmental activities being a centerpiece of military attention. Of those who supported military environmental activity, the spectrum can be said to run from those who believe the military should become a near-environmental agency, to those who believe that environmental actions should be conducted when such activities do not conflict with traditional military operations.

Several maxims are suggested by the expert opinion in this chapter. These dictums are generally consistent across the respondent pool, although there is variation in the degree of support for the relative "strength" of each maxim.

Maxim 4

- Expanded military environmental efforts are more likely when the environmental problem(s) being mitigated are viewed as significant by the American people.

Similar to maxim 2, this maxim suggests that in an era of decreased support for "big government" by the American citizenry, the expansion of any government program must be seen as germane to the interests of the public. The maxim was derived from a number of the interview respondents (in particular Smith, F; Taylor; Gordon; Hitzman), who suggested that the populace of the United States is not likely to support what might be seen as an expansion of the bureaucracy absent an exceptionally good reason. For example, growth in the military to fix an environmental problem perceived as small and insignificant may be judged more threatening than the small ecological concern itself. Gillcash stated that no new programs or initiatives were likely without significant public support. McCall suggested that public attitudes toward environmental policy were critical in determining how far the government was likely to go (see also Hair; Azzam; Smith, R).

There is strong survey evidence to suggest environmental improvement is an area where the American people would in fact support additional spending and attention. Public opinion polls consistently show support for environmental efforts. Nearly two thirds of Americans consider themselves to be environmentalists, while 83 percent believe at least some additional actions are needed environmentally for life on the Earth to continue without major environmental disruptions. Over one third believe drastic action is needed. Nearly two thirds of the American people believe that protection of the environment should be given priority over economic growth. Just under half the population (49 percent) does not believe the Republicans in Congress will provide adequate protection for the environment, while less than one third believed they will (Moore 1995, 1-3).

The environmental activists interviewed who were aware of the current levels of military environmental activity offered strong support to the notion of a broader environmental mandate for the military. This suggests that support from persons in that "sector" for increased military environmental actions is likely if and when the capabilities of the military to deal with various environmental problems become more widely known.

Maxim 5

- Military environmental mitigation efforts will be most accepted, and will be more beneficial, when the solution to the problem is dependent on speed of response.

Maxim 6

- Military environmental mitigation efforts will be most accepted, and will be more beneficial, when the solution to the problem is dependent on technical applications.

In general, there was not support among the experts interviewed for a broad mandate of military environmental intervention on all ecological problems. Mobilizing the

Army to collect recyclables, for example, would not be supported. Such missions would not enhance traditional combat readiness nor make use of military expertise. Strong support was voiced, however, for the military to become involved with those problems where the armed force's unique tools and expertise could prove decisive in the mitigation effort. Hypothetical programs to deliver oil containment booms around grounded tankers, to locate point source polluters via satellite imagery, and similar high tech ideas earned nearly unconditional support from the respondents not philosophically opposed to all expansion of government. Swint, Hamilton, Seely, Turner, Azzam, Brower, Gordon, and others stressed that the military's speed and resources make it particularly well tuned to a variety of environmental ills. The examples of whale counting, point-source pollution spotting, and surveying of timber lands are all dependent on technology. The example of oil spill containment, tested in Chapter 6, shows the utility of military speed in disaster response.

The most dramatic example of both maxims' 6 and 7 is the case study of Chernobyl. The disaster at that power plant offers practical support to the suggestion that when speed counts the military may be of great use, as will be seen in detail in the next chapter. In general, when the speed and tools of the military could be most important to relief of a negative environmental situation, the experts tended to support military action.

Maxim 7

- The military response to an environmental problem reasonably must mirror some traditional military function, capability, or need.

Support for military environmental programs will be strongest when the program bears some relation to ongoing military activities. Thus support for programs such as oil boom deliveries was high, while support for mobilizing the Marine Corps for tree planting was

minimal. Oil boom delivery is consistent with the traditional military combat requirement to be able to deliver critical cargo to remote locations with little advance notice. Tree planting by ground troops is not directly related to a needed combat talent, and is therefore much more difficult to support as a military mission. This is not to say that acceptable programs must deal only with direct war-fighting applications. The day-to-day activities of the armed forces include the functions often associated with major industry or small cities. Thus innovations in such areas as recycling, energy use, composting, and resource management may prove within the acceptable sphere of military environmental operations, as will be seen in the cases that follow. Virtually all the military respondents, including McCall, Hamilton, Swint, Seely, Turner, and Gallogly, volunteered that it made little sense in their view to task the Air Force with environmental duties for which the service was not equipped and not trained. Several from outside the armed forces (Gillcash; Taylor; F. Smith) stated that it was not wise to task the military with environmental obligations which did not reflect a current military capability or need.

Theoretical Links

In summary, the interview data endorse the theoretical framework proposed earlier in this work. National security is, in the view of a variety of experts, properly viewed more broadly than simply keeping borders inviolate and armies vigilant. The military respondents were, as noted above, quite strong on the concept of service to nation. Protection of the national security of the United States is central. When national security is defined more broadly, the appropriate range of national service actions increases as well.

A more widely defined notion of threat, suggested as proper in the theoretical chapters, earned support from the interview subjects. None would define the concept of threat today to merely represent bombs falling on American cities. Contamination of ground water, loss of species and habitat, and other environmental concerns now seem to reasonably fall within an appropriate conception of threat.

A broad interpretation of the proper role of the military in a civil society, an area of concern central to the theoretical underpinning of this dissertation, was supported by the respondents. Only two (Taylor and F. Smith) objected to the military's becoming involved in non-traditional operations from a philosophical standpoint. While many (especially the military respondents) raised concerns about needing to meet traditional security needs first, the concept of the military's assisting society more broadly was acceptable to most, and strongly supported by many. This broader view of the role of the military has implications beyond merely environmental concerns, to include economics and other issues. In the next chapter, I use case studies to illustrate and explore these theoretical points.

The maxims generated in this chapter are generally consistent with the maxims suggested by the archival evidence of Chapter 4. The archival and interview data suggest that a grand mandate for military environment action does not exist, but that there does exist a relatively large domain of environmental policy decisions within which military environmental activities will be welcome. Clearly, some opinions were given greater weight in my analysis than others. This is due to what I judge to be the heavy weight of opinion that has emerged near the position of support for military environmental action. The preponderance of the interview evidence supports the basic hypothesis of this dissertation.

Dissenting opinion is not ignored. The views of those with varying ranges of concerns for broadened military environmental policies are reflected in the limitations the maxims place on decision makers. These caveats limit the degree to which the military should be employed as an environmental force. Thus the maxims and model fall nearer the middle of the policy spectrum than any one respondent might like. The military would, using this model, engage in too many environmental actions in the views of Mr's Taylor and F. Smith, and not nearly enough in the views of Ms Azzam and Mr Brower. The result of these limitations is the rejection of military intervention in a variety of seemingly

well-intentioned environmental concerns. This concept is made more clear when it is tested in Chapter 7.

In the next chapter, I examine several examples of past and ongoing military environmental programs and activities in an effort to learn specifically what has worked well, what has not been as effective and, finally, what characteristics of an environmental problem are conducive to successful military environmental action.

End Notes

¹ See Appendix C for fuller discussion of military nomenclature and acronyms.

² For a fuller explanation of the Superfund, see Appendix E

CHAPTER 6

CASE STUDIES

This chapter considers three cases where environmental concerns and military matters overlapped. Two are domestic examples, The United States Air Force Academy and Wurtsmith Air Force Base (AFB) , and one is a special international case, Chernobyl. This chapter also explores several examples of the military's use of new or unproved technology and the potential validation service this use might offer the private sector.

The interview data contained in the previous chapter and the case study data presented here nest well together. The elite opinion suggested that the military could perform a variety of environmental roles, with a variety of caveats attached. The case studies offer an opportunity to examine the assertions of the elites, and test the effectiveness of military environmental activity along several dimensions.

With the exception of Chernobyl, the cases selected for study are not the most dramatic possible examples of the theoretical underpinnings of this dissertation. Travel and data acquisition costs prevented selection of even more robust cases. The Air Force Academy and Wurtsmith AFB are, however, good cases to study precisely because each is typical of the environmental challenges facing Air Force planners today. The Air Force Academy case study offers additional insight due to its specialized mission. The results of the case studies concur with those of the interviews, and support the hypothesis that the military can be an important environmental actor.

The Air Force Academy (hereafter referred to as the Academy) is a city unto itself, with all the environmental challenges cities face, combined with thousands of acres of territory requiring wilderness and animal management programs. Thus environmental

planners must deal with the problems typical of a traditional Air Force base, while also confronting those posed by the addition of educational components such as civil engineering training facilities and chemistry laboratories. The success of the Academy shows the positive results possible when an armed force pauses to consider the possible environmental consequences of its actions.

Wurtsmith AFB was once home to a mighty nuclear weapons force. It is now closed and largely vacant and is under the control of local government. Typical of most military bases, Wurtsmith was pocked by ground contamination sites. Major environmental efforts began well before closure and continue to this day. The Wurtsmith experience illustrates the strengths and weaknesses of both the Cold War planning process and the military's management of a base closure.

Chernobyl offers an illustration of the ability of military forces to respond rapidly to environmental disaster, and the utility of employing military resources in such situations. The Chernobyl situation is reviewed in some detail to illustrate the key role military personnel played in that most egregious of nuclear disasters. The heroic action of the Soviet military illustrates the central role high levels of training and technology can play in a crisis, as well as pointing to the importance of risk-acceptant responders when environmental crisis mitigation is dangerous.

Yin (1984, 78-98). Documentation and archival records are used to examine Chernobyl and Wurtsmith particularly. Interviews provided information about all but the Chernobyl case. Direct observation was limited due to the high costs involved, but was conducted at Wurtsmith during December 1995. My involvement in environmental matters at the Academy during my five year tenure there offers participant-observer data during a time of growing environmental action. This multiple source of data approach, as with the variation in archival sources in Chapter 4, and the interviews in Chapter 5, offers a more robust collection of documentation and evidence than would any single method.

Wurtsmith Air Force Base

Why study an Air Force base that no longer exists? Examining the process and aftermath of closing a major military facility can provide lessons about what works and what does not, both before and during a base closure. Military bases share characteristics of small cities, industrial sites, transportation centers, and other human activity. By examining the base closure process from an environmental perspective, it is possible to tease out systems, ideas, and methods that can be applied to the civilian sector. During a time of industrial and corporate drawdown and reduction, the ability to safely and efficiently handle a variety of hazardous materials is very significant. Transfer of such knowledge and skill from the armed forces to the private sector is consistent with the broader theoretical notions of national service and military duty outlined in earlier chapters.

When Wurtsmith AFB near Oscoda, Michigan, was ordered closed, it contained 58 documented Installation Restoration Program (IRP) locations. IRP sites are locations of known or suspected environmental contamination requiring investigation and, if needed, restoration. These contaminated areas range from landfills to storage tanks, and the proper clean up and restoration of these lands represented a significant management challenge for Air Force leaders. Multiply these problems by the number of additional military bases ordered closed, and you begin to see the magnitude of the technical and administrative tasks facing the Pentagon.

A brief history of the military at Wurtsmith will help frame the scope of the environmental problems facing the Air Force. Data for this section were gathered from the various environmental impact assessments filed for the base closure process, other Air

Force publications, interviews with the current environmental staff at Wurtsmith, and personal observation.

Base History

Wurtsmith Air Force Base is located on the Lake Huron coast north of the thumb area of Michigan. Although no longer active, it is still referred to by the local population and signage as "Wurtsmith AFB." One of a number of bases closed on the orders of the Base Closure and Realignment Act of 1988 and the Defense Base Closure and Realignment Act of 1990 (collectively known as BCRA), Wurtsmith AFB formally "stood down" on June 30, 1993 (U.S. Air Force 1993a, S-1). Environmental restoration was an ongoing process when the base closure was announced, and continues to this day.

In size, Wurtsmith AFB was typical of many bases. It was not a particularly large military facility. The immediate grounds covered 4626 acres, including an airfield, aviation support areas, industrial sites, medical, commercial and residential areas, and public facilities and recreation areas. The Air Force directly owned 42 percent of the lands, with the remaining 48 percent held in the form of various land leases with local government or private citizens (U.S. Air Force 1993a, S1-2). Wurtsmith AFB first became military property in 1924 as an Army Air Corps facility. The lands were used as a gunnery range and winter training area. During World War II the base was expanded, and used for various pilot training activities, including bombing practice. While written records of this time period are sketchy at best regarding the use of hazardous materials, it is reasonable to assume that the grounds were contaminated with a variety of petroleum products, solvents, and other industrial chemicals (U.S. Air Force 1993b, 1.9-1.10).

From 1945 through 1947 the military abandoned the area. The infrastructure remained but there was no active military presence. In 1948, with the Cold War beginning to develop, the base was reactivated. In 1958 the real growth of the base started, as the

Strategic Air Command (SAC) took over Wurtsmith AFB as a strategic bomber and tanker facility. During the thirty-five years that followed, a wide variety of military aircraft and equipment was based there, each bringing its own particular set of environmental challenges. During much of this time, however, little interest was expressed in environment quality, and the single mission of the Air Force was to "fly and fight."

In addition to the actual weapons systems used on Wurtsmith AFB, an assortment of other potentially hazardous materials was used there as well. The base had a fully functional hospital and a number of machine and industrial shops. The legacy of the various weapons systems and other potential hazmat generators stationed at Wurtsmith AFB can be seen in Table 6.1 below.

Table 6.1 - History of Base Operations

Period	Types of Operations	Weapon Systems	Hazardous Substance Activities
Pre 1924	Forest Land (undeveloped)	None	None
1924-1945	Pilot/Technical Training, Bombing Techniques, Aerial Gunnery	Single-winged and bi-plane aircraft, fighter and pursuit aircraft	Aircraft gunnery range, aircraft maintenance, construction, sewage disposal plant, housing, maintenance areas, hangars, runways, water reservoir, ordnance buildings, fire station, hospital
1945-1948	Base Inactive	None	All infrastructure remained
1948-1993	Tactical fighter and bomber training, Air-to-ground and air-to-air gunnery ranges, bomb scoring range, refueling operations	F-86, F-102, B-52G, B-52H, F-106, KC-135	Construction, landfills, fuel storage, hangars, storage of solvents/oils/metals, weapon storage areas, EOD, aircraft-gunnery range, fire protection training areas, ASTs/USTs, oil/water separators, storage areas

Source: (U.S. Air Force 1993a, 1-11)

As can be seen in the figure, Wurtsmith AFB was home to nearly all the environmental dangers posed by a small industrial city, plus those unique to its military mission and operations.

The Cold War era saw the introduction to Wurtsmith AFB of a variety of new technologies with environmental ramifications. A major expansion took place in the use and storage of petroleum products, oils, and lubricants (POL). These POL materials were stored in both above-ground and below-ground storage tanks. Wurtsmith personnel also handled a variety of nuclear equipment and associated gear during the active period of base operations. Both nuclear weapons and additional conventional weapons were included in the Wurtsmith inventory. This resulted in expanded weapons storage areas and the creation of an explosive ordinance disposal (EOD) area. The EOD area was created to allow for the safe destruction of unneeded or unstable conventional weapons. Many of these weapon systems are rich in heavy metals and other environmental toxins. Additionally, the security police needed to safeguard the nuclear assets of Wurtsmith needed regular and realistic training. A grenade range and small arms range were constructed for this purpose, with the resulting lead and other heavy metal contamination of the "down range" soils.

The base added a major fire fighting capability in the 1970s and created a training area for the fire fighters to practice extinguishing blazes. The "practice fires" were usually created by dumping gallons of jet fuel in an open metal trough or onto the ground and setting it ablaze. Fuel contamination of the soil was an inevitable consequence of this now-forbidden action.

Wurtsmith AFB was also home to a branch of the Defense Reutilization and Marketing Office (DRMO), a clearing house for the disposal of unneeded government materials. Thus additional hazmat items were stored at Wurtsmith prior to their sale.

Finally the base housed several thousand military and civilian workers and families, producing the same type of garbage and waste as any small city. Wurtsmith AFB

therefore contained landfills with household refuse as well as construction debris and industrial waste. Upon inspection, this waste was found to also contain electrical system components such as transformers with polychlorinated biphenyls or PCBs (U.S. Air Force 1993a 1.10-1.14).

Environmental History and Concerns

An early indication that there might be environmental problems at Wurtsmith AFB came in October of 1977 when a resident of the on-base military housing complained of a noticeable odor and taste to the base drinking water (U.S. Air Force 1993a 3.7). The contamination was found to be due to a leaking underground storage tank (UST) containing trichloroethylene (TCE). The Air Force used TCE at Wurtsmith as a degreaser. When allowed into the water table, TCE degrades into vinyl chloride, a powerful carcinogen (Hunter 1995). Several base drinking water wells were found to contain significant levels of TCE due to a failure of the connector between the tank and the filler pipe (U.S. Air Force 1993a, 3.7-3.8).

A base restoration effort was begun with the installing of a system to pump the contaminated water from the tainted areas to a treatment facility. Shortly thereafter, the contamination plume was found to have moved off base property. When this discovery was made, the Air Force provided alternate drinking water to the civilian residents and began additional aeration efforts and studies.

Beginning with an agreement between the State of Michigan and the Air Force in 1980 dealing with military responsibilities for ground water contamination, Wurtsmith AFB began serious study and cleanup efforts (U.S. Air Force 1993a, 3.7-3.9). Over the next thirteen years, a total of 58 IRP sites were documented. The IRP sites reach back in time to the earliest days of the post W.W.II era. In addition to the TCE plume in family housing, there were fifteen cases of contamination with JP-4, military jet fuel. The small

arms range was contaminated with lead in the form of spent bullets fired into the earthen berm behind the range. Heating oil had leaked from above ground tanks (AST). Several USTs also leaked heating oil. The crash of a tanker aircraft on the runway and nearby grounds had compounded the tragedy of the accident with the environmental problem of soils contaminated with spilled fuel and oil. Industrial and construction waste was discovered to have contaminated the base landfills, and the disposal of various explosive ordnance had tainted the EOD range with several heavy metals (U.S. Air Force 1993a, 3.3-3.5). To date, approximately \$25 million of a total of \$70 million budgeted for Wurtsmith's environmental problems has been spent (Jones 1995).

The Air Force's attitude toward the contamination problems at Wurtsmith (and similar problems force-wide) changed fundamentally in the 1989-1991 era (Jones, 1995). Prior to that, environmental concerns were often viewed as being orthogonal with national security. The environment was viewed as a place where the military operated, not something the military needed to protect. Beginning in the late 1980s environmental problems began to be seen as not an adjunct to traditional defense, but actually part of the mission itself. This was codified by then-Secretary of Defense Richard Cheney who in 1989 told the military service secretaries:

I want the Department of Defense to be the federal leader in agency environmental compliance and protection...The universal recognition of effective DOD environmental compliance and stewardship activities is the surest way to maintain our access to the air, land, and water we need to maintain and improve our mission capability (Siehl 1993).

Wurtsmith responded to its contamination with the installation of three ground water pumping stations. Each pump draws water from four collection points spread throughout the contaminated area, and then pumps the water through a filtration system that eliminates the pollution (Recowski 1995). Thus environmental concerns were integrated into the day-to-day operations of a strategic bomber base.

With the decision of the BCRA in 1991 to close Wurtsmith AFB, environmental concerns became central to those charged with returning Wurtsmith to the private sector. In addition to ongoing environmental efforts to deal with the five known and documented toxic ground water plumes and other environmental threats, military planners had to deal with issues relating to shutting down military operations safely. Can an explosives ordnance disposal area *ever* be turned over for civilian use? Do half-million gallon storage tanks designed for military jet fuel present an environmental problem if left behind for civilian use? These specific problems as well as many others had to be answered by the military and civilian personnel within DOD charged with the base closure process.

Lessons Learned

There are several important points that can be drawn from the experience of the military at Wurtsmith, with lessons for both military and civilian environmental planners. These lessons can be grouped into logistical and technical categories.

A major cause of TCE contamination at Wurtsmith was a lack of continuity in the personnel in the engine repair shop. A single UST was used for waste TCE. As young airmen charged with the oversight of that tank (among other responsibilities) moved onto other Air Force assignments, they were replaced by new workers. Each tended to assume that a predecessor must have safely emptied the tank, as it never seemed to get full regardless of how long spent TCE cleaners were allowed to collect in it. The tank, of course, had a leak. This leak was not discovered for several years, during which the TCE plume entered the base housing area and fouled a main water well. The lesson learned here, applicable to the civilian world as well, is the importance of good records and continuity of ownership of toxic materials.

An additional aspect of logistics is the openness with which the military conducts its environmental affairs. Michael Jones, the current Air Force Base Closure Agency

(AFBCA) site manager at Wurtsmith stated that without exception all the documents relating to the environmental problems at Wurtsmith AFB were on public file in the local library. These documents receive, he noted, heavy use from local citizens (Jones 1995). The overall openness of the base closure process was important but frustrating, in Mr Jones's opinion. It is much easier, he noted, for the owner of the local gas station simply to dump his unused solvents into the ground behind his station than to comply with federal regulations. The Air Force, of course, does not have that illegal alternative. The ethic of national service, in addition to severe sanctions placed on individuals who violate the law, generally render criminal activity unthinkable. Any environmental issue that arises is subject to significant and lengthy debate in the civilian world about the merits of the Air Force's environmental plan.

This is not all bad, however. As noted in Chapter 5, a number of environmental players tend to view ecological situations with the military as a Prisoners Dilemma game, in which each expects the other to defect. Communication between players can be a key instrument in reducing distrust and building cooperation. Jones noted that the reputation of the military among local area environmentalists is quite good. The openness of the environmental process at Wurtsmith AFB has created a sense that the military, while having made mistakes in the past, is dealing with the public in an honest and above-board manner. This lesson of open communications may also have civilian implications. Had corporate entities such as Exxon, for example, maintained a more open environmental policy, it is plausible that the public response to the Prince William Sound spill might have been less vitriolic.

Continuity and openness are but two aspects of the overall Air Force environmental program, part of a significant "tool" that the military could appropriately and effectively transfer to the private sector. The ongoing environmental awareness ethic in the military, while not always perfect, does contribute significantly to better environmental outcomes. The EIAP (Environmental Impact Assessment Process), for

example, has openness as its cornerstone. By integrating environmental concerns into the earliest stages of operational planning, the Air Force has often avoided significant environmental injury. There is nothing in the EIAP that relegates it to military utility alone. Other governmental actors, and most importantly the private sector, could gain from a philosophy of incorporating environmental concerns more fully into their planning process. By linking environment and business, corporate entities would find reduced litigation costs, rejection of environmentally unsound ideas before significant sunk costs are invested, increased public approval, and improved environmental quality. Thus one of the most significant transfers from the military to the civilian sector many have nothing to do with a particular technology or hardware, but rather with an idea and a philosophy of "doing business." This view is supported by interview respondents Seely, Turner, Swint, and Hamilton.

In a time of industrial drawdown, the lessons learned by the Air Force in closing military bases may be of use to industrial concerns. Closing a military facility poses lessons regarding the downsizing or closure of chemical plants, aircraft and vehicle maintenance yards, medical facilities, restaurants, gas stations, as well as all the other "business types" found on military bases. These lessons include management lessons very similar to the ones noted above as well as technical breakthroughs.

The Air Force's in-depth study of the problem of ground contamination by jet fuel demonstrated that JP-4, the commercial industry standard for jet engines, migrates in ground water much less than expected, and degrades into environmentally benign substances within a relatively short time. Thus if a fuel spill is not too close to a source of drinking water, it may be reasonable simply to monitor that site. This frees up significant (and scarce) dollars to handle more environmentally destructive contamination such as TCE. The openness of the data-gathering process noted above has resulted in the acceptance of such reasoning in the Wurtsmith area. Thus the twin lessons of JP-4 degradation and process openness may provide significant benefits to the civilian sector.

The lessons of Wurtsmith AFB were generally logistical and technical in nature. Similar lessons are being learned at the 31 other AFBCA sites around the country. The magnitude of the problems varies from small National Guard bases with a single IRP site to McClellan AFB in California, a major depot, with hundreds. In each case, however, the process is generally the same. Openness, responsibility, and completeness characterize the Air Force base closure process. The Wurtsmith experience largely validates the comments of several interview respondents who noted the veracity of the military's environmental program (see McCall, Null, Turner, Swint). The suggestion in this dissertation that the military could be an important environmental partner is supported by the example of Wurtsmith AFB.

The United States Air Force Academy

The United States Air Force Academy sits on 19,304 acres on the front range of the Rocky Mountains, roughly 50 miles south of Denver. The Academy is an accredited undergraduate college offering its 4000 students a Bachelor of Science degree in any one of twenty-five academic majors. Built in the late 1950s, the Academy also supports roughly 3000 on-base residents in 1234 single family homes, a staff of 4100, and over 1000 personnel who work at the Academy. Within the confines of the base are 160 miles of roads, 500 miles of utilities, eight million square feet of floor space, 143 acres of athletic fields, and 33 surface acres of lake (Gallogly 1995).

The Academy contains much of the physical infrastructure associated with a city of perhaps 5000 residents. On-base businesses with potential environmental effects include a large grocery store, a retail general merchandise outlet, a gas station with repair facilities, a military motel, two 18 hole golf courses, dry cleaning, a shoppette, and other commercial outlets including a Burger King restaurant. There are also two military clubs (the Officers' Club and the Non-Commissioned Officers' Club) that provide restaurant services.

In addition, the base supports several military operations with potentially significant environmental consequences including machine shops, electrical repair facilities, a large motor pool with a wide range of equipment ranging from cars and buses to heavy earth moving machinery. The busiest runway in the world (in terms of number of takeoffs and landings) is also located at the Academy, where virtually all cadets are exposed to flight through gliders, motor-gliders, small propeller aircraft, and skydiving. Associated with the aircraft facilities are various maintenance and repair operations, radar and radio activities, and POL tasks. The replacement cost of the Academy facilities is estimated at \$2 billion (Gallogly 1995).

The Academy's academic areas contain environmental concerns similar to those of any small college, plus several associated with its particular mission. Like other schools, the Academy deals with a variety of toxic chemicals and materials in chemistry, physics, engineering, and other academic areas. Beyond these more traditional academic environmental challenges, the Academy is faced with the problems generated by a fully functional jet engine test cell, complete with several jet engines, a rocket engine test cell for firing solid rocket motors, and weapons ranges for both small arms and rifles. As many military training exercises require large areas of terrain within which to maneuver, use of the delicate foothill flora and fauna must be regulated to prevent overuse and damage.

Thus the United States Air Force Academy presents environmental planners with all the problems of a small city, combined with the problems of an undergraduate college, combined with the difficulties created by specialized military operations. The manner in which the Academy's environmental planners have dealt with this medley of problems offers a useful insight into the potential utility of making use of the military as a partner in non-traditional environmental concerns.

The most fundamental contribution military leadership provides the environmental situation at the Academy is, much as at Wurtsmith AFB and other military facilities, integrated environmental management. The environmental ethic is ingrained in virtually all operations at the Academy, with compliance ordered as mandatory from the very beginning of any planning operation. To facilitate this process, the Academy's environmental office is organized around the four "pillars" of compliance, restoration, pollution prevention, and conservation. Environmental programs fall under the Base Civil Engineer. At the Academy, there are approximately 20 full time environmental staff working in the four areas.

Compliance means living up to current environmental requirements from national, state, and local governments, in addition to international treaty obligations. At the

Academy, compliance with current regulation is the direct responsibility of the staff in two offices, air quality and water quality. Ongoing air pollution programs include conversion of base vehicles to compressed natural gas (CNG), and the building of an on-base CNG fueling station. To date, 70 vehicles, including three large buses, have been converted. Emissions from these vehicles are negligible.

Major strides have been made with a program to manage ODCs. The primary user of ODCs was the heating-ventilation-air conditioning system. Major reductions in CFC use have been accomplished, and remaining CFCs are captured and recycled. All halon fire fighting systems have been replaced with either water or CO₂ systems, with the only exception the small rare book collection of the library.

Water pollution efforts include a non-potable water reuse program. This is a particularly important program for a base such as the Academy, due to the dry high-alpine climate found in the foothills of the Rockies. The Academy captures wastewater from both base housing and cadet dormitory areas and treats it at an on-base facility. This treated gray water is then used to irrigate over 600 acres of landscaping. The compliance staff also deals with issues such as radon, storm drain runoff, PCBs, asbestos, and lead.

The restoration staff manages clean up of past problems and mistakes. Currently there are 12 documented IRP sites on the grounds of the Air Force Academy. Of these, one has been closed, and seven are expected to be closed in 1996. These sites range from more significant contamination of ground water by USTs, and less significant "contamination" of the rifle range by lead bullets. At the Academy, the restoration program is the direct responsibility of the restoration section of the environmental office.

Pollution prevention responsibility is spread over three major sub-offices with separate responsibilities. The Hazardous Substance section deals with traditional hazmat issues. The Pharmacy section deals with hazardous materials generated by medical and dental activities at the Academy. Finally the Recycling and Composting section runs the major recycling center on-base along with the base-wide composting facility.

The recycling effort has evolved dramatically since the author started the first Academy recycling program in 1989. Fully 31 percent of the waste stream is now intercepted and recycled, well above the normal civilian community average of just over ten percent. Over 90 percent of families living on-base take part in the curbside collection program. In 1995 the program recycled over 141,000 pounds of newspaper, over 392,690 pounds of office paper as well as thousands of pounds of cardboard, aluminum, steel, glass, and plastics. In addition, all grass clippings are intercepted and composted in a base-wide compost pile. Much of the collection is done by civilian contractors, for which the Air Force pays just over \$90,000 per year (Gallogly 1995).

The Pollution Prevention section is also charged with energy reduction, including upgrading to more energy-efficient systems. The current program includes retro-fitting many of the tens of thousands of overhead light fixtures with more energy efficient light bulbs. The Academy expects a 30 percent reduction in energy use by 2005 from 1985 levels.

Finally, the Conservation section provides overall environmental planning to tie the ecological requirements mandated by law and regulation to the ongoing military operations of the Academy. Sub areas of conservation include wildlife planning, forestry planning, and EIAP planning. The Conservation Office deals with the various wetlands and flood plains that exist on the Academy, along with endangered and threatened plant and animal species. The Academy is home to the world's largest known population of the rare Prebbles Meadow Jumping Mouse, a candidate for listing as an endangered species, with some 300 to 450 known to live beneath the Academy's soil. Overall, there are over 70 mammal species, 243 species of birds, and 649 species of flora identified as living within the boundaries of the Air Force Academy. Populations and habitats of such a diverse range of living things require careful management.

The Academy has been designated as a "Tree City USA." The Conservation office uses a variety of techniques to promote wildlife habitats including controlled burns, watering stations, and tree and shrub plantings.

Not all management programs meet with complete public acceptance. During my tenure at the Academy, the Mule Deer population soared to over 1400, well above the carrying capacity of roughly 900. A variety of possible programs were considered, including the expansion of the already underway deer feeding program. The feeding efforts had thus far prevented a large scale starvation of Mule Deer. Equally important, the program had largely prevented the wholesale destruction of the population of Juniper trees on which the deer fed. It was ultimately decided that the only practical solution was an organized hunt. In this system, game wardens indicated to hunters which deer could be shot and collected. Yet even a minimal hunt (15 animals in the first year) was met with vociferous protest. The openness of the process resulted in a number of individuals at the extreme end of the environmentalist spectrum becoming very active in opposing the hunt. Nonetheless, ultimately the hunt took place, and has become a biennial program to manage deer populations.

In addition to the technological innovation in programs such as gray water reuse and travel reduction incentives, the Academy's environmental program clearly demonstrates the important role of a quality management program and commitment to the success of an environmental process. This managerial expertise and mindset may prove to be a major contribution by the military to civilian administration of non-military environmental challenges. This transfer of expertise is similar to the technological transfers suggested by other examples. While Wurtsmith AFB illustrated the importance of the military's technological innovation and invention, the Academy shows the utility of making use of existing resources and talents within a framework of quality environmental management.

Other than the brief flurry of protests about the deer hunt, the Academy's environmental program, built on openness and completeness, has been generally accepted as sincere and effective in the Pike's Peak region. Similar examples of this process are found at many Air Force bases around the nation. At Vandenberg AFB in California, some 80,000 of the 98,000 acres are virtually untouched by human hands. The EIAP process has resulted in the preservation of 742 Native American archeological sites, the ongoing protection of eight endangered species, and the safeguarding of a number of other threatened or rare species of flora and fauna (Judd 1991). Such examples are typical of the current military environmental ethic.

As the theory presented in Chapter 3 suggests, the military can serve the broader notion of national security by transferring the management philosophy and practices that have made the environmental programs at the Academy and other bases generally successful. The military's EIAP process, along with the IRP procedure would seem directly transferable to local governments. This top down management system offers small to medium communities the opportunity to reduce costs and increase "customer satisfaction" with minimal costs to the military and the communities.

Additionally, the demonstration of the viability of natural gas retrofitting of vehicle fleets offers industrial operations planners an opportunity to validate at no cost to themselves the environmental and economic utility of conversion. Similarly, the use of base compost material to assist in the regeneration of denuded landscapes suggests cities could find a similar utility in city or neighborhood composting operations. The success of the Academy's recycling program demonstrates that by making participation easy with readily accessible collection areas, significant reductions in land fill volume are possible. A simple requirement, for example, that a recycling container be placed next to every waste container seems to result in an inculcation of a recycling ethic. This lesson is not restricted to military personnel, and is yet another small example of military environmental practices

and management that might well transfer to non-military applications. This validation role is consistent with that proposed by interview respondents Brower and Weaver.

Both Wurtsmith AFB and the Academy illustrate ongoing military environmental programs and the utility of expanding such efforts. Are there other environmental arenas in which the military might be an effective and appropriate player? The following case study suggests that environmental crisis may be such an area. Few cases are more illuminating in answering that question than the accident at Chernobyl. I now turn to that disaster in the Ukraine.

Chernobyl

The disaster at the Chernobyl power station ranks as the worst nuclear accident in world history. The scale of radioactive release dwarfs not only that of Three Mile Island, but also the bombs dropped on Hiroshima and Nagasaki. The response to the explosions and fires was provided overwhelmingly by the Soviet military, including firefighters, pilots, and chemical weapons troops. It is the actions of these military personnel that is of interest to this dissertation. Did it make any real difference that the Soviet military became involved? The answer is clearly and strongly, *yes*. The role of the military proved critical. Without the prompt and sustained actions taken by the Soviet armed forces, the disaster would have been horrifically worse. Use of the military in the alleviation of this environmental calamity offers an answer to a basic theoretical question of this dissertation: can the military help in crisis?

My analysis of the Chernobyl disaster relies, of necessity, on secondary sources. I include Chernobyl because the disaster at the nuclear power plant offers a rare opportunity to examine military forces engaged in crisis environmental activities first hand. The Soviet military responded to the emergency situation in dramatic form. If one of the basic claims of this dissertation is the utility of using the military during environmental crisis, the history and lessons learned at Chernobyl should prove most illuminating.

Several secondary sources were particularly useful.¹ Grigori Medvedev was an engineer at Chernobyl in the 1970s as the plant was being built. He ascended the hierarchy within the Soviet engineering world, and was the expert sent to Chernobyl by Moscow in the hours just after the explosion. Medvedev wrote *The Truth about Chernobyl* (1987), that provides a first hand look at the actions taken immediately after the blowout of the reactor. A British scientist, Richard F. Mould, visited Chernobyl a year after the disaster, and wrote *Chernobyl, the Real Story* in 1988. Zhores Medvedev (no relation to Grigori) penned *The Legacy of Chernobyl* in 1990. In 1993, Glenn Alan

Cheney wrote *Chernobyl, The Ongoing Story of the World's Deadliest Nuclear Disaster*. Finally, Piers Paul Read wrote an exhaustive study of the Chernobyl disaster in 1993 titled *Ablaze: The Story of the Heroes and Victims of Chernobyl*. Based upon these and other sources, here is a summary of the incidents of April 26, 1986 and the military response.

The Chernobyl nuclear power plant is a massive power station. At the time of the accident, four reactors were each providing 1000 megawatts (MW) to the Kiev electrical grid, the equivalent of fourteen million tons of coal (Read 1993, 40). Two more reactors were under construction. Had all six units been completed, the V. I. Lenin Nuclear Power Station at Chernobyl would have become the largest power generation station in the world (50).

The reactor design at Chernobyl was known as RBMK 1000, an acronym that means "large power Boiling Reactor" (Cheney 1993, 10). This design was used only in the Soviet Union. The RBMK design calls for a massive block of graphite as the reactor's core. This 1700 ton block was riddled with large machined holes. Some 1661 such bores were designed to permit zirconium alloy tubes filled with uranium pellets to be placed inside as nuclear fuel, while an additional 211 channels were drilled for the boron control rods that were lowered into the reactor to slow or stop the nuclear reactions. These control rods were raised and lowered in various combinations to vary the level of atomic reactions, and thus the amount of power being generated. Plant regulations require at least 28 rods be in the reactor core at all times to prevent the core from becoming dangerously hot (Cheney 1993, 20).

A maze of plumbing brought water to the reactor to be flashed into steam by the immense temperatures generated by the atomic combustion. This steam was then used to spin the turbines that in turn generated electricity (Read 1993, 29-31). Reactor number four at Chernobyl was loaded with 185 tons of uranium 235 (Cheney 1993, 10).

There is no single cause of the explosions and fires of 26 April 1986. The disaster was due to a combination of shoddy design, poor oversight, and poorly conceived testing

procedures. The RBMK design was hardly on the cutting edge of nuclear engineering. The design was, in fact, a scaled up and “modernized” version of a British nuclear design from the 1950s (Mould 1988, 1). Significantly, unlike virtually all other nuclear power plants in the world, the Soviet design did not call for the reactor building to be housed within a larger, stronger, containment building. Plant operators were also aware that their relatively plush life style would be at risk if the power plants stopped generating the critically needed electricity.

The direct cause of the debacle at Chernobyl grew out of a test performed on a reactor that was, at the time, operating safely and normally. The RBMK design called for the plant itself to receive its electrical power from outside sources and not its own reactors. This presented a danger. Should the power from the outside be interrupted, several critical systems would lose power. These included the control rods that could stop the atomic reaction, the cooling pumps that would provide water to the core, and the emergency cooling system that would dampen the nuclear fires in a crisis. This could be calamitous, as the reactor core requires water flow and control rods in order to prevent a meltdown of the fuel rods. Should such a meltdown occur, the molten atomic liquid would burn through the bottom of the reactor building, and would come into contact with ground water. The resulting steam explosion would spread vast amounts of radioactive precipitates over a large area.

Engineers at Chernobyl were, therefore, tasked to find a solution to the problem of an external “blackout” of power to the plant. An experiment was devised. Performed in the early morning hours when electrical demand was at its lowest, the plant operators would simulate a blackout. The expectation was that the turbines driven by the atomic steam would continue to spin for several minutes due to their own inertia. The engineers believed this would provide electrical power long enough to lower the control rods and cool the reactor (Cheney 1993, 11-12). Backup diesel generators were to be disconnected. Most significantly, the emergency power reduction system was to be

disabled. Automatic controls that raised and lowered the control rods were to be turned off as well. Everything was to be run by hand during the experiment (17-18). At 11 P.M. on April 25, 1986, the engineers began to configure the reactor for their tests.

Without the automatic control system operating, the reactor became more difficult to control precisely. The experiment called for a power generation level of 700 MW, and by 1 A.M. the power output had dropped to only 30 MW. In an attempt to bring the reactor back to the desired level quickly, additional control rods were withdrawn from the core. Seven minutes before the explosion, only 18 rods of the required minimum of 28 remained inserted in the core (G. Medvedev 1987,, 56). Since the outside electricity had been cut off, the reactor was now drawing its power for its systems from the still-spinning turbines. However, the insufficient power level meant that the water pumping system for cooling the core was under-powered. As the engineers continued to remove the additional control rods, the reactor finally began to heat up dramatically, as they had desired.

At 1:23 A.M. the power surged from 200 MW to 530 MW in three seconds, and continued to rise at an exponential rate (Mould 1988, 10-14). The reactor was now out of control. At 1:24 A.M., a massive explosion blew out the top and front of reactor four. The 1,000 ton steel and concrete "lid" of the reactor was tossed into the air and landed vertically on the reactor building. The first engineer sent to investigate climbed to the roof and reported that he could see directly into the blue glow of the nuclear fuel. He would die several days later from massive radiation poisoning (Read 1993, 82). The explosion sent a shower of radioactive graphite and pure uranium 235 up and out of the building. These chunks descended on neighboring buildings, parking lots, and soils. Due to the very intense heat of these objects, over 30 fires were ignited. Thus the area around reactor number four was littered with flaming chunks of highly radioactive nuclear material. What had begun as a simple test of turbines had now become the single worst disaster in the

history of the nuclear industry, dwarfing any previous atomic calamity. Within minutes the first military units, a detachment of firefighters, began to respond.

To understand fully the significance of the military response to the Chernobyl disaster, one must be familiar with the concept of nuclear radiation and assumed safe limits of human exposure to it. The actions of various military and civilian personnel in the face of high levels of radiation are remarkable, made even more so by a fuller understanding of the dangers they faced. The unit used to measure radiation from an engineering and scientific point of view is the *curie*. According to Glenn Alan Cheney, the Three Mile Island nuclear accident released between 15 and 30 curies into the atmosphere. Chernobyl released at least 500 million curies (28).

The amount of radiation that strikes a person is known as *radiation absorbed dose* or "rad." As different atomic particles vary in their potential lethality to humans, a *roentgen equivalent man* or "rem" unit was devised. For example, one rad of x-rays, gamma rays, or electrons has a rem value of 1, as these are the least lethal radiation products. One rad of neutrons or protons, however, carries a value of ten rems, while one rad of alpha particle equals 20 rems (Mould 1988, 219-220). "Safe" levels of radiation exposure have been debated since the dawn of the atomic age. No clear consensus has emerged on what is truly safe. *The Journal of the American Medical Association* offered the range of radiation illness as shown in Table 6.2 (Mould 1988, 219).

Table 6.2 - Radiation Illness

Dose in Rems	Clinical Illness	Percent Surviving (with treatment)
15-50	Asymptotic, possible chromosomal damage	100%
100-200	Nausea/Vomiting, Bone marrow damage	100%
300-400	Severe damage to blood cells, circulatory system	50%
600-1000	Severe damage to gastrointestinal system	0-10%
1000-5000	Acute encephalopathy, cardiovascular collapse	0%

The average person is exposed to approximately 360 millirems, or .03 rems per year (Cheney 1993, 30-33). This radiation comes from such sources as the sun, radon gas, radioactive isotopes in the soil, and medical x-rays and treatment. In general, the medical community believes the human body can sustain such levels and repair any resulting chromosomal damage. The US government has set a standard of exposure for the general public at no more than one tenth of a rem *per* year. Workers in radioactive environments (e.g., x-ray technicians, power plant workers) should be exposed to no more than two rems per year over several years (32).

The first military units to arrive at the power-plant noted that over two dozen fires were burning, many on the roof of the adjoining turbine building. Fire fighting units in the Soviet Union were part of the Ministry of Internal Affairs (MVD), a branch of the Soviet military. These units were stationed at the town of Pripjat, a bedroom community for the Chernobyl plant. Commanding the first MVD unit to arrive at Chernobyl was Lieutenant Vladimir Pravik. Upon seeing the size of the fires, Pravik ordered all fire fighting units within the Kiev region to come to Chernobyl. Within two hours 186 firefighters and 81 engines were on scene fighting the fires (Z. Medvedev 1990, 42-45). With nothing more

in the way of protection than standard Soviet fire fighting garb, Pravik stood on the roof of the turbine building for several hours directing his men's efforts to extinguish the fires. In those few hours, with a direct line of sight into the reactor core, Pravik absorbed perhaps 10,000 to 90,000 rems. When he died days later, his body (like that of many of the victims) had to be treated as toxic waste. As Piers Paul Read (1993, 154) noted, "there was a tragic correlation between the heroism of the injured and the seriousness of their disease."

Perhaps the most dramatic use of military personnel involved the task of cleaning the graphite and nuclear fuel from the roof of the turbine building during the time the reactor fire was burning out of control. Over 3400 soldiers were used, each allowed to run a single time across the roof with a shovel to collect a chunk of debris and run to the edge of the roof, and toss it onto the exposed reactor core. That environment carried sustained radiation loads of between 10,000 and 20,000 rems per hour. Each man was allowed a mere 90 seconds to perform the task. After that brief tour of duty, each was allowed to retire on a disability pension plus cash (Cheney 1993, 40; Read 1993, 208-211).

As the firefighters battled the conventional fires, the core continued to burn at a temperature of over 4500° F. Military units were engaged in two main activities: suppression of the fire in the reactor core, and collection and decontamination of the area around the reactor. The first action taken by the Moscow military leadership was the mobilization of chemical warfare troops to the Chernobyl section of the Kiev military district. The commander of the chemical services section of the Soviet army was Colonel General Vladimir Pikalov, and he assumed direct command of the Chernobyl efforts (Z. Medvedev 1990, 49).

Upon arriving, Pikalov faced twin major concerns. The first was how to extinguish the nuclear fire within the destroyed reactor building number four. The second

problem was stopping the release of radiation from both the reactor core and the litter of radioactive waste spread over a wide area.

The first problem was unprecedented. No one had ever had to put out a reactor fire before. As a result, there was some confusion and indecision early in the process. Finally it was decided that the fire might be smothered by blanketing the reactor with sand, boron, dolomite, and lead. The sand would melt and fuse with the uranium 235 reducing the chances any of the nuclear matter achieving critical mass, and possibly exploding. The boron would absorb neutrons. The dolomite would break down due to the heat of the fire into carbon dioxide, that would help to smother any traditional fires, and finally the lead would serve to shield the radiation.

The immediate challenge was one of logistics. It was agreed that the sand and other materials should be dropped on the glowing reactor core, but just how was that to be done? The obvious answer was military helicopters. The sand would have to be dropped from as low an altitude as possible, to reduce the amount of radioactive dust kicked up into the atmosphere by the impact of the bags of material. This meant that the pilots would have to fly at just 700 feet above the reactor, hover in place, and drop their loads. The radiation levels at 700 feet were 300 rems per hour (Read 1993, 109-110). In a single flight the crew would receive several years worth of allowable radiation exposure. The pilots flew until they were too weak or too ill with nausea to fly (Cheney 1993, 42).

Elite military helicopter pilots began flying these horrific missions immediately upon arrival. The pilots had to hang motionless over the reactor while bags of material were tossed through an open door. The heat was terrific, but the pilots dared not turn on any ventilation systems due to the danger of introducing even more atomic particles into their lungs. Three thousand tons of materials were estimated to be needed to smother the fire. After one day, only 150 tons had been dropped in just over 40 missions. Within three days, the military had moved heavier and more capable helicopters to Chernobyl, and the mission rate went to 180 per day.

The only protections offered to the helicopter crews were iodine pills (to saturate the body with "good" iodine and prevent the absorption of radioactive iodine), and lead sheets to place under their seats as they flew. Several pilots refused the lead, as it would decrease the amount of cargo they could deliver onto the reactor. There were occasional pilots who objected strongly to flying these incredibly dangerous missions, but most did fly (Read 1993, 123).

While the dropping of the sand mixture did reduce the amount of radiation being disgorged into the atmosphere, an additional problem was created. As more and more sand, lead, boron, and dolomite began to cover the reactor core, concerns were raised that such a blanket of material could, in fact, trap and hold heat, thereby increasing the chance of a core meltdown. If the nuclear material achieved very high temperatures, the fuel might melt through the bottom of the reactor building. Directly below the reactor were two massive water tanks known as the "blubber pools." Normally used in cooling the reactor, this water now presented a very significant danger. Should the nuclear fuel burn through the concrete floor of the reactor building and drop into the water, the resulting steam explosion might well destroy the other three intact reactors at Chernobyl, liberating their radiation as well.

A crucial question became how much water was actually in the tank. Once again, the military provided the answer, as an engineer and two foot soldiers donned protective gear and crawled through the rubble beneath the reactor. They reported the upper tank nearly empty, and thus no danger. The lower tank, however, contained enough water to raise concerns about an explosion. The decision was made to try and find a way to drain the tank of its now highly radioactive water.

Major Georgi Nagaevsky commanded the special MVD fire fighting unit trained for chemical situations. He and four others volunteered to run a hose to the tank through an area receiving 300 rems per hour. Other military teams from chemical warfare units cleared the rubble from the lowest entrance to the reactor area using armored

reconnaissance vehicles. Nagaevsky and his men drove unprotected fire trucks directly under the reactor and parked next to the reconnaissance vehicles. Using the armored trucks as some measure of protection, the men took turns running out and placing four large hoses in the blubber pool, and running the lines to a water reservoir at the power plant. The pumping began at 10 P.M. The men checked the fire truck pumps every half hour by leaving the relative safety of the armored vehicle and running to the fire trucks. At 3 A.M., Nagaevsky looked out to see radioactive water spraying out from the hoses only 75 feet from his location. An armored vehicle had run over the lines, cutting them in some 20 places. The men had no choice but to leave the armored vehicles and replace the hoses. At this point Nagaevsky and his men were replaced by other volunteers and went directly to the hospital with radiation poisoning.

Some 30 hours later, all the water had been removed, and the danger of explosion was over (Read 1993, 134-137). On May 6, the radiation output of the reactor dropped from 8 million curies to 150,000 and remained relatively low from then on. The fire in the reactor was largely out. Later that same day a bright spot appeared in the crater and an additional 80 tons of lead were dropped by the Air Force. The light went out and the core finally went dark (141).

As noted above, the fire in the core was only one of two major problems with which the personnel at Chernobyl had to deal. The second was radioactive contamination and its containment. As with the reactor core fire, the role of the military in mitigating this portion of the disaster was critical.

Soviet physicists estimated that 96.5 percent of the reactor core had remained inside the reactor building. Only 3.5 percent had been ejected. Nonetheless, that 3.5 percent amounted to 59.9 tons of radioactive materials spread over several acres. By way of comparison, the bombing of Hiroshima released 4.5 tons of radioactive material (G. Medvedev 1987, 79). At Chernobyl, no less than 199,000 pounds of graphite, uranium

235, and other building materials required collecting. This effort was carried out almost exclusively by military personnel.

As the immediate crisis of the reactor fire wound down, additional contamination concerns arose. Should heavy rains fall, the radiation on the ground, in the form of radioactive dust, would run off into local streams and rivers. Military engineers engaged in several major construction efforts to protect the surrounding areas. A series of dams and drains was constructed, directing runoff back to the holding tanks at the Chernobyl power station. The engineers also drilled 300 bore holes some 120 feet down to a depth where impermeable clay began. Should ground water show signs of contamination, these holes could be used to extract the water before it could migrate to other aquifers. Finally, a massive concrete barrier was constructed underground around the Chernobyl plant to prevent any further seepage of contaminated water into the water table (Read 1993, 211-212).

As these efforts continued, military helicopters were used continuously. Some sprayed chemicals designed to break down radioactive particles. Other huge military transport helicopters were fitted with large tanks in order to spray the reactor and surrounding area with a plastic polymer solution that would form a crust on the ground, trapping radioactive dust (Read 1993, 212). A final helicopter mission was flown by a Ka-27. This aircraft was unique in the Soviet military inventory with twin rotors on a single shaft. With this more stable platform, a crew of test pilots was able to hover over the still-smoking reactor to lower a special probe directly into the core. This probe provided critically needed data to the military leaders about the level of radiation coming from Chernobyl (213-214).

The final task at Chernobyl that involved military personnel was the construction of the sarcophagus. The entire reactor building was encased in 14 million cubic feet of concrete with walls 45 feet tall. Steel plates were then welded onto the concrete. Most of the actual construction work was done by miners, while the military provided support and

logistical management. In addition, military forces erected and continue to this day to patrol a fence line surrounding the Chernobyl facility and the contaminated and abandoned town of Pripyat. Within Pripyat, soldiers hunted, shot, and buried the abandoned and highly radioactive pets of the evacuated townspeople (Cheney 1993, 50).

In all, 260,000 soldiers were involved in the Chernobyl aftermath, with the largest dose of radiation (among survivors) absorbed by General Pikalov himself (Read 1993, 330). It is not known with any degree of certainty how many military personnel died as a result of their service at Chernobyl. Precise data are obscured by the secrecy of the old Soviet state, the confusion and clutter within the Soviet medical community, and the dramatic changes in the governance of what was once the Soviet Union. The official death toll from the Soviet government was 31 (Read 1993, 169). This includes six firefighters, including Lt Pravik. Several made remarkable recoveries, thanks in part to the efforts of Dr Robert Gale, an American doctor sent by industrialist Armand Hammer. The actual numbers are difficult to guess. It is hard to imagine that many of the soldiers on the roof shoveling glowing graphite and uranium will not face long term health risks. The helicopter pilots and crew also would seem likely to be at risk for increased cancer and other radiation-induced illness. Nonetheless, the "battle of Chernobyl" was fought largely by military troops, who did finally win a victory, albeit a costly one.

-Analysis of Chernobyl-

The wisdom of utilizing military forces in environmental crisis was demonstrated at Chernobyl in two primary ways. The first was the area of unique or near-unique military tools, and the second was unique or near-unique talents of military personnel. I shall address each in turn.

The military of the Soviet Union had assets that were crucial to the Chernobyl relief efforts. The military's most important tool was staffing. Military forces can

mobilize large numbers of disciplined troops rapidly. As was demonstrated at Chernobyl, environmental misadventure often requires large numbers of laborers to relieve the environmental pressure. The ability of the Soviet military to provide 260,000 troops demonstrates the ability of a military organization to generate a workforce of sufficient numbers in limited time.

In addition to the personnel, the Soviet military was able to provide needed transportation of both troops and critical equipment. Virtually all the chemical warfare troops and equipment was delivered via heavy air lift. Concurrent with the carrying capacity of military transportation is speed. Airlift provides the most rapid delivery of personnel and equipment possible. While some civilian airliners can be converted (over the course of several hours) to cargo configurations, only military forces have large numbers of heavy lift aircraft configured for large pallet cargoes. Even in the West where private sector cargo airlift is available, the carrying capacity of military airlift dwarfs the private sector capacity of such carriers as Federal Express and United Parcel Service. Thus the size and speed of military airlift was critically important to the mitigation of the Chernobyl disaster, and no obvious alternative presented itself. This airlift capability matches an identical wartime need, that of rapid mobilization in response to threat.

Beyond mere transportation and speed of delivery, the military often has unique technical tools. Due to the mission of a military force, the armed services have equipment not available to the civilian community, but that ends up being profoundly valuable in non-military uses. At Chernobyl the Ka-27 helicopter, that delivered the vital instrument probe into the reactor core was a unique military asset. There were no commercially available helicopter platforms capable of maintaining a stable hover over the reactor for a long enough period. American examples include Chinook helicopters, high resolution satellite imagery, and hurricane penetration aircraft. Each of these represents a technology developed for a particular military use, but that has significant civilian (and environmental) utility. These resources would be costly to duplicate in the civilian sector.

While the hardware of the military is often unique, it is not through hardware alone that the Soviet military at Chernobyl proved the utility of using military forces in an environmental disaster. The unique and near-unique talents of the military personnel involved was equally important to the situation. These talents include risk acceptant behavior, technical knowledge, organizational skills, and technical skills.

In many cases of environmental disaster, such as the cleanup of Prince William Sound following the grounding of the Exxon Valdez, private market-driven contractors may be able to perform the environmental cleanup in an efficient and cost-effective manner. In other situations, a partnership between private and public resources may make sense. At Chernobyl, the military was the only game in town. The situation was so grave as to preclude those who had not assumed a risk acceptant view of national service. Military personnel accept as implicit in their duty some risk to life and limb. National service implies a willingness to risk, and at Chernobyl the risks were enormous.

One need only look at any of the many examples of risk-acceptant behavior by military personnel to see this demonstrated. The 3000-plus troops who shoveled raw nuclear material off the roof of the turbine building, the military firemen who doused fires within sight of the core, and the soldiers who ran fire hoses through radioactive water all demonstrated a willingness to expose oneself to risk to a degree that is difficult to imagine in a civilian contractor. While there are no doubt heroic individuals who would engage in such behavior, I argue that the *norm* of military service is risk acceptance. As no similar disasters have utilized civilian work forces, my assertion carries the flavor of conjecture. Nevertheless, I believe the motivation of military personnel is fundamentally different from that of civilian contractors. The pilots of Chernobyl were, for the most part, veterans of the war with Afghanistan and flew their missions with a combat orientation: go in fast and low, bomb the target, and depart. I suggest such a mindset is a military asset uncommon in the civilian world.

It is not possible to assert categorically that all environmental crises would meet with the same level of self-sacrifice seen at Chernobyl. The nuclear leak was easily identifiable as a threat to life in Ukraine. Would military forces be willing to engage in high-risk activity for lesser environmental goals? In general I believe the answer is yes. Navy SEAL teams *did* dive in an effort to free a trapped Right Whale (Chapman 1995), and the Air Force *did* fly dangerous missions to stop Saddam Hussein from pumping oil into ocean waters. The motivations for both these missions were clearly mixed, and not purely environmental. Nonetheless, I believe these and other examples suggest risk acceptant behavior often needed in time of ecological crisis is more likely to be found in military personnel than in civilian contractors.

A corollary to the issue of motivation is the issue of training and experience. The pilots' mind-sets were coupled with the knowledge of how to hover in a "hostile" area, how to deliver "munitions" (in this case sand, lead, boron, and dolomite) on target in an uncomfortable and dangerous bit of airspace. Civilian pilots would require additional training (to say nothing of experience) to become qualified to fly such missions. Again, what is expected in the military is often extraordinary in the civilian sector.

Beyond motivation, the question of technical knowledge favored the use of military forces at Chernobyl. The chemical weapons troops of the Soviet army were trained to work and function in a contaminated environment. They possessed the skills and knowledge to protect themselves while working on the containment and disposal of exceptionally dangerous materials. These skills are uncommon outside of the armed forces.

Most modern militaries of the world today are highly technical. The disaster at Chernobyl was an example of how such technical knowledge can be put to use. Similar environmental crises may find military knowledge and experience useful, or indeed critical, to successful abatement. This seems especially true in nuclear situations, as nuclear decontamination and containment are largely the purview of military forces. Those who

make nuclear devices are often the best trained to handle the unintended consequences of nuclear materials.

The organizational skills of the military are also quite useful in crisis. The military mode of "take charge and move out" implies a willingness to assume leadership roles and implement policies to deal with a crisis. As was noted by several of the interview respondents, the hierarchical organization of the military offers a framework within which problems can be worked and solutions reached. At Chernobyl the military was able to seal off the area, engage in major civil engineering projects (e.g., the massive system of dams and retaining walls), provide security, collect and dispose of nuclear materials, and provide medical treatment to the ill and injured. All this was done within days of the accident. It is difficult to imagine civilian contractors, with the system of bids and protests, moving this rapidly and efficiently.

Thus it seems clear that in the case of Chernobyl, the use of military forces was critical to the mitigation of the world's worst nuclear disaster. Within the Soviet system, it is hard to imagine any other actor providing the needed services. Within western nations, additional options would be available, and the ability of some private market contractors to provide needed services could well reduce the range of environmental emergencies needing military intervention. But the example of Chernobyl suggests that the role of military forces in environmental crisis may continue to be significant.

Technological Validation

Several respondents mentioned the role of the military in creating and/or validating new and innovative technologies. When a need arises for a technical solution to a problem facing the armed forces, the Pentagon often either invents in its own laboratories -- or contracts the invention of -- a solution. These products often have non-military application. If the broader definition of national security suggested by this dissertation is accepted, then the transfer of such technology to the private sector is consistent with the military's service to country. In this section, I briefly examine three examples of military-invented or military-sponsored products that have both significant environmental ramifications and direct non-military uses. I also briefly describe the current Air Force structure created to support technology transfer, and comment on the role of the military as technology validator.

Bioventing

Bioventing is a new technology developed through the efforts of the Air Force Center for Environmental Excellence (AFCEE). It involves stimulating the existing biodegradation of petroleum hydrocarbons in the soil by increasing oxygen flow to the soil microorganisms. Direct injection of oxygen into the soil provides the required minimum amount required to increase the efficiency of the microorganism's ability to naturally degrade gasoline, aircraft fuel, and similar hydrocarbons. Bioventing was tested at 138 sites on 48 military bases with significant success. Test sites have reported reductions in ground contamination on the order of 98 percent. Air Force researchers have produced over 20 scientific publications on the bioventing technology since 1989. The significant advancement of bioventing over existing technologies is the ability to mitigate contamination in the ground without extraction. This technology has tremendous private-sector potential. The technology is very simple. The innovation comes from the new

process more than from new hardware. Thus community ground water contamination programs need not buy some exotic machine from a limited number of (and therefore likely expensive) suppliers. The end result is a low start-up cost, a critically important factor considering the number of locations around the nation contaminated with fuels and fuel derivatives (AFCEE 1994a).

Bioslurping

The Air Force Center for Environmental Excellence has sponsored the development of the "Vacuum-Mediated LNAPL Free Product Recovery/Bioremediation" system, commonly known as bioslurping. This system is designed to remove light nonaqueous phase liquids (LNAPL) such as gasoline, jet fuels, diesel fuel, and heating oil. A vacuum extraction pump pulls contaminants up from contaminated soils through a "slurp tube" and into an oil/water separator. The system is so effective that the recovered fuels can be used in internal combustion engines located on site for power generation and energy conservation. The Air Force is in the process of testing bioslurping at a number of sites of ground contamination on military bases. The results thus far are very encouraging. The technology has direct application to identical ground contamination problems at innumerable private sector sites (AFCEE 1994b).

Internal Combustion Engines for Hydrocarbon Vapor Destruction

One of the problems associated with decontamination of soils tainted with fuel residue is what to do with the waste once it is pumped out. The Internal Combustion Engine (ICE) technique is effective in remediating soil contamination by high concentrations of volatile organic compounds (VOC) such as gasoline. VOC pollution is common at base gas stations and motor pools where automobile fueling operations are

ongoing. Contamination is often not due to a single large spill, but rather is the result of years of numerous small spills common to private-sector gas stations as well.

The technique involves the use of the intake manifold vacuum of an engine to extract and burn VOCs from the soil. The vapors pass through the engine as fuel, and are largely destroyed. The remaining hydrocarbons are run through catalytic converters, after which the discharge into the atmosphere is essentially untainted (AFCEE 1994c).

The ICE technique has very direct civilian applications. Years of filling underground storage tanks and fueling automobiles has contaminated the ground at a vast number of private sector gas stations. This technology may prove a significant application of military technology in the civilian world.

The AFCEE Technology Transfer Division

The Technology Transfer Division (ERT) of the AFCEE is tasked with, on a small scale, the transfer of technology. The ERT is charged primarily with promoting existing "off the shelf" technologies, not the invention and demonstration of new ideas (AFCEE 1994A). This organization can be viewed, therefore, as a prototype of the larger demonstration function suggested by David Brower and Dennis Weaver. The mere existence of this organization in an era of military belt-tightening suggests that a central theoretical construct of this dissertation, the appropriateness of using military resources on non-traditional concerns, is accepted by senior Air Force leadership.

What additional role might the Air Force play in this area? Several respondents stated in their interviews that the military could provide a valuable service by acting as a demonstrator and validator of new innovations. As venture capital for new ideas is often difficult to secure, the example of the military proving the practicality of a new

environmental practice could provide the important validation required by the private sector before investing. If the military were to attempt to test and then employ new and environmentally benign materials in a variety of applications, there is potential for a “win-win” scenario. The military could presumably obtain rights to use new products and processes at below market prices due to their as yet unproved capabilities. This validation process already takes place with “in house” technology, as numerous military-sponsored inventions have found their way into the civilian sector after having been tested and validated in the military. Air Force examples range from improved fuel efficiency for commercial jet airliners to the new satellite personal locator systems offered in high-end new cars.

Following adequate testing of the new product or process for its military utility, the employment of the new system could result in both reduced environmental damage and an enhanced investment outlook for the corporate partner. There are currently, Dennis Weaver suggests, several varieties of construction materials, lighting sources, and water systems that could profit both the military and the private sector by greater use.

In addition, new technologies developed by the military could undergo a similar process designed to document the private sector utility of the new product or system. Examples of each notion are available within the military literature.

Maxims

Beyond offering evidence in support of several maxims offered thus far, the case studies suggest three additional maxims. A general discussion of the support for each maxim is deferred to Chapter 7, but the new maxims built out of the case study data are presented below.

Maxim 8

- If an integrated EIAP-like process has been used by an agency or private actor already mitigating the environmental problem, then military involvement will

likely offer less added value, absent a need for military technology, great speed, or military personnel expertise.

This maxim notes that the environmental planning process used by the military can be easily exported to non-military consumers. Should an environmental problem arise where an effective management program is already in effect, the utility of bringing in the military may be limited. For example, a problem with ground water contamination found at a closing chemical plant may not be helped by bringing in military experts if the chemical company has already begun a comprehensive and effective treatment program. Thus situations with solid environmental programs will be unlikely to profit from military involvement. An important caveat to this maxim is a situation when an environmental problem or crisis arises outside the corporation or agency's experience and expertise. In those situations, where speed, technology, and specialized knowledge are critical, there may still be a role for the military to play.

This maxim is taken from both the Academy and the Wurtsmith AFB cases. The ongoing environmental programs at the Academy showed the value of an in-place program when dealing with the variety of ecological challenges confronting planners. By integrating an environmental ethic into projects from the start, initiatives such as the CNG program meet less resistance. The process of closing Wurtsmith AFB, as with other bases, was greatly eased by the in-place EIAP system. A confidence within the local civilian population that environmental problems would be fixed, due to the existing environmental policy structure, eased concerns about environmental degradation after the base was closed (Jones 1995, Recowski 1995).

Maxim 9

- If a technology or process needs to be quickly invented or tested to mitigate an environmental problem or crisis, and the problem or crisis is similar or tangential to an ongoing military talent or need, then military involvement may be appropriate.

The military, in time of war, is often confronted with a critical need and little time to meet it. Often the ebb and flow of the battle theater creates a demand for an innovative solution rapidly reached. An example from the Gulf War shows the ability of the military to assess new dangers and to respond quickly. An early problem was the challenge of preventing "friendly fire" casualties. Desert dust often obscured the US armored vehicles' identifying markings, rendering them susceptible to attack from the air. The solution was to purchase from a variety of electronic distributors small infra-red strobe lights to place on the tops of the tank. These lights could be seen easily by the sophisticated vision systems of American aircraft, but not by Iraqi troops. Thus American pilots had only to look for the flashing lights to identify friend or foe (Stephan 1992).

Many examples exist that show the ability of the military to respond quickly to technological need. This ability could prove decisive in assuaging environmental crisis situations. The Chernobyl case illustrates this concept in several ways. New procedures were rapidly crafted to extinguish fires, to contain contaminated water, and to deliver a smothering blanket of sand and other materials on the reactor core. Wurtsmith AFB showed the skill of the military in responding to ground water contamination with new technologies. The Academy's initiative for reusing gray water to irrigate various grassy areas is another example of the military's ability to formulate and execute technological fixes. Thus this maxim evolves from numerous small and large examples of military technological innovation.

Maxim 10

- The justification for military intervention in an environmental problem or crisis increases as the personal danger to those responding increases.

The military is one of few professions in which there is found a mindset that accepts grave personal danger as part of the job. While such other public servants as firefighters and police officers have a similar orientation, only the military contains the large numbers of highly mobile and highly trained risk takers needed to deal with major

environmental crisis. The example of Chernobyl shows the importance of having risk acceptant responders in times of environmental crisis. While many ecological emergencies can be adequately and appropriately handled by contract employees (e.g., oil clean up following the Exxon Valdez spill), other situations may require people who accept personal risk as part of their everyday duty requirements.

Individually the case studies offer insight into the everyday relationship of the military with the environment, as well as how the military functioned in one time of profound crisis. Collectively the cases point to several maxims which help frame and simplify the policy choices facing decision makers. When archival, interview, and case study data are combined, the maxims form a useful model for environmental policy making. In the next chapter, I will draw together the maxims crafted thus far, and combine them with an additional maxim based on the sum total of the data. I then test the model and finally in Chapter 8 will speculate on the future of this line of research.

End Notes

¹ In addition to the sources noted here, the UN has published widely on Chernobyl. These documents are often in the form of reports by various UN organizations on their post-disaster efforts to study the effects on flora and fauna, as well as to assist the human victims to resettle, re-employ, etc. For example, see UN documents A/41/339,355 A/40/PV.127-.129 (1986) and A/48/731, 406, 218 (1993) dealing with UN efforts to strengthen international cooperation and coordination of efforts to study Chernobyl effects. Also see WHO document LUN 29 (1991) concerning WHO efforts to establish a long range study on Chernobyl effects.

CHAPTER 7

ANALYSIS AND MODEL BUILDING

In the introductory chapter of this dissertation I ask a basic question about the role, if any, appropriate for military forces beyond traditional war making. The primary research hypothesis was: *If the military performs non-traditional functions, then the society will be improved.* In this chapter I now review the data gathered and conclude the research results support the basic hypothesis.

To narrow the general hypothesis down to a workable scale, I limited my dissertation to an examination of a possible environmental role for military forces. I therefore constructed a working hypothesis that *if military forces are allowed to address environmental issues which are within their realm of expertise, the overall environmental situation is improved.* This is an important question to study. The world's political, economic, and military circumstances have evolved dramatically in recent years, and environmental concerns are increasingly becoming more central to national and international policy.

Scholars have made a strong case that the world is becoming more interdependent, especially in economic terms (e.g., Rosecrance 1986). The ties that increasingly bind nations together are not, however, limited to financial affairs. As common pool resources such as oceans, the atmosphere, and the biomass of the planet are consumed at higher and higher rates by a growing population, environmental concerns become even more central to policy makers. Norman Myers(1989) examined several cases where the national interests of the United States are likely to be at stake, including deforestation in the Philippines, water use in the Middle East, land degradation in El Salvador, and Mexican

population growth. He concluded that "The world is becoming increasingly interdependent environmentally as well as economically" (23).

Environmental security is undeniably tied to any comprehensive definition of modern national security. The environment, unfortunately, can also become an important part of traditional warfare. I noted in Chapter 3 that armies have for centuries fouled their opponents' lands and waters as part of military campaigns. The recent Gulf War demonstrated the global implications of environmental warfare. Oil well fires and crude dumped into ocean water may represent the next reprehensible weapon in the conduct of war. Environmental security is regularly becoming more closely tied to traditional national security. A modern military, therefore, faces a wide variety of threats.

Other factors increase the salience of the military-environmental link. In the United States, and other nations as well, the military competes with other governmental agencies for increasingly scarce funding. A United Nations report nearly 20 years ago noted that the problems of "combating the degradation of the environment [makes] claims on investment, research, and other resources that are in direct competition with military claims [for resources]" (UN 1978,23).

Thus it is important that military leaders understand the new prominence of environmental security concerns, and have an effective strategy for dealing with them. Until recently, environmental response from the Pentagon was ad hoc. Ecological issues were addressed as they arose, with no overall management plan in place. Today an overall EIAP system is firmly established, a significant step forward. Unfortunately even today military environmental planners are compelled to generally focus on immediate problems and limited resources. Any disposition to think beyond what *must* be done immediately, to what *might* be done is usually held in check. Existing environmental problems dampen theoretical musings.

The Maxims

In this dissertation I have crafted a set of decision maxims to assist policy makers in more precisely reasoning out the proper environmental role of the United States armed forces. These maxims, taken collectively, allow for more balanced and more appropriate environmental policy decisions. The maxims allow a policy maker to “think big picture” about the Air Force role in mitigating environmental problems, sifting through data more quickly and efficiently.

It is important now to emphasize clearly what the maxims are, and what they are not. They could be primarily descriptive, forecasting the relative likelihood of military environmental intervention under differing circumstances, or they could be prescriptive and suggest military forces become involved in those cases where they are most likely to be effective if involved environmentally. Or, they could be a fusion of the two.

At its core, however, this dissertation is suggesting a normative view of what the military *ought* to do. Thus all the maxims are fundamentally prescriptive. The evidence supports the maxims I propose, and therefore my model makes policy recommendations based on the particular situation involved. Issue, context, and time may vary the degree to which a particular maxim gains some descriptive character. For example, if a major Chernobyl-like accident were to befall the United States, one might reasonably forecast a military response. Yet this situation would be one in which my model would not merely forecast but would *advocate* such a role for the armed forces. Thus the model is properly viewed as prescriptive, with descriptive implications.

I now review the maxims developed in preceding chapters, and add an additional one. I will not repeat the more lengthy discussions of each maxim contained in the data chapters, but will simply and briefly restate the major thrust of each. In reviewing the maxims, I will comment on the descriptive/prescriptive nature of each. I then test the model with three examples of environmental problems outside traditional military

operations: ground contamination by fuels, oil boom and skimmer storage and delivery, and tree planting. Following that, I turn to some comments on the risks such a decision-making system might create.

Maxim 1

- Other things being equal, the more significant the threat to national security that national civilian leadership believes environmental issues to be, the more likely it is that the military will be used environmentally.

This maxim prescribes action by civilian leadership when environmental concerns represent a threat to national security. There is also a descriptive component to this maxim, in that civilian leadership is more likely to command action when the national interests are threatened. The archival data suggested that Congress had grown increasingly interested in military environmental issues during the time studied. This is a significant factor. Regardless of how effective an organization might be, if the President and the Congress do not view environmental concerns as real problems, no agency of government is likely to become involved. But when the President and the congressional leadership demonstrate to the Pentagon their belief that national security is threatened by environmental matters, the military will become engaged. This does not evaluate how *effective* the military may be as an environmental agent on a particular problem. Rather, the maxim merely suggests that the likelihood of the military becoming involved in the first place is at least partially dependent on attitudes of national decision makers.

Maxim 2

- If Air Force leadership believes environmental problems are significant to the military and represent a threat to national security, then that leadership will consider non-traditional environmental programs as reasonable within the Air Force mandate.

The question which was applied to national civilian leadership above is now addressed to the policy makers in the Air Force. If these leaders believe an environmental factor has a direct effect on traditional definitions of national security, the Air Force will assume environmental issues are part of its normal duties. Absent a consensus at the top

levels of the Pentagon that environmental action is an appropriate area of military activity, significant Air Force environmental interventions are unlikely. Thus, regardless of the potential utility of such activity, there is little chance of Air Force mitigation of environmental problems unless the senior leaders believe it appropriate. This maxim argues that military leadership carries the same responsibility to be proactive as does civilian leadership. When the national security is threatened, action is required.

Maxim 3

- If the Air Force is to address non-traditional environmental problems, then the Air Force budget must be funded to permit such programs without significant compromise of traditional mission elements.

It is almost trivially true that without funding, the military can not engage in new programs and initiatives. There are cases, usually emergencies, when resources can be shifted from one budget category to another during the crisis. For other than short-term situations, however, budgets must fit responsibilities.

The military's traditional war-fighting mission remains the single most important function of the armed forces. Additional humanitarian and environmental missions will be accepted only when properly funded. Given a forced choice between deterring traditional conflicts and meeting widespread environmental mandates, the Pentagon must choose war fighting. This maxim prescribes adequate funding for a broadened definition of national security.

Maxim 4

- Expanded military environmental efforts are more likely when the environmental problem(s) being mitigated are viewed as significant by the American people.

This maxim is the third and final of what might be called the "opinion maxims." Tied closely to maxims 1 and 2, maxim 3 indirectly drives the first two maxims. Public opinion regularly influences public policy (Page and Shapiro, 1992). Thus policy makers are unlikely to engage in major new initiatives without a sense of at least tacit public

approval. This is both understandable and appropriate. Thus when the public judges an issue to merit (or not to merit) military attention, the military should consider that judgment in making policy decisions.

Much as the armed forces can not engage in policies not directed by the national command authorities, the Pentagon will be reluctant to assume duties not supported by the American people. My interview data suggest that senior planners have an ear tuned to what goes on outside the Beltway as well as to what goes on within it.

Some environmental problems may not be in full public view, however. Within the government, the toxic legacy noted by Shulman (1990), and Renner (1991) on DOD, DOE, and Department of the Interior lands remains largely unknown outside environmental circles. It is plausible that some non-military environmental problems where military action would be useful will be hidden from the American public. In cases such as that, the utility of this model is reduced.

It is also important to understand that the term "American people" is not singular. There are many factions within the electorate, with wide-ranging views on the appropriateness of different governmental actions. For example, it is reasonable to assume that support for hypothetical military environmental action will vary with the degree to which the citizens feel a tie to the issue at hand. A radiation leak in an American nuclear power plant may garner immediate and widespread public support, while a similar leak overseas will not. Future research may allow for a ranking of possible military environmental actions by acceptability to the American people. It is possible, for example, that actions within our borders are most palatable, followed by intervention in neighbors and allies. The magnitude of the threat is also likely to play a significant role in public opinion.

Maxim 5

- Military environmental mitigation efforts will be most accepted, and will be more beneficial, when the solution to the problem is dependent on speed of response.

Maxim 5 suggests that environmental problems where “minutes count” are more likely to benefit from a military response than are problems that deteriorate slowly over time. This maxim has both descriptive and prescriptive characteristics, but is primarily prescriptive. When speed counts, the military may well be the proper responder. If, for example, a spill of red-waste materials endangered a local water supply, the ability of military decontamination units to rapidly mobilize and to contain the spill might generate a prescriptive view that the military *should* become involved.

Maxim 6

- Military environmental mitigation efforts will be most accepted, and will be more beneficial, when the solution to the problem is dependent on technical applications.

This maxim is primarily prescriptive, but contains some descriptive aspects. Simply stated, when technology is needed, the military may well be the proper actor to become involved. The high-tech focus of the armed forces of the United States has resulted in a wide variety of equipment and expertise. One major byproduct of the Cold War was the invention and deployment of a range of often-unique hardware, some of which has significant environmental implications. In addition, the knowledge and facilities needed to craft technical solutions to many environmental problems is often found in the military. Thus, if an environmental crisis calls for new technology, the military may be the appropriate agency to respond.

From the descriptive point of view, the likelihood of military involvement is affected by the degree to which the tools and talents of the military fit the situation in question. When the solution to a problem requires little technological sophistication, the military is less likely to become part of the answer. Thus the problem of nuclear

decontamination, with a technology-based solution, is more likely to see a military response than is the problem of habitat loss, which has a political/economic origin.

Maxim 7

- The military response to an environmental problem reasonably must mirror some traditional military function, capability, or need.

If the environmental task has little to do with any aspect of military operations, it is unlikely that policy makers will task the armed forces with the resolution of the problem. On the other hand, if particular aspects of the environmental problem in question directly relate to a military capability (e.g., aircraft on training flights used in counting of whale populations), military intervention should be more likely. When the military has already developed a needed expertise, the military should do what it can to mitigate environmental problems. Laws (e.g., NEPA), regulations (e.g., AFD 32-70) and policy statements by senior leaders (e.g., Cheney 1990), support this more proactive view.

The interview respondents were in general agreement that it would be inappropriate to ask the military to perform environmental functions which have no parallel in traditional military operations (e.g., Gillcash, Hitzman). While the range of military operations is quite large, it does not match every capability existing in the public and private sectors. Thus it might be wise to use the military's satellite imaging capability to locate point source polluters, as such a program is directly related to an existing military technology and expertise. It would be unwise, however, to task the military with on-scene regulatory enforcement based on the results of the satellite imagery. Such enforcement would raise practical, to say nothing of constitutional, questions.

An addendum to maxim 7 was evident in the Chernobyl disaster. The sheer size of the disaster rendered any non-military response inadequate. Only the military had the number of troops, vehicles, and machines needed to contain the radiation rapidly. Should a disaster of similar size occur in the United States, it is unlikely that any private contractor would have the vast stores of equipment and large staff needed to react. In the

case of the Exxon Valdez, the Exxon Corporation hired thousands of workers to scrub rocks, clean beaches, and collect contaminated animal carcasses (Davidson 1990). Once the oil reached the beaches, speed of cleanup was measured in days, not hours. In other disasters, however, it may be necessary to mobilize thousands of personnel very quickly. The military would seem singularly qualified to provide such a voluminous emergency response.

Maxim 8

- If an integrated EIAP-like process has been used by an agency or private actor already mitigating the environmental problem, then military involvement will likely offer less added value, absent a need for military technology, great speed, or military personnel expertise.

One of the most transferable aspects of the military's own environmental programs is the top down management program known as EIAP. Therefore, in situations where little environmental planning has been done, advice from the military may be quite useful in setting up a proper environmental process, and should be made available. If, however, an appropriate system of environmental management is in place, managerial help from the armed forces may be of little benefit. This maxim is prescriptive in nature, saying little about whether the military is likely to be used, only judging whether it ought to be used.

Maxim 9

- If a technology or process needs to be quickly invented or tested to mitigate an environmental problem or crisis, and the problem or crisis is similar or tangential to an ongoing military talent or need, then military involvement may be appropriate.

The proven ability of the military to create, test, and deploy technology may prove a useful boon in times of environmental crisis. The example in Chapter 2 of the Halon replacement chemical illustrates this principle, as do the bioventing and bioslurping technology discussed in Chapter 6. Maxim 9 is prescriptive, stating that the military's utility in mitigation of an environmental problem is related to the status of the technology needed to fix or mitigate the problem. If the situation requires new technological

innovation, then the military may well be an appropriate tool for decision makers to employ.

Maxim 10

- The justification for military intervention in an environmental problem or crisis increases as the personal danger to those responding increases.

The example of Chernobyl clearly showed the utility of military forces where ecological crisis results in direct risk to those responding. Only in the military does one find an ethic of service before self carried to the ultimate extreme. Thus when personal risk is a factor, the military may be a proper part of the response. This maxim has both normative and descriptive components. Based on the example of Chernobyl, it is reasonable to forecast that in situations of profound danger to workers mitigating the environmental problem, the likelihood of military intervention increases. From a normative standpoint, the use of the military seems appropriate. The military is an organization tasked with risking life to serve the national interests. In situations where environmental conditions threaten, and responding is hazardous, the military is a reasonable response.

Maxim 11

- If private sector contractors and technology exist to mitigate the environmental problem at issue, assistance from the military is less likely to be needed.

This new maxim derives from the previous two. Often, environmental problems will have, through market forces, created a private sector response. From a descriptive point of view, it seems unlikely that national decision makers would chose to employ military forces to deal with a problem for which private sector actors are a good match. In addition to spending tax dollars, such an action would have the effect of reducing private sector employment and growth by taking away jobs which could have gone to private individuals. If the private sector is not equipped to handle the environmental problem,

however, one might forecast the chances of military involvement to have increased, as elected officials could view such action as providing needed services to constituents.

Similar logic applies to the question of whether the military *ought* to become involved in a particular environmental situation. If there are private companies capable of doing the needed job, then it would be ill-advised to commit scarce defense dollars to deal with a problem the private sector can handle.

An example of this maxim is the evolution of the asbestos removal industry, which emerged following the publication of research questioning the role of asbestos in cancer. A strong private sector response has filled the niche created by the environmental problem. This maxim will likely be most applicable to long standing and/or slowly developing environmental problems, as the passing of time allows for the growth of new sectors of the economy. If, for example, an environmental issue requires aerial observation, the Air Force may or may not be the appropriate agency to respond. If the type of flying required is traditional reconnaissance, private contractors such as Bruce Gordon may already be in place to provide the service. On the other hand, if the type of flying needed requires special skills typically found primarily in the military (e.g., very high altitude, arctic weather, very high speed), then action by the Air Force may yet be an fitting response.

The Model

To explore these maxims more fully, I now examine three environmental situations where a military response *might* be judged, a priori, to seem reasonable and appropriate. In this case, this "reasonableness" stems from a deductive view of the Air Force and its capabilities. The Air Force may appear, to a hypothetical decision maker, to have the technical inclinations and personnel resources to be effective in each of the three cases to be tested here. Clearly this is imprecise. Absent a model, such a judgment must rely on what DOD policy makers today are limited to in making environmental decision: gut

feelings and personal experience. But with the model, a more efficient and exact assessment is possible.

I will first test the model on an environmental situation for which the results of military intervention are already largely known, the development and deployment of the bioslurping, bioventing, and ICE technologies for ground water decontamination. These test cases are not ideal, but there are no current examples of a wide-spread environmental effort by the military on a non-traditional problem. The motivation to become involved in this particular set of decontamination efforts was largely due to pollution problems on military bases, not a non-traditional application. Nonetheless, the fuel contamination problem is an adequate test to help validate the model due to the very non-military nature of the problem.

Petrochemical tainting of soils is a problem that touches every state, and virtually every city, with leaking underground storage tanks at existing gas stations, city vehicle garages, and industrial sites. In general, the new remediation technology has worked well (Crow 1995, Recowski 1995, Jones 1995). Should the model properly "predict" the relative utility of Air Force intervention, the validity of the model is increased. I will then turn to two cases of potential Air Force environmental involvement which have been briefly touched on several times in the text, oil boom storage and delivery, and mobilization of troops for reforestation.

For the model to be more than an intellectual exercise, each maxim must be converted from a theoretical hypothesis to a usable operational policy tool. Each maxim must be recast as a simple question with a yes or no answer. These questions, taken collectively, will give policy makers a practical tool to more precisely analyze new environmental challenges, and will allow for a simpler and more practical means of deciding on whether or not to use the military.

Questions one and two have been phrased in broad terms, asking if environmental concerns are important to senior leadership as a general rule. It would be more useful to have a measure of support from senior leaders on the particular environmental policy question before the decision maker. Unfortunately, such a determination will often be difficult if not impossible to get, although in the case of both oil containment and tree planting I happened to get high-level input. The decision maker will *usually* be compelled to make his or her best estimate of the overall policy climate, and then act. This results in a less *precise* but far more *practical* model. Table 7.1 contains the decision maxims in such an operational form.

Table 7.1

Operationalized Decision Maxims

Decision Maxim	Yes	No
1. Does national civilian leadership believe environmental issues in general are significant to national security?		
2. Does Air Force leadership believe environmental issues in general are significant and are a threat to national security?		
3. Is there adequate funding to perform the possible environmental action?		
4. Do the American people believe the environmental problem under consideration is significant?		
5. Is speed of response important in mitigating this environmental problem?		
6. Does the environmental problem require a technology-based solution?		
7. Does the possible military response mirror an existing military function, capability, or need?		
8. Have other non-military responders failed to use a strategic environmental management program?		
9. Does a technology or skill need to be invented/developed quickly to mitigate the environmental problem?		
10. Does the environmental problem present significant personal danger to those responding to it?		
11. Do the likely military responders possess particular environmental tools/talents/other capabilities which are not found in the private sector or private contractors?		

It is important to note that this list of policy maker questions should not be viewed as a "pass-fail" examination. There is no minimum number of "yes" responses a decision maker must score before approving a non-traditional use of military forces for an environmental problem. It is equally true that there is no magic number of "no" responses that would cause an environmental issue to be rejected. Additionally, the questions are not all of equal weight in all contexts and all times. For example, should a nuclear emergency similar to Chernobyl occur in the United States the issues of military speed and risk acceptance could prove determinate, while the question of the need for any new technology was moot. Informed rational decision makers will have to balance the various questions on the issue, context, and time-frame of any decision. Future research may also allow for responses to be coded on a continuous scale from "very high" to "very low" with varying weights assigned to each response.

The model appears to be quite subjective in nature. This is not entirely correct. The criteria for the model are rationally defensible. The evidence taken from three diverse data sources suggests these decisional maxims are correct. Additionally, a response within a given category is testable, in that it is subject to review, evaluation, and augmentation. The model is not deeply objective, but it is not entirely subjective either.

This is not to say the model should be viewed as a mathematical analysis. Should a decision maker elect to view the model as an empirical test, with policy supported when the 'yes' scores outweigh the 'no' scores, bad policy decisions may result. The model is a tool which allows for more precise thinking and management of environmental problems. It is unlike an economic or voting model. It will not yield an empirically measurable result based on empirical inputs. The model mixes an effort to forecast the likelihood of military involvement with an analysis of when such an intervention should be undertaken. Further research, discussed in the next chapter, may allow for additional specification in the future.

The model is implicitly a bounded rationality model. The assumption is made that policy makers will operate from whatever knowledge they have, and will make the most

utility maximizing choice from known alternatives. A bounded rational actor formulation is appropriate but not without limitation. A key (and hobbling) assumption is made when I assume personal prejudice and bias do not influence the decision making process. This assumption is necessary at this early stage of research. With additional refinement, normative orientations of senior policy makers may be able to be integrated into a wider model. For example, the relative partisanship of decision makers might provide predictive utility on whether a particular administration was likely to expand or contract military operations in general. A fuller discussion of bias problems follows in Chapter 8.

Ground Water Contamination by Fuel

The problem of fuel contamination of soils usually comes from several sources. Leaking tanks can be a major problem, but gasoline and other chemicals are also spilled in small splashes as tanks are filled, and as vehicles are refueled. A few lost drops with each truck or car can add up to many gallons over the life cycle of a gas station. Similarly, aircraft fueling stations contaminate the ground through careless spills. This problem is, therefore, hardly unique to the military. Yet the Air Force is at the forefront of developing new technologies to fight this problem.

In Chapter 6 I briefly outlined the technologies of bioslurping, bioventing, and the Internal Combustion Engine (ICE) technique. Was this an appropriate use of military resources? The successful results at numerous Air Force bases (Jones 1995, Recowski 1995, AFCEE 1994a) suggests the answer is yes, and the wide-spread technical applicability to civilian sectors indicates a strong future for the technologies. Would a policy maker several years ago, without the ability to see the successful development of the technologies, be aided in making the go/no-go decision by the model I propose? I now apply the 11 question test as a policy maker might have several years ago on the issue of fuel contamination of soils.

1. Does national civilian leadership believe environmental issues in general are significant to national security?

As noted in earlier chapters, the national leadership does seem to view environmental concerns as part of the overall national security equation. This change in thinking was beginning seven to ten years ago, roughly the time frame in which our hypothetical decision maker is operating. The interdependence which ties nations together, coupled with the growing realization of the implications of widespread environmental degradation, has resulted in a political climate which, while changing, continues to believe environmental issues significant. If nothing else, elected officials usually try to reflect the desires and opinions of those who elected them. As most Americans are still committed to environmental goals. Question 1 can be answered yes.

2. Does Air Force leadership believe environmental issues in general are significant and are a threat to national security?

The statements of the senior military leadership from then-Secretary Richard Cheney on down, both civilian and uniformed, clearly indicate an acceptance of the crucial role of environmental matters in making national security decisions today. Question 2 can be answered yes.

3. Is there adequate funding to perform the possible environmental action?

At the time these decisions were made, in the late 1980s and early 1990s, military environmental funding was one of the few areas within the armed forces which was undergoing an increase in funding (Vest 1993). Chapter 4 notes that environmental funding has increased 566 percent from 1983 to 1994. Question 3 can be answered yes.

4. Do the American people believe the environmental problem under consideration is significant?

Gallup poll data reported in Chapter 5 clearly show a sustained interest in things environmental within the American public. The publicity and outcry surrounding the contamination at Love Canal and elsewhere, for example, suggest this problem is viewed as significant. Question 4 can be answered yes.

5. Is speed of response important in mitigating this environmental problem?

A major hurdle in returning closing military bases to local control is the requirement to complete nearly all the environmental restoration before civilian use can begin. Thus major efforts are begun at closing bases, as was seen at Wurtsmith AFB, in order to speed the return of the property to non-military use. This is important for the military and for the civilian world. The military is anxious to be rid of the responsibilities and costs of excess bases, and the local governments and citizens are usually eager to invite private sector companies to come and create jobs by using the old military facilities. Question 5 can, therefore, be answered yes.

6. Does the environmental problem require a technology-based solution?

Minor fuel spills of light weight petrochemicals often require no restoration efforts, as natural processes will break the fuel components down into harmless chemicals (Recowski 1995). For any significant contamination of soil by fuels, a technological fix is necessary. The fuel/water mixture must be extracted, and the petroleum components removed. Question 6 can be answered yes.

7. Does the possible military response mirror an existing military function, capability, or need?

Fuel management is clearly a regular and ongoing military function. In addition, should an operational base's drinking water become unusable, the ability of the military units based there to perform their traditional national security functions could be degraded. Therefore

the ability to purify petroleum tainted ground water does mirror an existing military need.

Question 7 can be answered yes.

8. Have other non-military responders failed to use a strategic environmental management program?

The answer to this question will vary with the many diverse civilian organizations responding to the problem. Question 8, therefore, can not be answered in detail for a non-specific application such as a general technology, and is less significant for this particular problem.

9. Does a technology or skill need to be invented/developed quickly to mitigate the environmental problem?

Existing technology was inadequate for the scale of the Air Force ground contamination problem. Question 9 can be answered yes.

10. Does the environmental problem present significant personal danger to those responding to it?

There is little personal danger to the circumspect fuels worker. Question 10 can be answered no.

11. Do the likely military responders possess particular environmental tools/talents/other capabilities which are not found in the private sector or private contractors?

While there are private-sector contractors dealing with fuel contamination issues, the bioslurping/bioventing/ICE technology represents the cutting edge of technology. Thus vendors exist, but they did not yet have the best technology to mitigate the problem.

Question 11 can, therefore, be answered with a qualified yes.

The fuels example does help validate the model. A decision maker in the late 1980s would, if using the policy questions above, come to the conclusion that investment

in new fuels mitigation technology is appropriate. The preponderance of yes answers would suggest a good policy outcome. The problem was deemed significant, funding was available, speed and new technology were important, the need mirrored an existing military need, and the private sector was not yet able to perform the function. The only clear "no" answer came from the question of personal danger. As noted, this list does not require any particular number of yes or no responses to support or oppose military environmental action. In this case the decision maker would have judged investment in new technologies appropriate based on the weight of evidence. Such a solution is not perfect, but is a significant improvement over the previous system of a decision maker's basing his or her decision on their best guess of the situation.

The model passes a first test of validity. My research via other means also confirms the model's suggestion that investment in fuel contamination restoration was a good idea. Interview results and AFCEE publications cited earlier support the contention that bioslurping/bioventing/ICE technology was a wise investment, the technology works, and is cost effective (Crow 1995, Recowski 1995, Jones 1995). With this test as a background, I now examine two environmental concerns that may serve to bracket the overall question of military environmental policy— oil boom and skimmer storage and delivery, and the use of military troops in tree planting.

I chose oil boom and skimmer storage and delivery and tree planting for a specific reason. During nearly all the research, and in virtually all the elite interviews, I offered those two examples as potentially representing the extremes of the debate. Prior to beginning my research, based on my own experience, I posited that most experts would support the practicing of the critical wartime skill of cargo delivery with oil booms. I also conjectured that few experts would support the use of combat troops in tree planting operations, as that seemed to my eye detrimental to combat readiness. Nearly every interview respondent concurred with my a priori judgments. Thus elite opinion, absent

any model, suggests that if I have properly crafted my decision maxims, oil boom containment should be supported while tree planting should be rejected.

Oil Boom and Skimmer Storage and Delivery

One of the major contributors to the size and gravity of the Exxon Valdez oil spill was the eighteen hour delay in getting oil containment booms placed around the leaking tanker. This allowed nearly 10.1 million gallons of crude oil to spill into Prince William Sound, Alaska (see Keeble 1991, Davidson 1990). Would a military response have made a difference? More importantly today, could military intervention in future tanker spills be an important factor? I will now apply the model questions to a hypothetical oil spill at some remote location in the world.

1. Does national civilian leadership believe environmental issues in general are significant to national security?

Energy policy is an area where national security and environmental security are closely tied. Issues related to oil and energy supply will be viewed as significant even absent any environmental implications. The delicate relationship between the United States and oil-producing areas where such accidents are likely suggests US national interest will be keen. Question 1 can be answered yes.

2. Does Air Force leadership believe environmental issues are significant and are a threat to national security?

Barring significant changes in the global strategic situation, the response to question three here and in the next example will remain unchanged from the previous answer.

Availability of fuel is of particular concern to the Air Force, with virtually all Air Force combat operations involving fuel-gulping aircraft. In addition, in my interview with

Secretary McCall he specifically stated that oil containment was a potentially supportable action for the Air Force. Question 2 can be answered yes.

3. Is there adequate funding to perform the possible environmental action?

The answer will vary with time and context. In general, flights to deliver civilian cargo are not significantly different or more expensive than are flights to deliver military cargo.

Assuming the civilian and military leadership believes the oil spill is important, funds will be available. In addition, as the Air Force intervention would reduce damage to the environment by reducing the size of the spill, it would also be lowering the expenses assessed to the oil company responsible for the accident. It seems quite reasonable, therefore, for the Air Force to bill the accountable company for the storage and delivery costs incurred by the Air Force. This would still represent a significant cost savings to the oil company versus the expense of cleaning up coastlines and beaches. Such repayment could render the costs to the Air Force of conducting this type of environmental mission negligible. Repayment plans might be appropriate for a variety of Air Force environmental programs. Question 3 can be answered yes.

4. Do the American people believe the environmental problem under consideration is significant?

As was noted with the fuels case, public opinion remains pro-environment. In a case of an oil spill, the dramatic images likely from the disaster area are inclined to produce public concern. Question 4 will most likely be answered yes.

5. Is speed of response important in mitigating this environmental problem?

Clearly the more quickly the flow of oil is limited, the less severe the extent of the slick. Speed is perhaps the most critical element in mitigating tanker disasters. An emphatic yes is the answer to question number five.

6. *Does the environmental problem require a technology-based solution?*

Yes. Existing oil spill recovery equipment which might be delivered by the Air Force is generally low tech, but is specialized. Booms and oil skimmers are not highly complex, but do represent a technological response, especially in their delivery and deployment.

7. *Does the possible military response mirror an existing military function, capability, or need?*

Yes. In war time, the military will need to store, and then deliver to remote sites with little warning, critical equipment. This is a skill that the Air Force currently practices regularly.

8. *Have other non-military responders failed to use a strategic environmental management program?*

The answer to this question will vary. In the case of the Exxon Valdez, Davidson (1990, 296) notes that while Exxon was remiss in the original accident, it did respond aggressively based on an overall plan. The problem in Prince William Sound was not the completeness of the response, but rather the slow speed of Exxon's containment efforts. In the hypothetical spill being tested here, a strategic plan could be in place, or it could be lacking. Regardless, few corporate entities have the ability to respond as quickly as the Air Force's fleet of aircraft. Thus the answer to question eight may be yes or no, but may also be less significant in this case than in other environmental concerns.

9. *Does a technology or skill need to be invented/developed quickly to mitigate the environmental problem?*

No. In general, existing technology is adequate to deal with containing leaking oil.

10. *Does the environmental problem present significant personal danger to those responding to it?*

As in the ground contamination issue, a careful worker will not be exposed to profound dangers in storing and delivering oil containment equipment. There are always dangers inherent in flying operations, however.

11. Do the likely military responders possess particular environmental tools/talents/other capabilities which are not found in the private sector or private contractors?

Yes. The ability to respond quickly with large cargo aircraft anywhere in the world, especially to remote and unimproved locations, is primarily limited to military organizations. Commercial cargo companies generally fly fixed schedules, and from modern facilities. The ability of the Air Force to land and take off from short, rough landing strips could shave critical hours off the time required to place oil containment booms around the tanker.

A decision maker using the model would conclude that military forces could be of significant use in limiting the damage caused by a leaking tanker. As noted, in any potential case of using the military, the questions in the model will vary in their individual significance. In the case tested here, questions five, seven, and eleven appear most important. Speed matters, and the ability of the Air Force to deliver quickly to remote locations anywhere in the world could be decisive in limiting ecological damage. The storage and delivery of the needed equipment is absolutely consistent with existing Air Force mission requirements. Finally, there are no obvious non-military sources for the required speedy service. The model predicts, therefore, that the storage and deployment of oil booms and skimmers by the Air Force would be an effective use of military resources.

Tree Planting by Military Personnel

As the Cold War comes to an end, and large-scale military tensions have been reduced, does it make sense to use the uniformed personnel of the military in reforestation efforts? A casual examination of the question from those outside the military might lead to a positive response. The need for troops in Europe has declined, traditional foes are

less hostile, and troops may have additional idle time previously used to train for the Cold War. At the same time, deforestation is an increasingly major concern. Since 1950 nearly one quarter of the world's forest cover has been eliminated (Durning 22). The utilization of troops to help reforest has at least some surface plausibility. I now test the utility of using troops to reforest using the decision making model.

1. Does national civilian leadership believe environmental issues in general are significant to national security?

National leadership has shown that overall environmental concerns are seen as tied to traditional national security. In the broadest sense, deforestation can lead to destabilization of government in threatened nations. This concern was noted by several interview respondents and scholars. In specific terms, however, it is not clear that planting trees in the United States by the military would be viewed as dealing with a national security issue.

2. Does Air Force leadership believe environmental issues in general are significant and are a threat to national security?

As above, barring any significant changes in the global strategic situation the response to this general question will remain unchanged from the previous answer. For this particular case, however, I have senior Air Force leadership opinion. In my interview with Secretary McCall, he suggested that senior military leadership would likely oppose this particular use of military personnel. Question 3 can be answered yes within the general context, but on this occasion specific information is available on the issue from a senior policy maker. Thus for tree planting, question 2 can be answered no.

3. Is there adequate funding to perform the possible environmental action?

Mobilization of troops, especially in large numbers, is one of the most expensive activities a military can undertake. The costs of transportation, housing, and feeding deployed

troops are quite high. The current Congress would seem an unlikely source for significant increases in funding to support such a mobilization. Question 3 garners an answer of no.

4. Do the American people believe the environmental problem under consideration is significant?

Loss of rain forests, redwoods, and other forest lands have become a prominent issue on the American environmental agenda (Moore 1995). Question 4 can be answered yes.

5. Is speed of response important in mitigating this environmental problem?

Military speed is not a significant factor in tree planting.

6. Does the environmental problem require a technology-based solution?

No. Reforestation is very labor intensive, but is also very low in technology.

7. Does the possible military response mirror an existing military function, capability, or need?

No. Several interview respondents suggested just the opposite. Tree planting could degrade combat readiness, as the work is unallied with any current military function, capability, or need.

8. Have other non-military responders failed to use a strategic environmental management program?

The answer to this question will vary, but often the answer will be no. Foresters are usually thinking "big picture" and replanting is done as part of an overall view of the habitat and the biosphere.

9. Does a technology or skill need to be invented/developed quickly to mitigate the environmental problem?

No.

10. Does the environmental problem present significant personal danger to those responding to it?

No. From my own experience I can testify to the tranquillity and safety of reforestation efforts.

11. Do the likely military responders possess particular environmental tools/talents/other capabilities which are not found in the private sector or private contractors?

On its surface, the manpower of the military would seem to suggest the answer is yes. But further investigation indicates a different answer. Louis Gold, Ph.D., founder and director of the old growth forest advocacy group *Siskiyou Regional Education Project* is an environmentalist with years of forestry experience. He stated that there are plenty of people to plant trees, and reforestation efforts don't need military augmentation. The problem of old growth forests, he suggests, is not in the lack of folks to plant, but rather the abundance of people who are cutting them down (Gold 1995). This view was supported by other respondents including Mr McCall, Dr Hair and most military members.

The model suggests that using armed forces personnel for reforestation programs is not an appropriate or efficient use of military resources. The military brings few specialized talents to such a endeavor. The only significant asset in such a program would be the ability to mobilize large numbers of personnel, a tool Dr Gold suggests is simply unneeded. Thus the model supports the ad hoc view of many respondents that tree planting is not an important environmental role for the military.

Summary

The three cases tested support for military environmental action when the particular tools and talents of the military are most useful, and reject military intervention

when the utility of those assets is limited. The opinion gathered in elite interviews, and the data gathered in the case studies, support the conclusions reached by the model. The model, therefore, has increased validity based on these results. Policy makers can reasonably expect use of the model to more sharply delineate between good and bad environmental policy decisions.

As noted above, the model is not without flaw. It does not generate exact, precise conclusions, and requires the user to include a subjective component in the decision-making process. That decision can, however, be a more enlightened one because of the model. The model will allow decision makers to select from various policy options by making the relative strengths and weaknesses of each more apparent. There are several potential trouble spots which must be considered when employing this model. Of particular danger are the twin problems of motivated and unmotivated bias, as outlined by Jervis, Lebow, and Stein (1985).

Bias in general can render a bounded rational choice model nearly useless. My model calls for the policy maker to select the most utility maximizing decision from the available options. Unfortunately, bias can arise because

the problem of dealing with complex and ambiguous information leads people to adopt shortcuts to rationality that simplify perceptions in order to make more manageable the task of making sense out of environments (Jervis, Lebow, and Stein 18).

The authors were specifically discussing problems of deterrence, but I suggest the bias problem vexing a military planner on strategic weapons issues will be quite similar to the bias felt by the same person confronting a military environmental policy question.

Unmotivated bias is a result of cognitive predispositions in the decision maker. His or her own history creates a situation where "...perceptions are strongly colored by our beliefs about how the world works, and what patterns it is likely to present us with" (Jervis, Lebow, and Stein 18). Thus an ingrained personal orientation that environmental affairs are not the proper domain of the military could result in an abundance of "no"

answers, while a too-environmentally committed decision maker could see the military as a proper response to nearly any ecological calamity.

Motivated bias is equally dangerous to potential users of this model. The needs of decision makers to see particular situations in particular ways can skew the decision making process (Jervis, Lebow, and Stein 25). A decision maker in a DOD environmental policy office might look at any overall budget reduction as a threat to his or her own "turf." The result of this line of thinking might be the "conclusion" that nearly *every* environmental problem merits a military response, and a concurrent rise in budget.

Conversely, a policy maker who judged a rise in Russian ultra-nationalism imminent might feel all possible capital and personnel should be funneled into strategic defense and deterrence. That decision maker might feel that *any* environmental expenditure of funds was unwise, as it took money away from the Russian problem.

Therefore in using this model, attention must be paid to the biases of the decision makers and to the subjective nature of the questions. Prudent users will seek to identify and control for these dangers as much as possible *before* using the model.

Despite its limitations, the model is a useful tool to assist policy makers. It has a measure of legitimacy conferred on it by the above tests. It is also supported by the archival evidence, the elite opinion, and by the case study data.

CHAPTER 8

IMPLICATIONS FOR FUTURE RESEARCH

An examination of archival data, interviews, and case studies suggests environmental decisions within the military can be made from within a logical framework. This framework takes into account the distinctive tools and talents of the armed forces, as well as the characteristics of environmental challenges. The preliminary evaluation of the model performed here does not, however, appraise its utility beyond a narrow set of conditions. Additional research is needed to determine the degree to which the model may be useful on a broader scale. This chapter outlines what form such future research might take.

One important step will entail additional validation of the maxims by looking at other Air Force facilities, with different kinds of environmental challenges. Vandenberg AFB in California and Patrick AFB in Florida would both yield significant data. Both bases are large missile launch facilities. At Vandenberg over 80,000 of the total of 98,000 acres are virtually untouched wilderness. The large areas required for the launching of satellites and other spacecraft create significant, if originally unintended, nature wildlife refuges. Vandenberg is home to eight federally listed endangered species, and a number of other threatened and rare species. Patrick is home to a wide variety of marshland birds and mammals, as well as an extensive assortment of rare flora (Bidlack 1991). A study of the land and wildlife management programs on these bases might yield valuable data for other military or even civilian applications.

Of particular use in testing the results of this dissertation will be an examination of the environmental actions taken by the Alaskan Command, the portion of the Pacific Command charged with security in the land and seas of Alaska. As part of a broad environmental program, the Alaskan Command has put in place a small test program of storing oil containment booms for delivery in military aircraft to Alaskan oil spills (Gallogly 1994). A detailed examination of this program would be exceptionally useful in determining the validity of applying my model force-wide.

Can the model and process developed in this dissertation be applied to government actors other than the Air Force? Several possible examples of non-Air Force military environmental policy do seem plausible, and could be evaluated by additional scholarship.

The US Navy could survey ocean temperatures, water currents, and monitor marine mammals, often with little or no significant deviation from regular ongoing military operations. The Army's expertise in rotor wing aircraft could prove useful for aerial observation of a variety of habitats. The US Coast Guard could, as part of its ongoing shore patrols, assist the International Whaling Commission in its efforts to find and protect the now-unknown mating grounds of the very rare Right Whale, a critical need according to IWC member Nancy Azzam. The entire DOD community, acting in a coordinated manner, could provide a variety of important and timely environmental services while still maintaining the primary mission of traditional national defense. Further research will allow for the crafting of DOD-wide maxims to support this process.

A particular research case of interest is the powerful Army Corps of Engineers. David Brower (1995) believes the Corps could be fully utilized to do the work of restoration. He said:

They have the technical know-how, the training, and the dedication to service needed to redesign human systems and restore natural systems—our ecological capital. What to do, now that peace has broken out?...The duty of armed forces is to serve their country...The Army Corps of Engineers once dammed and channelized our rivers with great skill...It is

time for army engineers...to restore our rivers instead of trickling and dribbling them...I think, being good citizens, the engineers may well want to. Government should listen (112-113).

The Corps bears a unique ecological heritage among environmentalists. The maxim protocol may need to include a query regarding the degree to which the Corps is trusted by the non-military environmental community. The Corps' history of large scale projects, with sharply mixed environmental results, may create an undercurrent of mistrust of any new environmental initiatives.

I posit that the military environmental ethic, now fully ingrained but not yet broadly recognized, makes potential distrust of the Corps of Engineers less of a problem today. The EIAP is today firmly in place throughout the military. The Corps will earn, I assert, legitimacy through results. Trust will only come, however, from observation and experience. The use of the Corps on non-traditional environmental programs beyond the historical area of Corps activity may by necessity follow an evolutionary course. As time passes, and if positive results are more clear, acceptance of the Corps will increase.

Thus the model may have to be modified in accordance with the particulars of the military unit involved. This problem is less central to the Air Force, as a broad range of respondents interviewed indicated a basic trust of the Air Force as an environmental partner. As John Denver said, "If we can trust [the Air Force] with war and peace, we'd better be able to trust them with the environment."

Future research could extend the model beyond the United States military. Additional study could provide an understanding of how other nations' militaries could (or do) incorporate environmental issues into their missions. For example, in areas where massive deforestation continues, military forces could be used to monitor the extent and location of illegal harvesting from the air. An EIAP system rendered intrinsic in a foreign military might yield positive results similar to those seen in the United States. Programs similar to the EIAP might be used to protect the habitat of endangered species.

Do the maxims hold when the form of government or military structure is fundamentally different from that of the United States? Quite possibly, and consequent research could tease out maxims applicable to different national government and military structures and to varying environmental situations. Additionally, scholars might draw from this research a possible regime for cooperation on environmental matters *among* the world's militaries. Such a regime might assist nations in matching particular technological or management skills with specific environmental challenges. A potential corollary benefit which merits scholarly exploration would be the degree to which such cooperation could reduce tension, and assist governments in backing away from the required mutual defections of the Prisoner's Dilemma.

Future research could examine the degree to which the maxims could be successfully applied to other US governmental elements. The Department of Energy is home to a number of scientists and engineers whose expertise and technology could be useful in mitigating some environmental problems. The Department of Commerce could, perhaps, lend managerial expertise. Legal professionals within the Justice Department might be helpful to the private sector in dealing with complex SARA and IRP issues within an industrial context. It is difficult to say which scholarship might be most useful, but I believe the lessons learned from the military may have significant non-military governmental application. Any government actor with unique tools and talents that have environmental applications could be studied. Such scholarship could determine the cost effectiveness and mission impact of enhanced environmental responsibilities for that agency. Properly modified, the maxim model could yield useful results for a variety of governmental actors.

Beyond national government, an additional useful study would be consider similarly sized civilian industrial organizations. By comparing the closure of Wurtsmith AFB, for example, with the closing of a similarly sized civilian chemical or aircraft

maintenance operation, scholars could extract from the analysis those improvement in environmental quality that were due to a military component as opposed to those due to an industrial one. Perhaps General Motors could, therefore, mitigate the environmental consequences of some of their industrial applications by utilizing technology and/or management programs used by the military. And perhaps the military could learn from GM as well.

Environmental issues contain a national security dimension and are thus the proper purview of the armed forces. But to what degree should the Department of Defense engage in non-military functions *beyond* those with national security implications? These are questions which future research must consider if we are to get a fuller understanding of the place for the military in our national social structure. Basic questions must be answered. Does the impact of a military base on a local area's economy and health make a compelling reason to maintain a military presence in a non-strategic area? Should a base remain open for local reasons after the military reason for its existence vanishes?

These are exceptionally difficult questions, as yet inadequately addressed by scholars. Future research should examine the link between social welfare functions and the military. Air Force Secretary Sheila E. Widnall has stated that programs such as environmental restoration and repair are "defense by other means" (Pomeroy 1995). To what degree, if any, should this definition be broadened? There is little doubt that, regardless of intent, the Department of Defense has become more than a mere armed force.

This dissertation has focused exclusively on the impact of the military on the environment. Yet the military affects society across a wide range of criteria. These additional ties raise other important research questions.

As has been seen a number of times with the BRAC process, those who will be adversely affected by the loss of their "local base" will protest the closure decision.

Individual businesses and even entire regional economies can be severely impacted, needing years to recover. If F.E. Warren AFB in Wyoming were to be slated for closure, should it matter that the only two OB/GYN doctors in the state were military physicians at Warren?¹ Does the large number of military retirees around March AFB in California, each promised medical care for life, justify keeping the base open? Should military equipment, such as the complex and largely unneeded Seawolf attack submarine, be purchased to maintain an industrial infrastructure capable of building implements of war in times of crisis? Should the economic devastation caused by closing the shipyard be an adequate reason for keeping the yard open? These are difficult questions, with inadequate answers thus far.

Base closure itself generates an array of important research questions that merit further study. Should the military be used to support essentially local economic interests? When base closings have been announced, the responses of the Congressional delegation from the affected areas have been very similar. In addition to the usual national security arguments, the congressional hue and cry have been about the negative impact on the local and national economy such a closure will induce. The Department of Defense has become a welfare program for cities and states home to major military installations. Is this wise? Justifications for retaining particular military bases are often not based on strategic arguments, but rather on local economics. More broadly stated, should the general welfare provision of the Constitution be interpreted to support an *economic* role for the military in the national industrial fabric? The issue of closing military bases offers scholars an opportunity to examine this question. Lessons learned from shutting down large military operations may be particularly useful during the current era of industrial downsizing and corporate reductions. The problems of closing a military facility may well mirror the problems which are encountered in the downsizing of a major industrial operation. Management techniques, technical processes, and other lessons gleaned from

the military experience may well serve the larger public good in the business sector. Scholarship in this area could yield most interesting results.

Additional study is also in order on the impact of military environmental programs on other aspects of human behavior. A fairly common occurrence in most policy endeavors is the "law of unintended consequences." A decision may have unforeseen entanglements. Future scholarship should, therefore, examine the possible influence of military environmental programs on risk acceptance. A military environmental program's goal is to assuage environmental disaster. But would the mere existence of such a plan have collateral effects?

Psychology literature suggests that people may become more risk acceptant in the presence of high quality "insurance." Thus establishment of a program which lessens the jeopardy posed by ecological crisis might have the perverse effect of increasing risk acceptant behavior (Mano 1994; Slovic 1978; Beck 1984). For example, could a program of storing and delivering oil containment booms and skimmers cause tanker captains to become more reckless in their efforts to keep to a tight time schedule? Could a captain become more risk acceptant because he believed the US Air Force would quickly move to limit the damage caused by a leak from his ship? Likewise, if soil contamination from petroleum products becomes less costly to clean up, will a gas station owner become less careful while refilling his underground tanks? A scholarly review of the issue of risk-acceptant behavior should be considered in crafting such an agreement.

The Department of Defense, regardless of intent, has become more than solely an armed force. In the fields of race relations, gender equality, and environmental protection, DOD has demonstrated the ability of the military to lead society on issues far removed from warfighting. A persuasive argument can be made that such actions have greatly profited not only this nation, but people around the world. And so I hearken back to the

rough definitions and thoughts suggested in Chapter 1. The role of the military is to protect the nation from threat. The concept of threat in the next century, however, must be more broadly defined. This dissertation demonstrates the utility of expanded military environmental action within reasonably clear-cut decisional limitations.

A next step in my own research will be to determine the appropriateness of two nascent maxims at which I believe the data hint, but for which the data do not yet support formal inclusion in the model. Several interview respondents suggested that the use by the military of new and relatively untested products or systems might provide an important validation function within the private sector. In short, if the military validates a technology or product, then the private sector will be more willing to invest in it. That suggests the military could provide a useful economic function, possibly giving a boost to the national economy. Such a maxim might take the operationalized form of "will the use of the technology by the Air Force provide a significant validation factor for the technology?" Case studies of past military uses of technologies should allow for refinement and evaluation of this potential maxim. A literature does exist on "spin-off" technology from both the military and other programs with a technological orientation (see Brown 1986, Aviation Week 1987, Alic 1992).

The second embryonic maxim appears in various interview subject's responses. Several military respondents were more inclined toward active Air Force participation in environmental issues when no significant "hard resources" were used. If the solution to a problem required the use of resources that were "renewable," such as fuel, support was higher than if the action would result in the permanent loss of an Air Force asset. Thus if the answer to an environmental issue seemed to require the Air Force to give away a generator, filtration system, or other hardware for which the Air Force was not likely to be repaid, then support for intervention was reduced. This was never explicitly stated, but seemed implicit in several respondents' answers. Further research is needed to determine

the degree to which it would be appropriate to add the maxim "will non-renewable Air Force resources be lost in the process of mitigating the environmental problem?"

In Chapter 1 I asked the question "what is the proper role of the US military in helping to protect and defend the United States in this century and beyond?" The data support the concept of broadened Air Force involvement with a variety of environmental concerns within a set of guidelines. At the same time, however, the military cannot, and should not, be all things to all people. Future research may determine if similar sets of maxims can be crafted for issues other than the environment, and for organizations other than the military.

End Notes

¹ This was briefly the case in Cheyenne. During 1987 no obstetrician/gynecologist physicians remained in Wyoming other than the two stationed at the Air Force base. Women were required to travel out-of-state for complicated births. The Air Force doctors did provide emergency OB/GYN service as necessary to civilians.

APPENDICES

APPENDIX A

Interview Protocol

I am conducting research on the military and the environment. I hope to gain a better understanding of how the military in general, and the Air Force in particular, can support both national defense and environmental concerns. I am a major in the Air Force, and am on the faculty of the political science department at the Air Force Academy in Colorado. I am currently on assignment to the University of Michigan to earn my PhD in environmental politics, after which I will return to the Academy to resume teaching. This interview is part of my research for my PhD dissertation in political science at the University of Michigan.

Your position in the (environmental, governmental, military) places you in a position to have an expert opinion, and I am grateful to you for taking the time to see me.

If you have no objection, I will make an audio tape of this interview to which I alone will have access. This tape is strictly for my use, and will be used only to assist me in writing my dissertation. I will be happy to turn off the tape recorder at any time you direct, and your comments during that time would be strictly "not for attribution."

I am interested in your views on a wide range of subjects related to the military and the environment. Let me begin by asking you...

+

1. What are the environmental problems that you personally are most concerned about today?
2. What are some of the factors that you believe limit you or your organization's ability to be more effective?
 - If not listed by respondent--> Do you face any significant technological or logistical roadblocks you wish you could get past?
3. What do you think the role of the military should be in environmental protection?
 - if negative to military, ask what military represents to respondent
4. Some have argued that the military should be involved only in a very limited range of war-fighting functions. Others point to NEPA section 101 which states that the government is to use "all practicable means and measures" to achieve "productive harmony." Would you be troubled by the notion of the military becoming involved in a broader range of functions, outside of those traditionally associated with the military?
 - Probe --- distrust of military, dangers of standing army, "big government concerns"
5. What would you like most to see the military do regarding the environment?
6. Are there any environmental issues where you think help from the military would be useful?

7. (If civilian) Are there any environmental problems you deal with where the military's special tools and talents might be particularly useful? (if none, prompt e.g., airlift, aerial imagery, R & D efforts)

(if military) Are there any aspects of the environmental problems you deal with where you would find it useful to take advantage of any of the military's special tools or talents, but are unable to?

8. Do you believe DOD environmental efforts should be limited to military bases and military-generated pollution or should such efforts be extended into other potential areas such as point-source pollution location via satellite imagery?

- if yes, would there be possible conflicts with the private sector?

9. Do you see the military in general as a major source of environmental problems?

10. Is it your sense that the military is doing an adequate job in dealing with environmental problems today?

11. Do you believe that military operations are by definition bad for the environment?

12. Would you welcome expanded DOD environmental efforts?

13. Let me ask about the military as a potential ally on environmental concerns. Do you think the military could be an important partner in national and international efforts to deal with environmental issues?

Now let me shift gears somewhat and ask about your organization and your views on the role of government beyond strictly environmental concerns

14. Could you explain to me what you see as the role of your organization?
15. And what is your role within this "big picture?"
16. I'd like to learn about your philosophy about the role of government. Can you tell me something about what you see as the role of government?
17. Could you tell me a bit about what you think a government owes the people?
18. What, if any, dangers does an active government present to its citizens?
19. A big part of my research for this project will be looking at a few cases where the military and environmental concerns overlap. Can you suggest any particular case that you think illustrates your view of the military and the environment?
20. Are there any questions I should have asked but didn't?
21. Can you think of anyone else to whom I ought to speak about the military and the environment?
22. May I contact you again for your insight if questions arise during my research?

APPENDIX B

The chart on the following page is a complete listings of the interviews done for this dissertation. Interviews conducted on a "not for attribution" basis are not listed. The "Type" category refers to telephonic interview (T), an interview conducted in the respondent's office (O), or an interview conducted at a professional meeting or some other location away from the respondent's office (A). The "Duration" category is an approximation of the length of the substantive portion of the conversation.

Name	Organization	Position	Date	Type	Duration
Azzam, Nancy	International Whaling Commission	US Delegate	8-25-95	A	30 min
Brower, David	Earth Island Institute	Chairman	11-28-95	T	30 min
Crow, David	USAF Academy, Dept. of Civil Engineering	Instructor and Professional Engineer	11-27-95	T	30 min
Denver, John	Windstar Foundation	President	12-6-95	T	25 min
Gallogly, T. Gene	USAF Academy Civil Engineering	Environmental Flight Chief	8-23-95	O	30 min
Gillcash, Robert	Office of Senator Dodd	National Security Policy Advisor	9-14-95	T	20 min
Gordon, Bruce	LightHawk	Chief Pilot	12-11-95	T	15 min
Hair, Jay	National Wildlife Federation, World Conservation Union	President, both organizations	9-23-95	T	35 min
Hamilton, Mark	Air Force Environmental	Chief of Staff	11-1-95	T	30 min
Hitzman, Murray	White House Office of Science and Technology	AAAS/SLOAN Executive Branch Fellow	4-10-95	O	35 min
Hunter, Raymond	Hazardous Substance Research Center	Administrative Associate	4-10-95	O	30 min
Jones, Michael	Air Force Base Conversion Agency	Site Manager, Wurtsmith AFB	4-11-95	O	25 min
McCall, Thomas	Air Force Environmental	Dep. Asst. Sec of Air Force for Environment, Safety, and Occupational Health	11-21-95	O	45 min
Null, Marilyn	EPA	Regulatory Affairs	12-11-95	O	25 min
Recowski, Paul	Air Force Base Conversion Agency	Environmental Program Director, Wurtsmith AFB	4-10-95	O	20 min
Seely, Gregory	USAF Academy, Dept. of Civil Engineering	Associate Professor and Professional Engineer	12-11-95	O	55 min
Smith Jr., Fred	Competitive Enterprise Institute	President	8-23-95	O	35 min
Smith, Rolland	KNSD-TV San Diego	Anchor	4-11-95	O	45 min
Swint, David O.	USAF Academy, Dept. of Civil Engineering	Professor and Chair, Professional Engineer	5-2-95	T	55 min
Taylor, Jerry	The CATO Institute	Director of Natural Resource Studies	8-23-95	O	45 min
Turner, Michael	USAF Academy, Dept. of Civil Engineering	Associate Professor and Professional Engineer	3-23-95	T	20 min
Weaver, Dennis	Institute of Ecologonomics	Founder	4-6-95	O	35 min
			8-23-95	O	35 min
			11-27-95	T	20 min
			10-6-95	T	25 min

APPENDIX C

Air Force Organization

Military organization, acronyms, and abbreviations can seem daunting at first to an outsider. Unfortunately most acronyms, or 'office symbols' as they are called in the Air Force, rarely are intuitive. The Air Force, like all the military services, is divided into a civilian sector and a uniformed sector. The civilian sector is headed by the Secretary of the Air Force, whose office symbol is SAF. Those working for her in any of the organizations falling under her carry an office symbol which begins with the letters SAF. A sense of the hierarchy can be gathered by looking at the letters which follow SAF. The first level down from the secretary, the Assistant Secretaries, are referred to as "two letters," in that their office symbols are two letters long. Thus the Assistant Secretary that Mr McCall works for is SAF/MI. Mr McCall's organization, one layer down, is a "three letter," and is SAF/MIQ. Mr McCall is considered roughly equal to a three star general for protocol purposes, and in influence.

In addition to the civilian SAF side, there is, of course, the uniformed portion of the military. This organization is called the Air Staff, commanded by the Air Force Chief of Staff, a four star general. The Chief of Staff reports to the Secretary. Environmental policy (like other policy) is a result both organization's inputs.

On the uniformed side environmental matters go to the AFCE, or Air Force Civil Engineer. Under this two star general fall all of the uniformed civil engineers. The two organizations, SAF/MIQ and AFCE are expected to be in close contact, with the MIQ office setting overall policy, and the CE organization more fully engaged in implementation and research. There are understandably turf battles between organizations, especially in times of budget drawdown. The chain of command, however, is quite clear, with all uniformed personnel working ultimately for the civilian leadership.

APPENDIX D

Acronyms and Abbreviations

AAFES	Army and Air Force Exchange Service
AF	Air Force
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AST	above ground storage tank
BCRA	Base Closure and Realignment Act of 1988 and Defense Base Closure and Realignment Act of 1990, collectively
CFC	Chlorofluorocarbons
CNG	Compressed Natural Gas
CRP	Community Relations Plan
DCE	dicchloroethylene
DOD	Department of Defense
DOE	Department of Energy
DRMO	Defense Reutilization and Marketing Office
EIAP	Environmental Impact Assessment Program
EIS	Environmental Impact Statement
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ERT	Technology Transfer Division (of the AFCEE)
FONSI	finding of no significant impact
ICE	Internal Combustion Engine
IRA	interim remedial action
IRP	Installation Restoration Program
LNAPL	Light Nonaqueous Phase Liquids
MAP	Management Action Plan
MDNR	Michigan Department of Natural Resources
NEPA	National Environmental Policy Act, as amended
NFA	No Further Action
NGO	Non-Governmental Organization
NPL	National Priorities List
ODC	Ozone depleting chemical
POL	petroleum, oil, and lubricant
RA	remedial action
RCRA	Resource Conservation and Recovery Act, as amended
SAC	Strategic Air Command
SARA	Superfund Amendments and Reauthorization Act
SUPERFUND	Common name for RCRA
TCE	trichloroethylene
USAFA	United States Air Force Academy

USGS
UST

U.S. Geological Survey
underground storage tank

APPENDIX E

The Superfund and the Military

The Superfund, or more correctly the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, authorized the federal government to clean up toxic waste sites nation-wide, and to establish liability for contamination. This act was initially authorized \$1.6 billion, and was reauthorized in 1986 with \$8.5 billion. The reauthorization (known as SARA for Superfund Amendments and Reauthorization Act) also included strengthened standards for industry (Vig and Kraft, 393-397). By most measures the Superfund process has been unsuccessful. As one interview subject put it, "nobody defends Superfund, not liberals, not conservatives." The process has become mired into a legalistic jumble of suits and counter suits from the government and industry. As a result, fewer than 100 sites have been cleaned up, with over 10,000 listed by the Office of Science and Technology as needing cleanup (Greve and Smith, 84-85).

The military's version of the Superfund program is the Installation Restoration Program, or IRP.

APPENDIX F**Budget Figures**

Table A1
Gross Budget Authority,
DOD Environmental Restoration

Year	Budget (in thousands)
1984	150,000
1985	314,000
1986	360,000
1987	385,000
1988	402,800
1989	500,000
1990	601,100
1991	817,000
1992	1,183,900
1993	1,198,893
1994	1,962,300

Table A2
DOD Environmental Restoration
Spending
Adjusted for Inflation

Year	Budget (in thousands)
1984	165,107
1985	322,547
1986	370,675
1987	385,000
1988	388,690
1989	461,680
1990	532,182
1991	694,491
1992	977,460
1993	966,849
1994	1,552,084

Table A3
Total DOD Outlays,
Adjusted for Inflation

Year	Budget (in billions)
1984	241.7
1985	261.2
1986	276.4
1987	282.0
1988	283.3
1989	285.9
1990	272.5
1991	240.4
1992	250.2
1993	265.7
1994	220.1

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