Chapter XII

Panel Discussion: The Environmental Threat of Military Operations

Vice Admiral James H. Doyle, Jr., U.S. Navy (Ret.): Good afternoon. I am Jim Doyle. I have the unenviable task of trying to come to grips with the facts of the situation. First of all, let me say what a great pleasure it is to be back up here at the Naval War College at one of Jack’s forays and to see many old friends and to meet some new ones. In addressing this balancing role, that is, trying to figure out the risks versus the benefits of protecting the environment during combat, it is always helpful to know what the facts are in order not only to develop realistic international law related to armed conflict, but also to provide the basis for sound policy choices. Our panel will, hopefully, provide some insights as a basis for the discussions that will follow in subsequent panels. To the best of our knowledge, what are the actual effects on the environment of various land, sea, and air combat operations? Or, even before combat operations, in training and readiness, and all the other operations we are calling “peaceful deployments”, to actually deploying armed forces in combat, what are the impacts of our operations on the environment? Are the effects upon the environment of those actions negligible? Are they short-term or are they long-term? If they are short-term or long-term, how would you characterize the significance of the effect upon the environment? Do the effects trigger collateral effects and, in turn, are they short-term or long-term? How significant might such collateral effects be? What is the relationship of the various combat operations to the accomplishment of the mission, and very importantly, as we heard just a moment ago, in what context are they being carried out? Now these are all very tough questions for our panel but we have a very distinguished group of panelists that will try to come to grips with this enquiry. As Admiral Stark and others have pointed out, the business of operating at the limited end of the spectrum of conflict poses a tough challenge in considering the possible environmental impacts of combat operations. Not only are you trying to limit the war and, hopefully, bring it to a diplomatic conclusion, you are also trying to limit any damage to the environment because you are probably going to have to go in there sooner or later and redress any environmental damage you may have caused. Well, we are going to have to try to come to grips with that.

Our first speaker will be Colonel Frank R. Finch, Director of Environmental Programs in the Army. His mission is to ensure that the Army complies with all applicable environmental laws and regulations. Colonel Finch has had various command and staff assignments both within the United States and overseas,
including Deputy Chief of Staff for Engineering, U.S. Army Pacific, and the Commander of the Baltimore District of the Army Corps of Engineers. Frank would you lead off?

Colonel Frank R. Finch, U.S. Army: Good afternoon. My task, as the Admiral indicated, is to look at the environmental threat of Army operations. But, before I begin summarizing my paper, I would like to just add a follow-on note to our last panel. There was some discussion as to the extent military people are trained to be conscious of environmental considerations as they prepare to go into combat or to go to war. I can respond to that question from personal experience. One of the things that we do out of my office is to run the Army’s environmental hot line. This is, in reality, an assistance line, a one-stop 800 number, if you will, for anyone to call in and ask for help, whether it be with regulatory interpretations, or more complicated scientific questions. About a year ago, when the 10th Mountain Division was preparing to go in to what at that time looked like a hostile landing in Haiti, we handled dozens of phone calls from 10th Mountain planners and operators that were in their war planning process. They were developing plans both for deployment and for combat operations, and they were very concerned about doing all the proper things environmentally. We had quite a time answering all the questions they raised in making sure that they were approaching their duties in a diligent manner. I think that is just one indicator that our culture has changed considerably. For those of you who are not in the military and do not see it on a day-to-day basis, I think you would be surprised, pleasantly surprised, at the extent to which we have incorporated environmental planning into our day-to-day business.

With that as a preface, let me try to summarize the key points of my paper. It's a lengthy paper and I will just address the highlights so that we will have plenty of time for discussion. First of all, I think we all recognize that environmental threats have been an inherent part of warfare as long as mankind has had conflict. By definition, in warfare both sides are committed to a cause that they are prepared to die for and are prepared to kill for. Very often, environmental considerations are not an important factor in the decision-making process. What I am going to try to do is to show you how we have analyzed the threat to the environment posed by combat operations in terms of scope and scale. I think that there has been a lot of discussion already today that that is an important factor in the planning process. It is not a black, white, or binary discussion here that is necessary, but a whole spectrum of conflict and a whole spectrum of threats. In my paper, I go back to 400 B.C. Greece, where one of the first cases of a sacred temple being despoiled by the Athenians is recorded. This was done as a deliberate action and was designed basically just to antagonize the enemy. In the second century B.C., the Romans spread salt on the fields of Carthage to destroy their crops and to poison their soil.
Protection of the Environment During Armed Conflict

Sherman's march to the sea during the Civil War destroyed Confederate agriculture and industrial resources. In World War II there were many such occurrences. For example, the Russians used a scorched earth policy on their own territory to deny Germany the resources to continue its offensive. With respect to Vietnam, we have already discussed herbicides and their uses on vegetation in order to deny the enemy concealment. The long-term effects of herbicide use in Vietnam are still unclear. In the 1980s, the Soviets destroyed crops in the fields of Afghanistan to deny food to the rebels. During Operation Desert Storm, the Iraqis looted agriculture resources, destroyed irrigation capabilities, and destroyed oil processing facilities. Again, some of these actions are going to take us years to remedy. In my paper, I suggest a model to analyze hazards and note that the largest body of scientific analyses in this area comes from risk assessment of hazardous waste disposal operations. And here the general model to determine the hazard of any contemplated action is to look at a source-pathway-receptor process. A simple military example would be chemical nerve agents. Chemical nerve agents are the most toxic chemicals on earth. A person even briefly exposed to a small quantity of these chemicals will die, absent appropriate medical attention. Most such agents work either by being breathed or through absorption in the skin. Chemical nerve agents are delivered usually by air transport through spraying or through explosive munitions. Using the model that I described, the chemical agent is the source, air is the pathway, and the soldier is the receptor; you need all three to have a complete threat.

My paper then addresses the multiple sources of military threats to the natural environment. They could involve any physical, chemical, or biological agent that is capable of producing a specific harm or damage. The paper describes many of the sources of such threats. Let me read a few of them. Explosives, projectiles, chemical weapons, biological agents, and nuclear weapons are obvious ones. But, there is a much longer and less obvious list of hazardous sources, primarily chemicals, that are also essential in combat, including petroleum products, chemicals for biological and chemical decontamination, infectious waste from medical facilities, spent batteries, pesticides, and so forth. The list is almost endless. Contaminant sources may also be an indirect result of military operations, such as waste water treatment facilities that discharge untreated sewage following damage by an artillery shell.

There are many ways we can categorize threat sources and effects and so forth; I try to offer a few in my paper. I think it is important to distinguish deliberate effects from accidental effects. Each hazard source must also be analyzed to determine its hazard potential. Again, borrowing from the hazardous waste management process, we can classify these hazards as corrosive, ignitable, reactive, toxic, and infectious. We can also look at time frames, "acute" means those that have an immediate impact on health, and "chronic" means those that require some
period of time to produce an adverse effect. Nations see and feel the immediate
effects of acute warfare and its hazards but they feel and they worry about chronic
effects such as we saw with Agent Orange, nuclear exposure, or the unknown effects
associated with the so-called “Gulf Syndrome”, for example. Effects on the ecology
are equally uncertain.

My paper also briefly discusses pathways, and I think one important point to
look at is when you do not have all three elements of the source-pathway-receptor
model. Chemical warfare is possible and indeed we prepared for it in the Gulf War
because we had protective gear. That protective gear was intended to interrupt the
pathway. You still had a source; you still had a receptor, but you didn’t have a
pathway if you had protective chemical gear that is working properly. Likewise,
if you have a non-mobile agent located in an area without receptors, you do not
have a risk because it too lacks a pathway.

I spent a great deal of time in my paper talking about “uncertainty” and this
probably deserves its own conference. But environmental persistence is a major
factor. Chemical, biological, and radiological agents may transform when they are
released into the environment. These processes can be chemical reactions, physical
degradation, or biologically driven reactions. The products of these reactions may
be more or less hazardous than the original agent. There are numerous
mechanisms that influence the decay or change of an agent in the environment.
One of these is hydrolysis, which is a reaction of water that can yield a different
chemical. Another is photolysis reactions which are powered by sunlight in air,
transforming vapors and aerosols. Biological agents will either grow, die, or
mutate, depending upon environmental conditions they encounter. Chemicals in
the water and in the soil are susceptible under the proper conditions to
bio-degradation or bio-accumulation. As a common example, bio-accumulation of
PCBs in fish living in contaminated streams represent a hazard to the organisms
that eat the fish. To continue on with elements of uncertainty, the amount of
contamination that reaches the receptor, and the rate at which it is absorbed, are
determined by many factors as is the case of accumulation levels. Physical
characteristics of the receptor are also key, such as body weight, lung capacity, skin
surface area; and they influence the amount of contamination that actually enters
the body. Inhalation rate, water uptake rate, and duration of exposure are three
obvious factors that are important.

The graphic that I use in my paper lays out these categories. The left hand side
of the graphic lists the pre-combat phase, preparation to go to war, the combat
phase, and the post-combat phase. This listing is further broken down to reflect
acute and chronic effects. Across the top of the graphic are the Model categories
of source, pathway, and receptor that I mentioned, as well as hazard classification.
You can use this model to go through the various phases of combat operations and
determine whether you are dealing with acute or chronic conditions.
The next point that I want to make is that our weapons production system has produced major contamination problems for this country. I would like to read to you a short passage from the Office of Technology Assessment of the U.S. Congress. That office had this to say about the long-term environmental effects of weapons production:

Many factors have contributed to the current waste and contamination problems at the weapons sites. The nature of manufacturing processes, which are inherently waste producing, [have a] long history of emphasizing the urgency of weapons production in the interest of national security to the neglect of environmental contamination, a lack of knowledge about or attention to the consequences of environmental contamination, and it is an enterprise that has operated in secrecy for decades without any independent oversight or meaningful public scrutiny.

My paper briefly discusses Agent Orange from the standpoint that its half-life, when measured on a leaf, is two hours. Whereas, its half-life, when measured in soil, is ten years. Because its toxicity is so extreme, half-life becomes a very, very important factor when talking about soil contamination.

The next major point was alluded to this morning—targeting of certain large facilities that support a nation's war-fighting capability can have tremendous short-term effects on the environment and also can have certain long-term effects. My paper uses the example of the RAF bombing of the Mohne Dam in May of 1943. In the initial planning, the Allies focused on Hitler's industrial base and his ability to wage war. When the dam was breached, one thousand houses were destroyed or damaged; 11 factories were destroyed, and 114 damaged; and 25 road bridges were destroyed, and 10 damaged. Various power stations, pumping stations, water and gas facilities were also put out of action. The long-term environmental effects of this action are unknown. Damage to the environment was not analyzed at the time of the bombing and it is difficult to assess it retrospectively. It is unknown what types of factories were destroyed and what hazardous materials entered the Ruhr River. We know some chemicals would hydrolyze, some would settle out, and still others might bio- accumulate in organisms or biologically degrade.

My next major point, also mentioned this morning, is that predictions of the environmental threat of military operations can be exaggerated. We have all talked about the oil spills and the destruction of the oil facilities in Kuwait. Most early coverage of this included some very dire predictions about the magnitude and duration of this effect. Believe me, I am not trying to minimize this problem, but I just want to put it in perspective. The original estimate to stop the oil fires ranged from two to five years. In fact, innovative technology was developed during the recovery operations and reduced this time to less than nine months. Also, the predicted impact of the smoke that suggested large regional and even global
damage was mitigated somewhat by meteorological conditions that fortunately limited some of the severe environmental effects to very localized areas. However, the long-term effects of this, both the oil spills and the oil fires, is still being examined. I think it is important to not draw any premature conclusions.

I wanted to mention a point that I do not believe we have discussed yet. One long-term effect of military operations is that it is difficult to quantify the loss of talented people, historical records, and scientific equipment and capability. They could be used to provide better analysis of environmental problems and better strategies to recover and, indeed, to rebuild the country in question. Targeting of nuclear facilities or chemical facilities is, of course, a special concern. In the Bosnian conflict, we have seen war damage to some fifty factories along the Danube. Hazardous chemicals were involved in production of weapons and explosives there, as well as metal plating and refining of oil. Now these pollutants can be passed along downstream where they can settle in the river bottoms to be a future problem during dredging or whenever the river bottom is disturbed. Back in 1984, we had a well-known industrial incident in Bhopal, India which killed 2300 people and injured 20 to 30 thousand others. This accident was due to a small amount of water being released into a storage tank of methyl isocyanide. Collateral damage from military operations could cause a similar tank to rupture and be exposed to water with equally horrendous results. The Bhopal plant was an insecticide processing factory similar to those in many countries.

U.S. concern for environmental impacts is much greater and more sophisticated than it ever has been. However, potential adversaries may not share our ethical frame work. I think we discussed that at length this morning. The current military trend in armed conflict doctrine, as described, for example, in the Army's Force XXI doctrine, stresses information processing and technological innovations which reduce the size of the force, increase precision and lethality, and increase land area operations. Although the technology within U.S. and NATO forces is advanced, the technology of our enemy may run the spectrum. It is likely that environmental threats and impacts on the land caused by U.S. forces could decrease. However, as was stated earlier, in Operation Desert Storm, although everyone saw on CNN how precise our laser guided weapons could be, 93 percent of the ordinance that was dropped was gravity bombs, of which 70 percent missed their target. So, although we think of the Gulf War as a precision guided weapons war, there was a great deal of conventional ordinance dropped with inevitable collateral damage to the environment.

In the concluding comments of my paper, I make several points to place all of this in context. First, I stress the utility of the use of the model for analysis of the threat. Secondly, I believe the environmental impact of military operations can be exaggerated in the short-term, and I also believe it is very difficult to predict in the long-term. Many people are studying the effects of the Gulf War and it is too
early to say what the long-term damage to the environment is. Commanders should make military operational decisions when fully apprised of the risks and the uncertainties of environmental effects of their plans. There are times when military necessity would dictate that military operations will cause some adverse effect on the environment. But, as has been said earlier, commanders have an obligation to show due regard for the environment and to avoid unnecessary damage. Third, our ability to mitigate the effects of our combat activity has grown immensely. Fourth, our ability to clean up unexploded ordnance, particularly buried land mines, continues to challenge environmental resources and technology. I did not discuss that very much here, but it is a huge problem—detection and removal is a tedious and dangerous process for unexploded ordnance. Finally, as we assess environmental risks, we have to remember that a full range of warfare is possible and that other nations may not share our environmental ethic. The use of terrorist tactics against facilities which specifically target damage to the environment is very possible, and we have seen it in our most recent conflict. Thank you.

Vice Admiral Doyle, Jr.: Thank you very much Frank. Our next speaker is Commander John Quinn, JAGC, USN. John is a graduate of Duke University. He entered the Navy as a Supply Corps officer but soon thereafter saw the light and became a lawyer. He is a graduate of Georgetown Law School and has a Master of Laws in Environmental Law from George Washington University. John is now the Environmental Counsel to the Chief of Naval Operations, Environmental Protection Division, and is representing the Director of that Division, Rear Admiral Schreifer, here today. I might add that he previously served as Environmental Counsel on the Staff of CINCPACFLT. John.

Commander John P. Quinn, JAGC, U.S. Navy: Thank you very much Admiral. I would at the outset like to convey Rear Admiral Schreifer's regrets that he is not able to be with you today. He very much wanted to be here. He is currently the acting Deputy Chief of Naval Operations for Logistics. Dr. Ron DeMarco, representing the Office of Naval Research, and I have prepared a paper which we will be alluding to in our remarks. We will present a three-part discussion of the impact of combat and military operations other than war on the marine environment. Actually, I have the easy part. I get to lead off and do one of those parts and then Dr. DeMarco will take over and do the other two. What we would like to do is pose two questions and then hypothesize an answer. The first question is what should military planners and military commanders know about the marine environment as they prepare to, and actually do execute their missions. That is the part that I will address. The second part, which Dr. DeMarco will take, is the question of what actually do we know, and how extensive is our knowledge about the effect of combat and operations other than war on the marine environment.
He will point out that despite the fact that we do have a great deal of knowledge in this area, we have just scratched the surface, if you will, and there is still a great deal of uncertainty and unreliability, as has been mentioned several times so far today, regarding the anticipated effects versus what actually did occur with the benefit of hindsight. Dr. DeMarco will then offer a model for policy makers evaluating and dealing with this scientific uncertainty.

Moving into the first part, what should military planners know about the effects of their operations on the marine environment? As I look at the statement of purpose for this Symposium, I note that it is mainly internationally focused, and appropriately so. The focus is to examine the existing international legal order to determine if it adequately proscribes environmental damage not justified by military necessity during armed conflict and to determine, basically, if that regime is adequate. The second purpose is to examine the interrelationship of the law of armed conflict and the peacetime environmental regime as well as the adequacy of existing mechanisms to enforce State responsibility, etc. As a person who is trained in and whose experience for the last six years has been primarily in domestic U.S. environmental law, as it affects the Navy, I think we would be remiss if we didn’t pause during this Symposium and at least acknowledge the extent of requirements upon military operations that are imposed by the domestic law of the United States, perhaps by the domestic law of other nations, and acknowledge the extent to which those requirements actually travel with military forces in peacetime and to a certain extent in wartime as well.

I will postulate that there is a continuum of action starting from peacetime operations and carrying all the way through military operations other than war and into limited war and total war. This is a continuum of intensity of action, if you will, and I just ask you to reflect on what legal regime controls each stage of that process. At what point does one legal regime end and another pick up? From the standpoint of domestic U.S. law applicable to the operations of the military, and particularly the Navy and the Coast Guard since we are charged with discussing the marine environment here, I would advance two propositions. One is that there are very substantial requirements to collect information about the impacts of war on the marine environment, and to analyze and consider that information in decision-making mechanisms, that are imposed by domestic law. Secondly, to a great extent, the requirements to acquire information and to consider it, at least from the domestic law standpoint of the United States, do not disappear in time of conflict. They may be modified. In fact they are modified to some extent. But, it is important to acknowledge that they do not entirely disappear, and perhaps to reflect on what the meaning of that may be. I would like to illustrate that by looking at three aspects of U.S. law very briefly and to then compare and contrast their peacetime requirements with what those requirements are in war.
Colonel Finch mentioned environmental planning, the environmental planning done by the Army in preparation to going into a foreign country for purposes of conducting a military operation other than war. We have a very strong environmental planning regime in this country that has been in existence as early as 1970. The National Environmental Policy Act requires federal agencies to document the effects of their actions on the environment, including the marine environment, for any activity that would be considered a major federal action significantly affecting the quality of the human environment. In carrying out those responsibilities, the military services spend a lot of money and time and effort documenting what these impacts might be. This particular requirement travels with the Navy as it leaves port, at least as far out as the territorial limits of the United States, and it is a requirement that we pay a lot of time and attention to in order to stay on the right side of the law.

Beyond our territorial seas, the conduct of the military in this arena is directed by Executive Order 12114, which requires certain examinations of the environmental consequences of our actions on the global commons and even within the territory of foreign countries. There are a number of exemptions and qualifications to those requirements, the ultimate effect being that, for the most part, an operation such as war or an armed conflict other than war would almost certainly not be subject to the environmental studies requirement. But, certain other activities that might be conducted in the marine environment, during peacetime in particular, would be so subject and, in fact, the requirements are adhered to.

Now as far as the National Environmental Policy Act is concerned, how far into the continuum toward war does that extend? There is no national security exemption provided for in that Act. It does not say, "This does not apply during war," as do a few statutes, mainly those pertaining to vessel source pollution. There is simply a requirement or proviso in the Act that in an emergency—not war—the agency concerned can consult with the Council on Environmental Quality and they will figure out how to do the right thing. In fact, as our paper points out, that has had to be done on a couple of occasions due to military exigency during Operation Desert Storm pertaining to some operations that had to take place back then.

The environmental planning requirements of the National Environmental Policy Act and Executive Order 12114 are significant, substantial information gathering and analyses requirements that the United States military must and does consider. They are, however, requirements that are only procedural in nature. They do not necessarily require that you make the environmentally correct call, simply that you document and that you consider what the effects are, the objective being enlightened decision-making. There are two other U.S. statutes, however, that impose not only information requirements but substantive requirements on what
we can do. Those are the Endangered Species Act and the Marine Mammal Protection Act, both of which control U.S. entities on the high seas world-wide with regard to their requirements not to "take" an endangered species or a marine mammal of any description. If your activity, possibly including war, might result in a "take", then the requirement of these two Acts is to get a permit from the appropriate wildlife agency. In the process of getting such a permit, a considerable amount of biological information must be collected, provided and considered, most generally in a public way. Again, these requirements are extra-territorial, that is, they travel with the military when the military does travel. There are some qualifications to these actions under the Endangered Species Act. For example, there is a "relief valve". If an action otherwise must be taken, a committee of Cabinet level officials may grant an exemption from the requirements of the Act, but only after a certain process has taken place, which may make it difficult to take action in a very timely manner during a military exigency. Under the Marine Mammal Protection Act there is also such a "relief valve". These mandates of U.S. domestic law include quite substantial requirements, requirements that do not necessarily terminate, as you might think, the moment that we move into war or operations other than war. Moreover, at least several of them are extra-territorial in terms of their reach.

So what is the bottom line here? There are environmental constraints other than those imposed by international law on what the military is able to do. We need to access our environmental posture with regard to staying within the guidelines, assess the risks of our military operations, and assess the risks of being perceived not to be in compliance with domestic and international environmental standards. As has been said numerous times throughout this Symposium, and from my perspective in the environmental compliance business of the Navy, I can attest that there seems to be a true environmental ethic that has evolved over the last number of years in part driven by requirements such as these. This ethic is in part driven by the fact that the Navy now consists, in significant part, of young men and women that have grown up with Big Bird telling them to recycle, and so forth. These people are now lieutenants, lieutenant commanders, and senior enlisted people. They are truly imbued with an environmental ethic. Consequently, these requirements are viewed as consistent with military operations to the extent that we will take every measure that we possibly can to protect the environment, consistent with the mission. I would like, at this point, to turn the rostrum over to Dr. DeMarco. Having talked about what the commander should know, Dr. DeMarco will now tell us what we do know.

Vice Admiral Doyle: Thank you John. I am going to have to look into some of those provisions in our domestic law. Our next speaker is Dr. Ron DeMarco. He is one of our very dedicated Senior Executive Service civilians of the Naval
establishment. He is the Director of Environmental Programs of the Office of Naval Research. In this capacity, he directs Navy-relevant research in the areas of chemistry, physics, and interdisciplinary environmental research. His past assignments have included Head of the Advanced Inorganic Materials Section and Head of the Advanced Materials Section. He has written widely, holds three patents, and has given numerous technical reports. Ron.

Dr. Ronald A. DeMarco, Office of Naval Research: Thank you Admiral. It is a pleasure to be here as a scientist among legal and policy people. To borrow from Red Skeleton, my presentation is like a long-tailed cat in a room of rocking chairs. As Commander Quinn and I first started talking about our assignment today we realized very quickly that we were talking past each other; we were not talking the same language and we do not mean the same things by what we say. So what I am going to do is provide a scientific perspective because there is a difference when you talk about the impact of naval operations on the environment from a scientific versus a legal or policy point of view. I define “effect” as the result of an action. If we try to put it in military terms, we can look at the “effect” as the tonnage of bombs dropped. But that does not tell us anything about the consequences. The “impact” is that the target is destroyed, the target is missed, or it is partially destroyed and it will be back on-line in one week. The distinction between “effect” and “impact” is fairly important from a scientific standpoint. What we tend to see in the policy area is many people using effect and calling it impact. This will be the context in which I use these terms. When you talk about impact you have to know more than just the effect, you have to know what the capability was before and what the capability is after. There are time considerations to factor in as well. You can have a short-term impact that is very minor but in the long-term can be catastrophic. It is like changing the flow of water in a river. In the short-term, the impact may be minor. But, in the long-term it may create erosion or establish different flow patterns for the river and as a result you may flood some areas and destroy crop growing capabilities. Conversely, something that looks like a short-term catastrophe, and I think oil spills are of that nature, are in the long-term, due to bacteria that grows in oil polluted areas, able to be remediated. In the longer term, maybe ten or fifteen years, the impact may actually be very negligible. It can range from negative to beneficial. From the beneficial side, let us assume there was, for some reason, an excessive number of predators in some given species. So they are working very hard on the food chain below them and the chain can not survive. If by accident you happen to kill off some of the predators, you may actually have put the system in better balance than it was before. Whether an impact is negative or beneficial is often decided from a value judgment perspective, and this is part of the problem with science. Science takes a long time to complete, to verify, and to confirm, and often you do not have a long
time to wait to make decisions so it falls back on a value judgment. Society values life, society values other forms of life. There are differences in cultural values also. During the Gulf War, the Saudis wanted to protect their “RO” units, the reverse-osmosis water purification units, at the expense of other possibilities. So that was a value judgment on their part.

Development of a sound environmental policy should consider the initial condition of the environment, the anticipated effect of the policy on the environment, the impact of that effect and the cost/benefit ratio of that impact. As I mentioned, to assess the impact of an action, you have to know the initial conditions of the environment. You have to know not only what your impact or effect might be, but what does nature itself do? Your impact may be relatively small compared to what nature normally does. What is the effect and what did you do to the environment? That becomes the “numbers” issue. Then comes the assessment of the impact and that is a very hard thing to do. It becomes a cost/benefit analysis and cost does not have to be measured in dollars. Cost can involve a variety of things. How do you assess the cost/benefit of the impact a policy decision may have? Assume you have a policy for tuna fishing, for example. Because you change the net size, fishermen may say they are going to catch fewer fish, therefore, there is an economic impact on them. You can calculate the number of dollars or training hours affected by a policy decision. You can say what those numbers are going to be, but what is the impact of those numbers on reduced training capabilities? In the military what you want to do is train as you fight, you do not want to train at half speed and then find yourself in a situation where you have to be at full speed and not be aware of what is happening and how things can change. So you can lose the edge there and you cannot put a dollar value on that. But there should be some type of an assessment of what the policy actually does, not only to the environment, but, from the military sense, to our military capability.

I am going to provide three examples and go through them to try and give you an idea of actual situations. The Russians, the former-Soviet Union, released papers saying they sent radio-nuclides into some of their rivers; that they took some of their reactors from some of their ships and threw them into the Barents Sea. They say the reactors are down there and here is the amount of nuclear material that was in them and here is when it happened. What do you do? This stuff is leaking and we are now talking about its “migration”, which could get it into the rich fishing areas off the coast of Scandinavian countries. It could move considerable distances. What policy do you adopt? What action do you take? One thing that was done at the U.S. Naval Research Laboratory, using their computing capabilities, was to model what was going to happen to those materials. They calculated the high level waste that was dumped with those reactors, looked at the rivers that emptied into the Barents Sea, and then looked at the radioactive waste
that was dumped into the Irish Sea from the Sellafield nuclear power plant in the U.K.

What they found was that the river releases from the former-Soviet Union, and the Sellafield releases from the U.K., basically accounted for all the nuclear activity that was in the water. If they were to calculate in the high level nuclear waste that was in the Soviet reactors, they should have had real numbers ten times higher than what they were seeing. So we were in a good-news/bad-news situation. You are not leaking the high level radiation material. That is the good news. The other part of the good news is that you are in a position to get monitoring out there and to be able to really watch what is happening. The bad news is that the high level nuclear waste is not leaking yet. What is the environmental impact of all this? We do not know. Are the nuclides that are present in the water up there in such dilute concentration that their chances of getting into the food chain are extremely small, negligible, zero? Or, are they there at a level that they might get into the food chain? That consequence has not been looked at but at least we know the effect at this point.

The second situation I will address is the Gulf War oil spill. Six hundred plus million barrels of crude oil were dumped; six to eleven million, depending on your numbers, were released into the marine environment itself. The initial estimates were grim. It was believed that the oil slick would sink as the 1983 spill did, and if it did, it would cause catastrophic damage to sub-tidal organisms and there would be gross contamination of sub-tidal biological organisms. In actuality, that did not happen. There were physical, chemical, and biological reasons why it did not happen. The wind kept all the oil very close to the shores of Kuwait and Saudi Arabia. Many of the organisms on the shoreline were very severely impacted, including aquatic birds and animals that bore into the ground, like frogs. Oil went into the holes and it sat there. It does not weather there because there is no weathering down in the caverns. So there were some very severe impacts along the shore, but not what was anticipated. We also witnessed extensive oil recovery operations. Even before the war was over, people were already trying to recover the oil. The numbers vary, but somewhere between 15 and 35 percent of the oil spill was actually scooped up and taken away; it was recovered. A large amount of the oil evaporated. It is very hot in the Gulf and you get more evaporation there than you would normally. The discharges that regularly occur in the Gulf due to tanker traffic did not happen nearly as much because there was not much tanker traffic. Nobody wanted to run into a mine. So the tankers tended to remain in port and that lessened the impact on the environment. The intense solar radiation and enhanced chemical reaction, as mentioned by Colonel Finch earlier, helped mitigate some of the problem. But, as was pointed out by the Colonel, we do not know the long-term effects. One of the comments made by the National Oceans and Atmospheric Administration (NOAA) was that the environment has changed
and we do not know if it will ever come back to the way it was—it may now be different. What they found, however, were unspoiled areas that continue to prosper. If you can clean up what is there on the shore, you may be all right, in terms of ultimate recovery. How long that will take we just do not know. We are probably looking at twenty years before we can get to that stage.

My third situational example is one that is a little closer to the Navy’s heart. Acoustic thermometry of ocean climate (ATOC). ATOC looks to see if the “greenhouse effect” and global warming is actually occurring. The way this is done is you send impulses of sound into the deep basins of the oceans over thousand of miles and you measure the speed of the sound through the water. The speed of sound is very sensitive to the temperature of the water, so if there has been a change in the deep basin water temperature, there is a good possibility of global warming having occurred.

The problem is you have to use low frequency sound and there are environmental groups that have argued that if you use low frequency sound at these levels you are going to deafen marine mammals; you are going to cause physiological trauma to the marine mammal population; and all sort of negative things are going to happen. In actuality, the sound that would have been used would have been less than that emitted by a tanker. The number I have seen is one tenth the value of a large tanker. We send tankers back and forth across the oceans all the time. We have not seen any deafening of any marine mammals that we know of. So what has happened is that the experiment has been stopped. California has now issued a source permit for the ATOC experiment, so they can use California. Hawaii has not issued a source permit, so the experiment is still on hold. The National Research Council did a report in 1994, so we are not looking at dated information, and all the information and papers they were able to put together concluded that low frequency sound does not appear to be a problem for marine mammals. Although this report exists, the National Marine Fisheries Service has a 150 decibel (dB) source level proposed ruling that is being looked at right now. Large tankers exceed 150 dBs. The navigational equipment on most ships exceeds that. Many practical things exceed that number already. We have been able to do this without problems in the past; 150 dBs is not a scientifically based number. No information they have constitutes a basis for any regulatory action, and yet there it is. This is of interest to the Navy because we use low frequency sound, sonar experimentation and a variety of other things. A ship may have to get permits in order to exceed the 150 dB limit if that ruling goes through.

Now, what do we know about marine mammal hearing? We will spend some time on this as this is important to the Navy. Most of the hearing tests that have been done with a variety of species of seals are generally stopped at a kHz. We have to go lower than one kHz. We have determined that when you get down less than 1000 Hz you have to increase the volume to at least 125 or 135 dB before the animal
is able to hear it. Now hearing something and being harmed by that level of sound are two different things. Suppose my kids have their music on too loud. I can put a filter on it by shutting the door; I can turn it down; or, I can go away. But, if I was a marine mammal, I would have been “taken” because I would have been affected by that music. We are trying to understand the physiology and the hearing of marine mammals such as the Bottle-nosed porpoise. We have conducted hearing “tests” on individual porpoises over a period of fifteen years and have learned that they experience hearing loss as they age just as do humans. As an example, one porpoise could hear sound at 50 Hz at 50 dBs. Fifteen years later, that same animal had about 50 percent hearing at probably 60 or 70 Hz, but it required a power source of about 140 dBs for it to do so. What we are finding is that among marine mammals, hearing is naturally lost just like our hearing is naturally lost. That being true, how can we now assess what the impact of acoustics is on any particular marine mammal if we do not know the age of the particular animal and what his previous hearing was?

We are also assessing the effect of low frequency sound on marine mammals. We have patterns of marine mammals diving, climbing, diving and climbing in the ocean. As the animal dives its respiratory rate and heart beat becomes very slow, and as it comes back up they increase again. If you introduced a sound at that point and saw a change in the animal’s heart beat or respiratory rate, you might say it has been affected. We have done the same thing by determining whether an inputted low frequency sound affects the sounds Finback whales use to communicate with each other. Finback whales speak in dialect. Those in waters off California, the “southerners”, have a bit more of a drawl than do Finbacks off of Greenland and northern Europe. If you did not know they spoke in dialect, and were used to hearing a drawl and suddenly, in a different area, you do not hear that drawl, you might decide that Finbacks have been impacted. You might decide there is a danger, that something is wrong. But, nothing is wrong. It is just that Finback whales speak differently. The point is that you cannot make valid environmental policy decisions without first understanding the environment or the species that you are concerned about.

Let me return again to the process—the components of the environmental policy process. We began with mechanisms that produce environmental “effects”. These may be military operations, nonmilitary operations and activities, or natural events that occur. Each of these generate some sort of effect. That effect can impact the security of the nation which then would trigger activity in the political system and could have political consequences. The effect could impact the physical environment and have consequences for ecological systems. Or, the effect could have its impact in the economic environment with consequences for the social system of the nation. Therefore, an impact assessment should be made that involves all of these parts of the puzzle. What we are seeking is a proper balance.
There has to be a balance. What happens is that environmental policy decisions may not be balanced. An example of that is the way the Navy shock tests its ships. You want to ensure that the integrity of the ship and its systems are properly protected from shock transmitted through the water column. But you are also concerned for the safety of marine mammals if they get too close to the test site. Laissez faire—shock test any place you want, or ultra restrictions—you cannot shock test at all. What the Navy does is take a balanced approach. We put spotters in planes and on surface craft. We have floating and fixed listening devices to listen for any marine mammals in a wide radius around the test site. If none are located, we do the test. If marine mammals are detected, the test will be delayed until they leave the area. So that is an illustration of the balancing that can occur to meet everyone's objectives. But, you really have to watch to ensure that the proper balance is maintained. If it tilts too much one way or the other a compensating change in the policy and regulations may be required to bring it back in line again. If policy-makers want to look at new policy, they really ought to do so in terms of the entire assessment and the ability to balance the benefits and the costs with the policy that is generated. Thank you.

Vice Admiral Doyle, Jr.: Thank you Ron. Our next speaker is Mr. William Arkin. Bill is a columnist, an author, and a consultant specializing in modern warfare, nuclear weapons, arms control, and the environment. You name it and he has written about it. Bill was Director of Military Research for Greenpeace International and co-author of a book on modern warfare and the environment in the Gulf War. He presently has a MacArthur Foundation Grant for looking at the destruction of electrical generating facilities in warfare. He is also working with Greenpeace International on the general subject of denuclearization of the world's oceans. Bill.

Mr. William M. Arkin: First, I should say as the initial person speaking at this conference who does not work for the U.S. Government that what I am about to say is very critical of the US Government. Because of that, I should declare at the outset that I believe that environmental protection is adequate in warfare, but I do not think it is because of the law. I think it is because of our culture or ethic. The problem as I see it is that lawyers and military operators do not want to codify too many constraints. There is a cultural reality that much of what occurs during war is obviously secret; a reality that is used by some to deflect public opinion and to avoid outside intervention or control. When I say "outside", I mean the Air Force avoiding outside intervention and control perhaps even from another Service, or vice versa. I say that environmental protection is adequate because, to some degree, when I heard the presentation in the previous panel I expected examples to be given by the operators of cases where they felt that they could not conduct certain
military operations during warfare because of environmental restrictions and I did not hear any examples come up. There is a presumption, somehow, that environmental regulations and law do restrict operations or that in some way the lives of soldiers and sailors has to be balanced against environmental protection and I believe that dichotomy is false. In fact, the conduct of good military operations, and here again I refer to the United States, are not at odds with environmental protection. And, in fact, the conduct of bad military operations, that is, operations that are done to avoid domestic environmental regulation or international regulation, but are done in secret, ultimately are more detrimental to the enforcement of international law. That is the basis of my paper. I look at a number of examples in which actual practices during the Gulf War contradicted or violated the legal obligations of the United States but because they were done in secret, or because they did not receive as much attention as what the Iraqis did, they are not “lessons to be learned,” so to speak. In my paper, I argue that in spite of the absence of any war crimes being prosecuted against Iraq for its gross violations, in spite of the focus away from the Gulf upon the extinguishment of the last oil fires in November of 1991, and in spite of no new laws being promulgated as a result of the Gulf War (no new Geneva protocols), environmental protection has advanced. I examine some limited examples from the Gulf War that I think are applicable to future military operations. First, on a micro-level, I look at the use of certain weapons which I classify as “controversial” weapons. I classify them as “controversial” weapons because none of them are illegal, and here I refer to napalm, fuel-air explosives, cluster bombs, and depleted uranium ammunition. For whatever reason, we read about them in newspapers all the time. When the Ecuadorians and the Peruvians have a little spat, the Ecuadorian press is filled with articles saying the Peruvians are using napalm or when the press goes into Chechnya, the locals say the Russians use cluster bombs. No one really quite knows why they are referring to these weapons, as opposed to other weapons. Why does the news media report that napalm, or fuel-air explosives, or cluster bombs are used as opposed to just good old fashion other kinds of weapons which do similar or worse damage? I am not sure I have a clear answer other than that there seems to be an ethic of understanding of the repugnance of certain types of weapons. Whether you believe that the ones that I have mentioned are in that category or not is irrelevant. As General Linhard said this morning, the use of cluster bombs in the Vietnam War, in terms of going after triple-A on dikes, actually can be demonstrated as being a much less destructive means than resort to other, non-controversial bombs that might breach the dike. Cluster bombs used in urban attacks might be considered a more destructive means because of the high dud rate. Undetonated sub-munitions become virtual mines that have an adverse impact on the civilian population. Depleted uranium is clearly a superior tank killer to tungsten. It is cheaper; it is more efficient. Nevertheless, there is a residual
environmental effect from the use of depleted uranium that has now been demonstrated in the Gulf War and it seems that that classifies it as a controversial weapon. On the micro-level, after I look at certain types of weapons, my paper looks at the bombing of certain types of targets and here I look at two in particular, dams and oil tankers. In the case of dams, the United States and the Coalition did not attack any dams in the Gulf War. There were some suggestions early on by the Air Force that dams be considered as potential targets in response to Iraqi use of chemical weapons as a punitive measure, and three dams were identified by "Checkmate"—Headquarters, USAF Air Staff Planning Group—that would, if struck, have the most adverse civilian effect. They were chosen specifically for that purpose. However, legally they were scrubbed and that proposal was rejected at the policy level. As the war plan developed, and as the war was prosecuted, hydropower stations co-located at dams were looked at very closely in terms of the implications of striking those hydropower stations given the potential collateral damage to dams that might result. The conclusions being that there were methods that were tried and true from Vietnam for attacking those hydropower stations by the aircraft flying parallel to the dam wall, and by the use of precision guided weapons, which would minimize the danger to the dam, therefore hydropower stations were allowed to be hit. Having said all of that, according to the declassified Joint Uniform Lessons Learned System (JULLS) of U.S. Central Command (CENTCOM), the CENTCOM lawyers argued that in the future the U.S. Air Force should bomb dams because if we do not we are going to lose that possibility through some airtight legal restriction. Therefore, dams should be a part of target lists in future operations.

The second target I address in my paper is oil tankers and here the issue of law, of rules of engagement, listening to General Linhard speak earlier today, comes into full force. There were intense shouting matches between Admiral Arthur and General Schwartzkopf about the legitimacy of targeting tankers. The Navy attacked an Iraqi tanker on the 19th of January and sank it, causing a significant spill. That was a 72,000 ton tanker, one of Iraq's largest, presumed to be almost full of oil. Admiral Arthur argued to General Schwartzkopf why is not a tanker as legitimate a target as a dam or electrical power plants that you are hitting in Iraq. General Schwartzkopf argued to Admiral Arthur, "I do not give a [expletive deleted] what you think about whether electrical power plants or oil tankers are lawful targets, I say they are not going to be hit and that is what the rules of engagement say." Now I have interviewed the principals involved, and I have also interviewed the JAGs, and the JAGs all say the same thing, "Well, we do not know what they discussed." So when it comes to really ticklish questions of what to target and under what circumstances, often times they are resolved at very high levels with not much legal scrubbing, and without much legal consideration. But still I conclude that despite the fact the Navy had a very different interpretation of the
rules of engagement than did the CENTCOM staff, and despite the fact that one tanker was hit and then the operation ceased until later in the war when, after the Iraqis started spilling oil, the ROE were changed and Iraqi tankers were again hit, it appears that when you talk about "the rules", they are really important. "The rules" as codified, are really important because at the decision-making level there is a lot of leeway as to what can and cannot be hit. So today we have talked a lot about "commanders," like we were talking about a commander on a ship or a captain in a platoon and what a company might be doing, but, in fact, commanders are also four-star generals and admirals who have at their disposal far more destructive means of attack.

I should also say that one of our Coalition partners, the French, attacked tankers in the Gulf War as well, and they bombed Iraqi tankers moored at the Port of Al Ahmadi in Kuwait and two days later the Iraqis started to expel oil into the Gulf from that port. Now is there a cause and effect? I do not know, but why do we not know that the French attacked a tanker at the Port of Al Ahmadi? Because it is secret, because in order to not criticize a Coalition partner who did not follow the rules of engagement, they just decided to sweep it under the rug. I discuss at the end of the paper my perception of Iraqi views as a result of my trips to Iraq.

At the macro-level, I talk about what I call the "reverberations of military operations" to expand our definition of collateral damage. And here I look at remnants of war which Colonel Finch described in terms of the horrific land mine problem that we are facing worldwide. In the Gulf War, I do not need to tell you that the remnants question was enormous. It just so happens that when you have 1.2 million soldiers and 14,000 armored vehicles on a battlefield, they leave behind a lot of garbage. It is just unavoidable. Nevertheless, a lot of that remnant is toxic and some of it is explosive. The Gulf War saw the largest use of cluster bombs in the history of warfare, some 60,000 cluster bombs dropped from the air, or approximately one third of the munitions dropped from the air. It is estimated, with a conservative figure of 3%-5% duds, that somewhere around 2.7 million bomblets from cluster bombs were left behind. That is approximately the same number of mines that were left behind in Kuwait.

In my paper I talk about the remnants of war in the context of the "toxicity of the modern battlefield" and I use the term "toxicity of the modern battlefield" because of the latest view of the "Gulf War syndrome", and I say the latest view because maybe next week's view will be different. It is a kind of soup, if you will, a toxic soup. The common thread which seems to run between these syndromes, and there are more than one, is that most of the soldiers who are showing these symptoms were exposed to a variety of substances, including vaccines and chemical antidotes, as well as other highly toxic materials. One of the substances that the National Science Foundation pointed to in their report, as did the Rockefeller University in their report, was paint. I am a former Army guy and as any of you
who are former Army guys know, when you paint tanks or Army vehicles, it is
done in an airtight environment with tremendous attention paid to human
exposure because of the high toxicity of anti-reflective camouflage paint. In the
Gulf War a lot of expedients were used in order to do this same thing. It is not
coincidental, therefore, that many of the people who have been exposed to “Gulf
War syndrome” are from supply and services units, as opposed to those who were
in combat units, because those in supply and service units tend to be exposed to
more toxic materials. I am talking about the whole gamut, from lubricants, to
paints, to solvents, etc. Now, you may think that the “Gulf War syndrome” is pretty
far afield, but I do not think you can pick up many newspapers in a week’s time
in America and not read one or two articles about “Gulf War syndrome.” It seems
to have evoked enormous emotional energy on the part of veterans and has
collected a combination of former POW/MIA activists, UFO activists, antiwar
activists, and environmentalists. Actually, the environmentalists seem to stay away
from the Gulf War syndrome issue because it has to do with the military, and they
hate the military. Nevertheless, the reverberations, the unknowns, the
combination of factors, is what is interesting about the “Gulf War syndrome.”

When we talk about “long-lasting” and “long-term,” we are talking about
decades. So even what Mr. Harper said this morning, about how we are going to
determine what the environmental effect of Operation Desert Storm was by 1997,
is absurd. We are just now beginning to see Kuwait’s data about the health effects
of the war, just now. Kuwait had a conference in December 1994, where it first
began to reveal some resultant health statistics—respiratory diseases up 50
percent, child and infant mortality up something like 25 percent from prewar
levels. Are these attributable to the environmental decay that occurred in the Gulf
War? We do not know, and we are not going to know for some time.

Reverberations to me are also important because it is a new fad within the U.S.
military; this fad called information warfare. I think the Air Force calls it “parallel
warfare” and I heard General Linhard refer to it this morning as “strategic
paralysis.” Everybody has a term for it now. Information warfare is systemic
warfare, if you will, an attempt to conduct military operations so as to have a
systemic effect on the enemy. The idea is that our societies are becoming so tightly
inter-woven and interconnected; that communications and electronics and
electricity are so tightly inter-woven, that to disrupt those aspects of society is to
have a greater military effect than actual physical destruction. You see this coming
out of the Air War College at Maxwell Air Force Base. You see this coming out of
Joint Chiefs of Staff Memorandum of Policy - 30 (JCSMOP-30). You see it coming
out of the Information Warfare School at the National Defense University. This
theory, the thinking, about reverberation and the interconnectedness of society, I
find useful and interesting because in the Gulf War the actual prosecution of that
conflict was done with the intent of having that reverberative effect. And here I
refer to the bombing of electricity, the bombing of the national electrical grid in Iraq to have a military effect. The fact of the matter is that you cannot show that it had any military effect. The Gulf War Air Power Survey concluded that it is not possible to demonstrate that the destruction of Iraqi electricity had any impact on command and control, or air defenses, or chemical or biological weapons. It had a presumed effect but not a proven effect. A recent article in the Journal of Strategic Studies by Dan Kuehl, who is a professor at the National War College and who was a member of “Checkmate” during the Gulf War, concludes that neither in Vietnam, Korea, nor in the Gulf War can one conclude that the destruction of electricity had any effect. But what was the reverberating effect on the civilian population?

The reverberating effect was that some of the very targets which were proscribed by international law, some of the very targets which the rules of engagements stated could not be attacked—water being the particular one—were effected. As they found on 18 January, the day after the first day of bombing, all of a sudden CNN was reporting that the water was off in the hotel. And I have anecdotes of guys sitting in “Checkmate” in the Pentagon running around saying, “Did you think that the water was going to go off?” And, they said, “[Expletive deleted], we never thought that the water was going to go off.” But, all of a sudden, they found that by the systemic attack on electricity, water distribution, water purification, and sewage treatment were similarly effected. So a target which was not physically attacked was disabled by the destruction of electricity.

The impact on the civilian population is, of course, in dispute. Most demographers argue that from 1991 to 1994, 140,000 Iraqi’s died in excess of the number that would have died under normal demographic conditions—140,000 people. Now the Air Force argues this figure is not attributable to electricity. It is attributable to sanctions; it is attributable to the [expletive deleted] life in Iraq; it is attributable to the lack of food; and it is attributable to war damage. But, if we are talking about environmental destruction; if we are talking about any sensible reason why you restrict environmental destruction, it is because of the effect that that environmental destruction has on people. And, as I sat here as a true-blue tree-hugger, listening to the two previous presentations about the need to protect marine mammals and endangered species, and all that, I saw a lot of chuckling in the room, and I join you. But the fact of the matter is that environmental protection is about the sustainment of human life, and that may relate to preserving bio-diversity, and preserving an ecological balance, and preserving the natural environment in a state which will sustain human life. But, when we make an evaluation of the environmental effect of warfare, when we talk about the environmental impact, we have to ask what was the environmental impact of the oil fires in Kuwait? What did it do to the Kuwait people? What did it do to their ability to sustain their life in the long-term? And here, ironically, I would have to
say that other than the spotty health statistics which we are just beginning to see, the answer is “not very much.” Kuwait is now producing oil at a level of approximately 70 percent of what it was producing pre-war and because of many of the factors that Ron DeMarco described in his presentation, the oil spills seemed to have been mitigated—certainly not to the levels that would have been required in the Exxon Valdez or the Amoco Cadiz. But, CNN is not there any more; so we do not have to look at it. The Kuwaiti and Saudi interpretations of the level of environmental remediation that is required is different than ours. They are willing to live in that environment, but live they cannot.

Now we heard a lot this morning about the Iraqis this and the Iraqis that. I spent a couple of months in Iraq since the war, on three trips, as a part of the Harvard Study Team. In August 1991, I was there for a month and in 1993, I was there for a month. I had an opportunity to talk to Iraqis and to interview them and to ask them “why.” I seemed to have gotten three both direct and elliptical responses. The first thing that all Iraqis say is, “What we did is no worse than what you did.” So I say, “What did we do?” And they say, “You bombed nuclear power plants. You bombed chemical weapons facilities. You bombed irrigation barrages. You bombed bridges. You bombed urban areas. You used fuel-air explosives and you used napalm.” All of the things that you read in the news, the Iraqis read it as well. So when the New York Times printed an article that said depleted uranium is a problem in Iraq, the Iraqis said depleted uranium is a problem. When I asked them how do you know epidemiologically that it is a problem their answer was, “We read it in the New York Times.” They could not produce evidence of higher incidence of cancer; they could not show that there was even any diagnostic effect, but there was a presumption.

Second, there are sufficient documents now that have been released, Iraqi documents, captured in the Gulf War, that conclusively show that the intent of Iraq's destruction of the oil wells was vindictive and had no military purpose whatsoever. I have them in my possession. When I hear you folks, U.S. government lawyers, argue that the Iraqi destruction of the oil wells in Kuwait had some military effect, or that it had a presumed military value, I just am stunned. The documentation is there. The Defence Intelligence Agency has in its hands Iraqi documents that show that in the second week of August 1990, less than a week after invading Kuwait, the Iraqis began to wire together the oil wells to explode them as a totally vindictive measure if they were expelled from Kuwait early. The documents are there, the Iraqi documents are available and yet for some reason, which I do not fathom or understand, in the Conduct of the Persian Gulf War report, the Title V report, and in the presentation by General Linhard this morning, there is this hint that perhaps what Iraq did was justified, and here I will get back to effect and impact. It may have had some military effect but to argue that that was the intent behind what Iraq did is really grotesque. When I have
shown those documents to Iraqi officials, their answer is, “What the military does is not what the Government does.”

Number three. What all Iraqis seem to say is that the things that they did had an environmental impact and were extraordinary but that they were “necessitated by the situation.” I asked, “How does that comport with your acknowledgement that destroying the oil wells was not done to complicate the targeting of your forces?” What does “necessitated by the situation” mean? And their answer was, “Our military operation was to destroy Kuwait. Therefore, we destroyed the wells because that was what our military operation was.” Is that a violation of international law? Yes. But did they see it as being a part of their military operation? Yes. That is what they were directed to do. If they were forced to evacuate from Kuwait, their mission was to destroy the infrastructure.

Next, for those of you who question whether others recognize international law or understand it, I think the Iraqi case is also interesting and instructive. Whether you believe that CNN was a stooge in the Gulf War, or believe that the news media did the Iraqis’s propaganda for them, the fact is that on 21 January 1991, when the Iraqis took Peter Arnett to Dour, a village in northern Iraq that was flattened by a B52 bombing attack and was first revealed on TV, or when the Iraqis took Peter Arnett to the baby milk factory, or to the Mosque, or to this place, or that place, they knew enough to distinguish that those were the places that suffered collateral damage. The Iraqis never took CNN to military targets, including electrical power plants. They never took CNN to oil refineries. They never took CNN to government ministries in Baghdad. They took them to the places that anyone who has half a brain, who is not just blinded by thinking the Iraqis are all liars and therefore should be ignored, would accept as cases of legitimate collateral damage. Now the U.S., of course, had an explanation for each case. Nevertheless, it demonstrates that the Iraqis understood what they were doing; they understood the cases. And similarly, consider the acts of perfidy that Iraq perpetrated in the war, such as the case where they created false damage, and the case where they reversed their tank turrets. When I ask the legal people in the Iraqi foreign ministry about them, they pulled out their International Committee of the Red Cross (ICRC) manuals and showed me how those cases were legal. They argued that these were not acts of perfidy; that it is not established in international law that you cannot turn your tank turrets around. When I asked why they turned their tank turrets around they responded, “Because they feared U.S. lasers were going to be directed at the range finders on their tanks and, therefore, that they did not want to have their optical systems facing forward toward the U.S. forces.

What do I conclude from all of this? Well, in my paper I point to all of these controversial weapons and controversial practices and the political constraints, either because of public opinion or because of internal pressure, that seems to have been brought to bear in each case. To conclude, I generally agree with the Mr.
Harper; the law seems sufficient. The basic rules of proportionality and the overlap of these various measures seems sufficient. Does that address Mr. Harper's own argument that enforcement is the problem, when we are the ones that have failed to enforce the law when others broke them? The answer is no. But when the true record of the Gulf War is looked at, when the true examples that challenge international law are looked at, it seems to me that we come up with a very different conclusion. Thank you very much.

Vice Admiral Doyle, Jr.: Thank you Bill, for that very provocative and insightful presentation. I told you he would talk about anything. It is my pleasure to now introduce the commentator for our panel, Dr. Arthur Gaines. Arthur is a Research Specialist with the Marine Policy Center at Woods Hole Oceanographic Institute. He conducts research on ocean economics, law, policy, and management. He is the author of several papers on biochemistry and estuaries in the coastal ocean. Arthur.

Dr. Arthur G. Gaines, Jr., Woods Hole Oceanographic Institute: Thank you Admiral Doyle. I would like to start by telling you something about myself and my own viewpoint. My background is in the environmental sciences and oceanography. I am interested in how scientific information can be brought to bear on making better decisions. At the same time, I would call myself an environmentalist. I give more money than I like to think about to environmental groups, principally land preservation groups and environmental education groups. I find that the professional end of what I do is very often at conflict with these sentiments and often puts me on the opposite side of the table from people who call themselves environmentalists. I see a number of inconsistencies among so-called environmentalists or people who espouse environmental concerns that make me feel that, in a way, they are their own worst enemy. For example, everyone is concerned about oil spills, but when was an environmental impact statement performed on the use of asphalt all over the world for paving roads? That is a lot of oil. If people see oil on the beach, it is a crisis. But what about all the roads that are made of oil? What about farming? What about an environmental impact statement on farming? Farming is one of the most destructive environmental activities around. The entire bio-diversity of farm land, in essence, is reduced to one species. Wheat, rice, whatever is growing. The use of pesticides is very damaging to normal insects and organisms that would inhabit a farmed area. The use of nutrients has a very widespread impact on the quality of drinking water, the water quality of adjacent ponds, the receiving waters, rivers, and so forth. There are places in the American West, in the farm belt, where the ground water concentration of nitrite fertilizer is sixty parts per million. That is six times greater than the drinking water standard permitted by the Environmental Protection Agency. Yet you do not hear people saying farming is an environmental problem.
Before I get into the substance of my comments, I would like to point out that people feel that environmental protection is consistent with the best human interest, while I would say that they are often at odds. Farming is not consistent with the best environmental concerns. Farming destroys the environment. People, especially environmentalists, but everyone to a certain extent, have a feeling that nature is peaceful and that we should seek to emulate nature for peace and harmony. I took a course in parasitology years ago in college and the quote in the front of that book by the author, Chandler, was that we think of nature as peaceful and we seek to emulate it, yet in every meadow, in every stream, under every rock, in every creek, there is murder, destruction, and suffering going on all the time. I think that is a more balanced view than the idea that nature is very peaceful. That concludes my introductory comments. Maybe you will see where I am coming from.

Secondly, I would like to tell you something about the institution I represent because I do not ordinarily meet with a group like this and I thank Professor Grunawalt for inviting me. Before I begin, I would like to congratulate the panel on their very interesting papers. Every one of them was interesting and, in fact, I have noticed in the course of the day, that there is really very little distinct disagreement among them. I hear people falling in different places on the spectrum, but other than the outcome of the Ottawa Conference, I do not see any distinct disagreements. One of the advantages for someone like me to be here is that it provides an opportunity to get to know some of you and the organizations you are with, and vice versa.

I am with the Woods Hole Oceanographic Institution. Most of you who know of the Institute think of it in terms of basic ocean research. Our organization obviously has an administrative layer that provides administrative services, that operates our ships and submersibles, and that administers research, and so forth. The level at which research and creativity are accomplished, and the level at which proposals are written and sent out, is the next layer down. This second layer consists of 250 people, approximately, who do work in physical oceanography, biology, chemistry, geology, and ocean engineering. We have a third layer with Centers, which tends to bring those disciplines together again in interdisciplinary kinds of work. I am with the Marine Policy Center. At the present, we consider ourselves as sort of the "proto-department". We may become the sixth department at the Institution at some point. The Marine Policy Center, unlike all of the other departments that deal with earth sciences and engineering, incorporates the disciplines of law, economics, policy analysis, science and technology, and we conduct work on the law of the sea among other topics. My own background is in biology, geology, and oceanography. My work focuses on how marine science and technology bears on the decision-making process for use of the environment, for use of the ocean, and for its protection.
My terminology in some of these discussions of military matters could be way off because I am not used to talking about these things. If it is, I will make my correct paper for the published version. To evaluate the environmental impact of military systems, of having a military, one needs to consider the whole thing, in essence, from the beginning to the end. I see really two separate categories of environmental impact. One of them is associated with military preparedness, which involves all of the industrial support, research and development, production, transportation, storage, and so forth, associated with providing the military with the wherewithal to defend the nation, and it consists of non-warlike military operations. This would include training camps, operation of bases, storage of ordnance, training, and also, activation and deployment of forces. It does not involve any armed conflict. This category of military activity is typically conducted in a climate where, since there are no casualties, no one is upset, where there is generally more clear thinking. There can be a state of what you might call—efficiency. Materials are used efficiently and carefully, compared to what it might be under other circumstances. What I am saying is that environmental preservation, environmental regulation, and environmental protection are all consistent with this activity. There is no reason to believe that it is not possible to be responsive to these constraints. From what our military speakers here have said, the comments that I have heard today on that military preparedness side, we can talk reasonably about environmental protection in association with military activities. But, consider military activity that involves armed conflict. Under conditions of armed conflict, the stable mode I would propose is one of maximizing power. Even in the case of limited armed conflict, you would still see a tendency to maximize the delivery of force and power within the boundaries of the limits imposed by law and policy. Under those circumstances, there are casualties, there are more likely to be accidents, things are likely to happen fast, decisions need to be made quickly, alternatives evaluated, and so forth. Nevertheless, in the case of limited armed warfare, the conflict is still limited. There is rational thought, and to some extent, but perhaps not as great as in the military-preparedness side of the equation, environmental protection can be a reality. I think what we have heard today confirms that it is a reality under those circumstances. Now, when we speak of unlimited armed conflict, what I call, total warfare or strategic scale conflict, in which we are talking about employment of intercontinental ballistic missiles, hundred megaton scale nuclear weapons, and the like, in that context we can no longer talk about environmental protection. If the situation gets to that level, there is no discussion of protecting the environment. It no longer makes any sense.

We have not heard too much today about the environmental impact of the industrial military support infrastructure, and I am not going to try to do it myself. The whole nuclear fuel cycle is one which we have discovered has fundamental environmental significance—the storage of waste products, their transport,
reprocessing, accidents, and so forth. With respect to weapons development strategy, research and development of some weapons seems to be completely inconsistent with the idea of minimizing adverse environmental impacts. For example, one of John Craven's examples is the low altitude nuclear ballistic missile. It is, in essence, an unshielded nuclear reactor carried in a cruise missile that lays down a lethal 500 rad swath of radiation beneath it as it cruises for months at a speed of Mach 3.5. Now that weapon could not even be tested without having a hideous environmental impact. According to John Craven, apparently it has been developed, and there is one in a lead crypt somewhere. My point is that important decisions need to be made about research and development of weaponry which will have significant environmental impact.

Military operations which do not involve armed conflict, including training, readiness, and deployment, as well as the operation of military bases, have not, in the past, been conducted in ways that are always concerned with environmental impact, although we are improving in this area. Similarly, the activation and deployment of forces is often associated with an increase in environmental accidents, as I mentioned earlier. Here too, military activity could be made more amenable to environmental protective measures. The ground water plume at Otis Air Force Base on Cape Cod is an example of a problem that started during the early part of World War II when Camp Edwards was used as a staging area to deploy troops. Hydrocarbons, nutrients, and other materials were dumped into the ground. The resulting plume is 11,000 feet long and has closed down one of the wells of the town of Falmouth. This is a problem that in the future we do not need to have. I am not inclined to go back and point fingers for something that happened fifty years ago; I do not think that is appropriate in any way, but we do not need that to happen in the future.

Finally, with respect to limited armed conflict, there are at least three areas where there can be mitigation of adverse environmental impacts. One is in target selection. As an example, presumably you would not want to hit an active plutonium plant given the grave potential danger that the release of plutonium would have on the civilian population. There are other legitimate military targets that you would not want to hit as an environmental measure. Whether you did or not would depend on what the pros and cons were, the military advantages, and environmental disadvantages, and I think that there is room there for environmental concern. Such targets might include electrical grids, water systems, sewage treatment plants, transportation networks, communication facilities, and so forth. Whether you hit them or not may be a matter of debate, but there could be some environmental concerns expressed there. Civilian targets, such as the Bhopal-kind of fertilizer production plant, may best not be hit if you are concerned about the environmental consequences of doing so.
There are tactical methodologies that I have heard discussed here today that can avoid or minimize adverse environmental impact. For example, the capture of an oil tanker instead of its destruction. If it is possible to capture or disable it instead of sinking it, that has presumably a significant environmental consequence. A civilian population could be demoralized by information, rather than by destroying their city, possibly. Use of weapons that are not likely to have large collateral effect is a similar methodology that we have heard a lot about today.

In terms of specific weaponry used in armed conflict, we should consider the longevity of their environmental impact when evaluating the desirability of their employment. I would add remediation as a further consideration, which Mr. Arkin also mentioned. We should ask ourselves, "How easy will it be to clean up this situation? How easy will it be to prevent ongoing impacts?"

I am supposed to know something about environmental impacts and I have only pessimism to transmit to you today on that issue. When we think about this subject we should recognize that there are hierarchies of organization in the environment, the ecosystem being the largest. Habitats taken together, make up ecosystems and within each habitat are various communities, which, in turn, are assemblages of different kinds, different populations of organisms. A population is an assemblage of the same kind of species and so forth going down to the gene. Acute environmental impacts, those in essence that involve very quick death, are the only category of impacts in all of those systems that we have any kind of handle on. We use measures as LD-50, lethal dose 50. If you add different amounts of chemicals or toxicant, or you change the temperature in increments, at what point do you see death of the adult or death of the juvenile or collapse and loss of the community, and so forth. There is some hope in understanding acute impacts and having something to say about them. But, when it comes to chronic impacts involving increased susceptibility to disease or impaired feeding or impaired competitive ability of a species as a result of something that has happened, these are very difficult, if not impossible, to predict. They may take months or years or decades to express themselves in any particular case. Take, for example, the decline of coral reefs. No one knows why coral reefs in some areas are declining. This decline is not sudden, it has happened over a period of decades.

Another way to gain some perspective on all of this, and to understand the resilience of individual organisms and communities, is to look at natural disasters. Obviously, natural disasters have been happening for hundreds of millions of years. And obviously, people have little or nothing to do with any of them, except possibly fire. What I have tried to do in my paper is say something about the frequency with which natural disasters occur, the area that might be affected by them, and something about the longevity of their impacts. I make a totally gut impact assessment using an arbitrary scale of one to ten, where one is a very small impact and ten is certain major destruction. As an example, at least every few
months some place is hit by lightning. An individual lightning strike would affect, generally, a small area. You could be very close to a bolt of lightning and you would not be affected. The longevity of the adverse environmental impact of a lightning strike might be as long as one year. Maybe you could see where lightning struck or split a tree or destroyed a house a year later. It's immediate impact could be either very little or it could kill people. Conversely, tornados are very severe natural events that may have a war-like impact. Certainly volcanoes do. In the Galapagos Islands, volcanoes have spewed molten lava over 100 square miles of land. Now if you have hundreds of square miles of land buried in burning lava you could have a very serious impact on birds and tortoises, and so forth. Earthquakes may cause widespread loss of life, as did the recent Japanese earthquakes. The destruction in San Francisco, California resulting from the earthquake of 1989, involved major losses in civic infrastructure. Floods can be equally devastating. The hurricane now battering the Virgin Islands also has a war-like impact. A meteor impact may have a huge impact on the natural environment with nuclear-like consequences, that is a nuclear winter-like scenario, darkness, dust, loss of huge populations of species throughout the world. The longevity of the meteor impact that killed off the dinosaurs a hundred million years ago is still here. Mankind probably would not be here if that meteor had not hit. We are still living with that impact. I would say that nuclear war, total war, would have an impact like that meteor impact. The point of this is that if we look at the range of natural disasters, it does not provide rational arguments against warfare. The range of natural disasters is about as bad as warfare. Yet, natural systems recover from fire, flood, hurricanes, and so forth. When you destroy a dam, what you are really doing is turning a situation back to what it use to be. Destruction of dams is said to be environmentally destructive, but building the dam in the first place was environmentally destructive because it drowned everything in the upstream valley. Destroying the dam returns the valley to what it use to be, although it has horrible short-term consequences for people.

One final point. The direction of environmental concerns and environmental doctrine around the world is getting increasingly stringent and will have an increasing impact on the military. The nebulous concern with environmental protection that we see now is almost nothing compared to what is coming.

Let us look for a moment at the “precautionary principle” of Agenda 21. In its most stringent wording it turns around the concept of the environmental impact statement to look at it the other way. It is not saying that in order to do something you have to examine the circumstances and see whether it may or may not have an adverse environmental impact. What the precautionary principle says is that unless you can prove that there is no impact in advance you cannot go ahead with the proposed activity. This would typically be applied to industrial development, and so forth. But, can you imagine waging warfare under circumstances where you
have to prove that the armed conflict will not have an adverse impact on the environment in advance? Another emerging doctrine that is becoming increasingly common is the notion that the “polluter pays.” If an industry has damaged the environment and it can be demonstrated that it has damaged the environment, it must pay to put things right. That kind of thinking presumably can have a huge impact on the military. There is also increasing provision for wide public participation in the permitting or evaluation of environmental impacts. I am not sure that we will necessarily see increased public participation in military activities as well, but that is probably going to be a problem in the future. Requirements for research and monitoring, and financing that research and monitoring, are already happening but are likely to increase and become greater in the future.

I would just close by again thanking Professor Grunawalt and the panel and Admiral Doyle for the opportunity to speak.

Vice Admiral Doyle, Jr.: Thank you, Arthur. We are now open for questions from the floor.

Dr. Glen Plant, London School of Economics and Political Science: I am going to attack Bill Arkin. Bill, for a tree hugger you take a very anthropocentric view of the environment don’t you? You are looking at human health aspects alone. You are not taking into account the biological or the aesthetic aspects. And, you are saying that what we did to the Iraqis was worse than what the Iraqis did to us, without looking at the intention behind the acts and without looking at the harm that was done overall, which was surely the only fair process to undertake.

Mr. Arkin: I do not know that I said that what we did to the Iraqis was worse than what they did to us. I do not believe that, and if one has an anthropocentric view of the world, obviously aggressing upon one’s neighbors and violating all of the standards of conduct in law are much worse than defending against that aggression. So that is my answer. As for my anthropocentric view of the world, I guess that’s why I do not work for Greenpeace anymore.

Vice Admiral Doyle, Jr.: Any other questions? Yes, Captain Rose.

Captain Stephen A. Rose, JAGC, U.S. Navy, U.S. Atlantic Command: Also a question for Mr. Arkin who struck a lot of sparks here. I get the sense that your confidence in the “environmental common sense” is just that. That there is an ethos, or a common sense in the public weal that acts as a self-regulating
Mr. Arkin: A friend of mine who read my paper said, "You do not want to say this Bill." One of the points he made was that in real wars, not the Gulf War, maybe these weapons or these methods or means of warfare would be used or people would perceive their use to be important because they were connected to military necessity. Whereas, in the Gulf War, surplus military capability allowed the Coalition to have many more choices and, therefore, it's compliance with the law was easier to ensure. I guess that is a flaw of my argument. Nevertheless, I think it is important to argue that environmental protection is codified in our behavior and actions, regardless of what U.S. interpretations of Additional Protocol I are or of what the law might be. If we have virtual compliance, to use a computer term that is popular today, it is important to codify that virtual compliance. The fact of the matter is that for political and public relations reasons we did not do certain things because the political leadership and military leadership perceived that doing them would have an adverse effect on public opinion. To demonstrate and promote that, I think, enhances the cultural norm because it creates virtual compliance. I would prefer to see that napalm or fuel-air explosives, or certain types of weapons or methods of warfare not be applied because of their adverse humanitarian effect and limited military utility rather than to argue endlessly about whether we should have better laws for that same effect. I think in the court of public opinion and the court of the real world, certain things are not done because of the perceived impact, as opposed to because of the letter of the law.

Professor Christopher Greenwood, Cambridge University: I would like to startle Bill Arkin enormously by saying that I agreed with some of the things he said, not all of them, just some. I am quite sure that had we been able to put together a symposium that also had some 20 representatives of Greenpeace on one side of the room, probably not the same side as most of the rest of us, and 20 or so representatives of the Iraqi Government, they would currently be attacking Mr. Arkin's paper also. Whether that would make him feel better or worse I do not know. I would like to take up a point that Bill Arkin made and tie it into something that Dr. DeMarco said in his presentation and that is the very considerable difficulty of proving certain effects in times of war. Now, to some extent that is because unless you defeat your adversary completely, you just do not have access to the raw informational material at the end of the conflict. We do not know some of the effects that took place in Iraq because the Iraqi Government will not give us that sort of information, indeed, may well not have it itself. But, there is, I think, a very considerable danger in this area in taking received wisdom as though it was proven scientific truth and that was something that as a non-scientist, I found
enormously valuable in the two presentations about the impact of armed conflict on the marine environment. What you find, if you look at the history of warfare, is that certain assumptions are made about the effect of military operations, that is, what you could and could not achieve by way of bombing, or how accurate bombing was capable of being, et cetera. But what hatched in the First World War, and then carried through and was treated as though were written on tablets of stone in the Second, turned out to be totally untrue. Now that is the danger on one side. The danger on the other is that you take a case where you cannot prove conclusively what military effects were brought about by depriving the Iraqi armed forces of access to their ordinary electricity supply. You cannot prove what those effects are and compare them with observable collateral side effects of those attacks on the power stations. There is a danger in saying, “Well, here you have an unproven effect, here you have a proven one. Let us focus on what we can prove, and ignore the other side of it completely.” That, I think, would equally be a very considerable mistake. So taking a single, isolated, provable part of the effect on the environment and discarding all of the much more difficult aspects would, I think, be to misunderstand the way in which international law requires us to look at the environmental effects of warfare.

Professor Michael Bothe, Johann Wolfgang Goethe University: My question is for Bill Arkin. I am puzzled about the question of the role of law. Do you think that the fact that most of us do not kill has nothing to do with the law, just habits, and common sense? This seemed to be your implication, and being a somewhat self-respecting lawyer, this of course, is a stance that I could not accept. I think the role of law is to give some certainty of expectations, to put some order in social rules and that is a salutary role. Having said that, I know of course, that the motivation of a particular person behaving as he or she does is not exclusively inspired by legal considerations, it is a multitude of factors. It is culture, but please, the law is part of that culture and, therefore, it matters. I wonder whether you did not neglect some parts of this culture, which I agree with you, is changing indeed. That being so, I think what is necessary is a cool evaluation of what really happened and, therefore, I think the exchange is particularly valuable because what used to be a traditional perception of admissible or non-admissible damage may not be admissible in the current circumstances, because the social conditions, the physical conditions, are changing. There are no more free spaces because the impact of the things we do is felt around the globe. If you hit the life support system of a big city, that is different from what it was even in the Second World War where the individual still lived in a context where life support systems of the big cities did not matter in the same way they do today. I think your paper has shown this quite well and in this respect I agree with you. Not any other.
Dr. John H. McNeill, U.S. Department of Defense: I also found the discussion very interesting and, following on some remarks that Chris Greenwood just made, I would like to focus on what Mr. Arkin was referring to earlier as the ethic, as opposed to the law. We can and will argue about what the law is, but with respect to the ethic and the realization that many of the environmental effects of military operations are not proven—perhaps are unprovable and unknowable, at least during our lifetimes—it seems that the ethic operates in a manner which affects political self-deterrence, at least in examples that we are familiar with here in the United States. I think a comparable example to the environmental side was the self-deterrence that operated at the end of the conflict in Iraq. You will recall that the media was very interested in what was going to happen with respect to the so-called “highway of death”, which many of us remember quite vividly. That too involved an ethic that resulted in political self-deterrence. Similarly, we did not take actions in reprisal against Iraq for the wanton destruction of the 732 well heads. The law might have permitted us to do that, but we did not do it. Reprisal action in that instance was seen as something that was, as a matter of public policy, unacceptable. So I am wondering if the suggestion made by Mr. Arkin, that we ought to, in affect, codify these rules, is meant indirectly as a suggestion that the United States, and perhaps other members of the Coalition in the Gulf, other Western countries particularly, might similarly be self-deterred and, therefore, would benefit from rules that they were forced to observe as a political matter, being accepted and forced on others, even though there might not be the scientific ability to appreciate what the threat to the environment would be from the actions that would, thereby, be prohibited. It is an interesting proposition. Would you care to comment?

Mr. Arkin: Let me just answer Professor Bothe first and say that I spoke that the law was adequate. I did not say that it was irrelevant. I just felt that the existing law provided the framework for everything that has been discussed today and I have heard nothing yet that says to me that what we have discussed does not fall within the framework of existing law. That is all. I meant adequate, not irrelevant.

I think that enforcement does relate to deterrence and I will give you an example. Since the end of the Gulf War, the U.S. Government has been arguing very vociferously that Iraq is practicing a form of ecocide in the Southern marshes by diverting water away from an area that sustains an indigenous marsh life culture. The CIA has issued reports; a lot of attention has been paid to this. Madeline Albright has brought it before the U.N. Security Council. When I was in Iraq in 1993, I was taken on a Government trip to the marshes, including an Iraqi helicopter ride—which was scary in its own right, because I thought I might be shot down in the “No Fly Zone.” One of the things that the Iraqi environmental people, and there are Iraqi environmental people, argued was that as mere
functionaries in a scientific ministry they did not really see why their changing
the course of the Tigris River and their various canaling and channeling irrigation
projects, as they called them, could possibly be construed by the United States as
a violation of ecological international laws. They said, "Look at what Iraq did in
the Gulf in terms of blowing up all those Kuwaiti oil rigs, *et cetera.* The
international community never took any action as a result of what we did to the
environment there." So their attitude was, "What we do to our environment is
different from what we might do to your environment and since there is not
enforcement of some standard practice that says we cannot do something to our
own environment, than we just assume that what we do in our country is our own
business." A part of my answer to you would be that I can show that the lack of
any kind of international enforcement had a real impact in that the Iraqi's
perceived that they might get away with something that they otherwise might not
have. Another thing I would say would be that all of this discussion of the Gulf
War is both instructive and irrelevant because of the many unique qualities of that
conflict and the fact that we had choices to make there that we may not have to
make in the future. It was a type of conflict where you could actually sit and choose
targets to hit, sit and choose weapons to use, and sit and decide whether you are
going to launch a ground war or not—I think Larry Freedman called it "war by
appointment." It seems that that is war of a very different quality, where a lot of
these issues of reprisal and heat of passion and what is done when you feel like you
are losing a war or when you feel like you really have to do something to give
yourself a step up in a war, does not really come into play. That was the situation
in the Gulf War, at least on our side. That, I would say, is in agreement with
Professor Bothe's point that the law is really important. You need to have legal
standards, even in this nice casual war, to say these are still things that if this were
a heated, passionate war, one could not do and it is unfortunate in that regard that
there are a lot of Iraqi's running around, including the Iraqi leadership, who in
1995 feel that they got away with murder, literally. The U.S. Government, I think,
has been a part of that unfortunate policy.

**Vice Admiral Doyle, Jr.:** We have to close our discussion here and I would like
to thank the panel.