STRATEGY RESEARCH PROJECT

FUTURE OPERATIONAL AND ENVIRONMENTAL CONCERNS IMPACTING THE ARMY TRANSFORMATION

BY

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Future Operational and Environmental Concerns Impacting the Army Transformation

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ABSTRACT

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As the Army plans to create and employ the objective force, it is essential that environmental planning be front-loaded into the planning. There are ever more restrictive environmental concerns, including land use, pollution prevention and mitigation, protection of animal and plant species and waste management. If we do not plan early on to address these and other concerns the impacts on training, procurement, maintenance and waste disposal can be extremely costly.

This paper looks at today's environmental regulations, practices and concerns. Then four scenarios looking at ten and twenty five years into the future are developed. The impact of the scenarios on transformation and the likelihood of each scenario are described.
The final part of the paper provides recommendations to ensure the most advantageous circumstances for Army transformation occur.

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I want to give all of the folks above credit for the insights and assistance they gave me. Any errors I will take full credit for, as a product of my interpretation and analysis of their input.

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FUTURE OPERATIONAL AND ENVIRONMENTAL CONCERNS IMPACTING THE ARMY TRANSFORMATION

This is a historic opportunity. Most armies change when wartime defeat forces them to do so. Today, we seek to change in a time of peace, prosperity, perspective, and potential. But we have a narrow window, and these conditions will not last for very long. While they do, the Army is embarking on its most significant effort to transform since World War I... The Army has moved out. We will repay America's investment in us with quality people, warfighting readiness, and in time, with a land force transformed to meet threats all across the spectrum of operations... We cannot afford to miss this opportunity."

GEN Eric K. Shinseki, 10 Feb 2000[1]

President Clinton has placed several responsibilities on the United States military. In the 1999 National Security Strategy (NSS) the president points out the necessity for a responsive, agile force as essential for global power projection, which provides options for responding to potential crises and conflicts even when we have no permanent presence or a only limited infrastructure in a region[2]. The forces used to protect this power must be lethal and capable. As the President later maintains in his 1999 NSS:

> "First we must maintain the ability to rapidly defeat initial enemy advances short of the enemy's objectives in two theaters, in close succession. We must maintain this ability to ensure that we can seize the initiative, minimize territory lost before an invasion is halted, and ensure the integrity of our Warfighting coalitions. Failure to defeat initial enemy advances rapidly would make the subsequent campaign to evict enemy forces from captured territory more difficult, lengthy and costly, and could undermine U.S. credibility and increase the risk of conflict elsewhere."[3]

In Secretary of Defense Cohen's Annual Report to the President and Congress, 2000 he outlines the three elements of the DoD strategy – shaping, responding and preparing the international security environment.[4] He states that one facet of meeting these challenges is to prepare for an uncertain future. This preparation involves pursuing the revolution in military affairs. He declares,

> "Just as earlier technological revolutions have affected the character of conflict, so too will the technological change that is so evident today. This transformation involves much more than acquiring new military systems. It also means developing advanced concepts, doctrine and organizations so that U.S. forces can dominate any future battlefield."[5]

To meet the president's strategy for the military, the Army must, as Secretary Cohen asserts, pursue the revolution in military affairs. The Army's vision meets these challenges

and requires the Army to have strategic dominance across the entire spectrum of operations through responsiveness, deployability, agility, versatility, lethality, survivability and sustainability.[6] This vision in turn will drive the Army's Transformation effort, the number one priority in the Army today. As General Shinseki announced at the Association of the United States Army in October 1999 "The critical path of the Transformation leads to the objective force ... The Army will make the technology investments that, after eight to 10 years of development, we anticipate will result in new technologies that underpin the Objective Force design"[7]. The Objective Force, though still being designed, is envisioned as composed of Brigade Combat Teams (BCTs). Each BCT is lighter than a current heavy brigade, deployable to anywhere on the globe in 96 hours, and able to seize the initiative and fight any potential enemy land force.

To ensure the appropriate high-level of awareness of potential environmental issues effecting the transformation are addressed before policies and plans for implementing the Army's Transformation are too far advanced, the Army has initiated the Strategic Environmental Assessment (SEA).[8] The SEA is not a NEPA (National Environmental Policy Act) environmental assessment. The Army later in a programmatic environmental impact statement will address NEPA concerns and will develop subsequent environmental impact statements as needed.

This strategy research paper will focus on future operational and environmental concerns that can affect the objective force in support of the Strategic Environmental Assessment. To do so the paper will first provide some background information related to environmental regulations concerning the land, air and water along with the public policies and the increasing role of the public. Using that background, it will identify four possible scenarios that may effect transformation, which range from a benign environment with minor evolutionary change to one that becomes increasingly risky from an environmental perspective. From these scenarios this paper will identify environmental risks and opportunities for the Army as it pursues transformation. Finally, the paper will make four broad recommendations to mitigate the risks and to take advantage of the opportunities.

BACKGROUND

To assist the reader's understanding of some of today's environmental related concerns and their impact on Army transformation, this paper will present issues facing us today in environmental management. Some of these policy issues are common to all governmental and industrial operations in the United States, but the Army "flavor" to the common concerns will be

shared to show their possible impact on the future. This section will first outline general policy and regulatory issues followed by their impact on land, air and water usage, demilitarization, and then public perception issues.

POLICY ISSUES

The *U.S. Army Environmental Strategy Into the 21st Century* provides the vision, goals, objectives and action plan to "ensure that environmental considerations are integral to the Army mission and that an environmental stewardship ethic governs all Army activities".[9] The policy of the Army is that environmental stewardship is an integral part of the Army's mission.[10] The Army, as with all federal agencies, is required by Executive Order 13148 to ensure compliance with environmental regulations and implementing a compliance audit system to ensure they are met.[11] Executive order 13148 also requires agencies to consider life-cycle assessments and environmental cost in their budget submissions (section 302). Senior leadership will not only be trained in this executive order, but will be evaluated on successful implementation (section 404).

REGULATORY ISSUES

At one time, sovereign immunity applied to all federal agencies in regard to compliance with environmental laws. Sovereign immunity was sometime specifically waived by enabling legislation such as the Clean Water Act.[12] By the early 1990s there was a consensus among lawmakers that this federal agency immunity provided for a double standard between the federal government and the private sector as to how environmental laws were applied. In 1992 the Federal Facilities Compliance act was passed, which waived sovereign immunity with regard to the Resource Conservation and Recovery Act (RCRA).[13] RCRA is not the only act applicable to federal facilities. In November 1990, President Bush signed into law sweeping revisions of the Clean Air Act (CAA). Title V of the CAA Amendments established a federal permitting program, similar to the Clean Water Act permitting program, which is to be administered by the states.[14]

What these examples show is that federal government operations, including those of the U.S. Army, must now comply with various environmental statutes and implementing regulations for these statutes. The regulations, depending on the law and the state involved, may be federal regulation, state, or federal and state both. Because of the variety of laws involved - the Clean Air Act, the Clean Water Act, RCRA, Hazardous Materials Transport Act, and the Comprehensive Environmental Response, Compensation and Liability Act just to name a few - regulatory compliance can be complex, confusing, and involve multiple state and federal

regulatory agencies. Failure to properly address current and proposed regulatory issues has the potential to stop the Transformation in its tracks, significantly delay the introduction of the Objective Force, or raise the cost of the Objective Force due to rework, redesign, fines or penalties.

An additional point for regulatory management is that environmental requirements, driven by law and national policy, are often enforced at the local level. This causes inherent conflicts with bases that have a mission orientation, and regulators who have a geographically based structure. The Army as a whole and local commanders must all be proactive in dealing with regulatory issues and concerns.[15]

LAND REQUIREMENTS FOR TRAINING

From May 1997 through May 1999 the Army conducted a study to develop a methodology to analyze training capacity at Army installations.[16] The study provided qualitative assessments of land and ranges by comparing requirements and assets on installations, as it qualitatively addressed demographic and environmental factors that impact live training. Environmental factors considered in the study methodology were: erosion; land maintenance requirements; population proximity; cultural resources; natural resources; air and water quality; noise; contamination; land withdrawal; public interest and enforcement climate.[17]

Maneuver land was analyzed by land asset capacity and by annual maneuver area throughput requirements. Capacity was evaluated by: total land; impact/detonation land; restricted land (environmental purposes such as endangered species); and net maneuver area for various types forces (light, heavy, amphibious). The end result was a calculation of maneuver area asset capacity. The capacity and throughput were compared to evaluate if a given location could meet its requirements. A quantitative maneuver land rating was then assigned.[18] Ranges were similarly analyzed.[19]

The study was conducted with Force XXI as the baseline force. The amount of effort required showed the complexity of land use planning required for Army training. Army planners and operators must allow for the complex analysis of needs and available land, and then the interaction of the requirements thus derived with the complex regulatory environment, local and national, which will be in place. Innovative use of training lands may arise as the Objective Force matures.

LAND USE ISSUES

Army training lands are under increasing constraints. The following factors, identified in the draft SEA, impact Army training: urban encroachment, land withdrawal, long-range weaponry, lack of diverse climates, threatened and endangered species, erosion and inter-service barriers[20]. Army operations can be hard on the land. Army units expend real effort to minimize damage to the land. The benefits of this are many. It prevents the loss of strategic training land, minimizes safety hazards to personnel and equipment, ensures adequate tactical land for maneuver training, minimizes costs of corrective actions for maintenance of the land, and protects critical habitat for endangered species.[21]

Encroachment forces the Army to provide additional mitigation for noise, to address potentially more restrictive air and water permitting requirements, and limit training time and hours. Communities do not want their lifestyles adversely impacted by military training and operations. Erosion considerations limit where on post units can train, especially with heavy equipment. Similarly, limitations on how equipment is operated or troops deployed are often needed to reduce erosion.[22]

AIR AND WATER ISSUES

Development of the Objective Force must address air and water impacts and should be focused to lessen the impacts compared with today's forces. There are several limitations under the Clean Air Act facing the Army today. Two examples are: limitations on dust and diesel exhaust at the National Training Center, Ft. Irwin, California; constrained training at the Chemical School at Ft. Leonard Wood, Missouri due to state limitations on use of graphite smoke in smoke generators. Stationing an interim brigade combat team at an installation may require changes to central heating and base facilities, which could run into permitting problems.[23]

State and federal regulators are showing increasing attention to water quality issues. Under the Clean Water Act and Safe Drinking Water Act regulators govern the use and protection of water resources. Aging installation facilities are the cause of many Army violations and enforcement actions. Consequently, maneuver and training must be evaluated for impact on streambeds and waterways.[24,25]

DEMILITARIZATION AND LIFE-CYCLE CONSIDERATIONS

In the past weapons have been produced to be used, with no consideration for disposal if not used. The U.S. government is facing a tremendous cost to disassemble nuclear weapons and to dispose of chemical weapons. We are even helping Russia and the other countries of the former Soviet Union to demilitarize nuclear weapons and dispose of chemical weapons due to the proliferation risk they pose.[26]

The traditional view of programs as production and delivery of a product has proven a failed model. Nuclear weapons production facilities in the United States that are no longer in use have left us with a tremendous legacy waste problem. Estimates of cleanup exceed $200 billion![27] Although the analogy between an urgent nuclear weapons program during the cold war, while there was a relative nonchalance about environmental concerns, to the concerns of the Army transformation is a stretch, the lessons learned are germane - plan up front or costs will be more prohibitive than expected.

PUBLIC PARTICIPATION

Public participation in federal government environmental decisions and actions has been codified in many of our environmental laws. For example the National Environmental Policy Act of 1969[28] (42 U.S.C. 4321 et seq.) and its implementing regulations have provisions for public involvement in major federal actions. Over the years public interest and participation have increased. Plans for the efforts supporting Transformation must include adequate funding, schedule and other provisions for public participation. Failure to account for public participation can cause unacceptable delays in fielding the Objective force.

But, lest the necessity for public involvement be seen as a negative or nuisance, well-managed public participation can be invaluable to the Army. New insights can be gained, and innovative ways of doing business can be found. Perhaps the most significant benefit is that the population will support plans they help prepare, and will then provide more public support for the Transformation. This will be seen in more cordial interactions with the public, more support expressed to Congress, and good community relations.

FUTURE CONCERNS

Now that the paper established a foundation of major environmental issues facing the Army and Army Transformation, it will now focus on how the potential future regulatory environment may be shaped, and how public attitudes may be involved in fielding systems,

operations and training. The paper will postulate four different future scenarios that can be used by Army planers to both anticipate emergent problems and then avoid them by taking proactive measures today.

The four different scenarios were developed ranging from the benign to the risky with regard to environmental issues. The first scenario assumes the future looks much like today; incremental technology improvements occur and relations between the Army and its local and national regulators are generally cordial and professional. The second scenario is similar to the first, but technological improvements spurred on by today's research and development (R&D) allow for significant reductions in environmental impacts caused by training and operations. In scenario three the relations between regulators and the Army are strained as the trust in the Army's ability to keep its work had been degraded. The public and Congress have doubts about the Army's competence and commitment to environmental stewardship. The final scenario has the Army at loggerheads with the public and Congress. The Army is considered untrustworthy and incompetent, which adversely impacts progress toward fielding the objective force.

METHODOLOGY

The methodology employed to develop the future scenarios used in this paper is a modified version of Taylor's,[29] who is the author of the popular text on alternate world scenarios development and usage. The scenarios address two time periods, at ten and twenty five years out. These periods allow for scenario development in the long-range planning time frame, plus a mid-point to this long-range time frame. Serendipitously, these points in time are quite close to the planned fielding of the first objective force brigade and the complete transformation of the Army to the objective force, which are October 2010 and October 2030 respectively.[30] These time periods allow for an assessment of evolutionary changes in technology and environmental regulations and practices.

Alternative scenarios were then developed for these time periods. For example, one could postulate that engine efficiency will increase by 1% on average in one scenario. Therefore the 2011 engine would be 11.5% more efficient than today's, and the 2026 engine would be about 30% more efficient. The scenario could also include a reduction in vehicle weight over that time period, which would further improve fuel economy. For a purely hypothetical example, say the scenario postulated that given weight reduction and fuel efficiency, the 2011 vehicle would require 14% less fuel than today's vehicle for equivalent operations, and the 2026 vehicle would require 40% less fuel. This scenario could also mean

that maintaining the same training tempo in 2026 would cause a significant reduction in carbon dioxide from any vehicle compared with today's emissions. Similarly, scenarios could be developed regarding vehicle weight, land use restrictions, public perceptions and combinations thereof. In summary, as outlined in Taylor's book:

> Scenarios...are narratives or outlines that depict preselected future environments at some near or far-off time. They largely consist of knowable things, conditions and situations in new relationships that when projected into the future evokes new concepts and ideas about change. Although scenarios are neither predictions, nor forecasts in themselves, they define future environments and provide insight that allows today's planners, policy makers or decisonmakers to influence the future. Scenarios are generally semiqualitative (*sic*) or qualitative and judgmental.[31]

Environmental Criteria

There are several environmental practices, trends, and policies that will be common to multiple scenarios used in this paper. The ones used in this paper are the maturity of existing laws, water concerns, lubricants, and incentivizing productive proactive behavior.

Environmental laws are fairly mature in the United States. Although new laws may be expected, they will not change the fundamental structure in existence today.[32]

Water availability is becoming a greater concern. A recent report by the Central Intelligence Agency shows that water availability per capita in the United States will decrease from 10,000-20,000 m^3/year to a range of 5,000-10,000 m^3/year between 2000 and 2015.[33] Even in the water "rich" eastern United States, water issues are becoming more prominent, as wildlife, sporting uses, agricultural, industrial and municipal needs work to develop appropriate and equitable allocations of water usage.[34,35] One way water usage on U.S. installations can be better managed is by installing graywater systems. Graywater is water from showers, baths, bathroom sinks, and drinking fountains. It contains a minimum amount of contamination and, with minimal processing, can be used again for non-potable applications.[36] A graywater system can be installed on existing facilities, and designed to allow for growth of water sources to the system as base infrastructure is improved and modernized. The water recovered can be used for maintaining base landscaping (lawns or flowerbeds); special services facilities such as golf courses, vehicle cleaning, and similar projects. This will minimize the use of potable processed water and can cut down on sewer fees and wastewater treatment costs.

Lubricant use and disposal is an area ripe for management by the Army. On a typical automobile engine the oil change requirements are driven more by the breakdown of essential additives than on breakdown of the base lubricant.[37] It would make great strides in waste

minimization to be able to process used motor oils to remove acids, particulates etc, and refresh the additives rather than dispose of the oil (whether or not the used oil was used in heating oil application upon disposal). For this paper this process will be called "refreshing". Currently approximately 14% of the oil in the U.S. undergoes refreshing, called re-refining in the industry[38]. Either federal personnel, or contractors operating a facility on federal property could do the oil refreshing on Army installations. A field deployable oil-refreshing unit could be developed. This would allow for restoration of the oil in combat situations, reducing the lubricants required to be transported and protected in the logistics tail.

Over the past several years, as organizations have become used to environmental planning and regulation, there is a trend away from a purely "stick" approach - that is fines and legal action to enforce compliance to adding the carrot - incentives for environmental compliance.[39] The Army can make a conscious effort to incentivize all life cycle stages, from R&D through procurement and disposal with a focus on environmental stewardship. To do this will require political will and fiscal allocations, because often environmental costs are not obvious and don't come due until the next guy's watch. From the program manager who must convince the Army leadership to Congress, all parties must be onboard. It takes good logical explanations and political will to provide the up front funding. Installation commanders can fence funds to provide for incentive awards to personnel who make environmental operational goals. The Army as a whole must provide the top-level management and leadership to empower these and other incentives. This could include cash awards to soldiers, civil servants and contractor personnel. The military is very aware of incentives to excellence by soldiers in the existing awards and medals programs, so this extension is not a giant leap of faith, but will require leadership from the top levels.

SCENARIOS

Now that you have an understanding of the environmental issues and common environmental characteristics applicable to transformation scenarios, the paper will formally introduce the four scenarios. After identifying the scenarios, the paper will provide a preliminary analysis as the to the plausibility of each scenario and summarize the scenario's impact to the Army Transformation effort.

These scenarios all include the common characteristics given above. Mature environmental laws are in place with no fundamental changes in the laws during the 25 years. Water management is addressed from early on and throughout the scenarios' time frame of 25 years. R&D and procurement are focused to reduce the usage of lubricants and fuel. All levels

of the Army are incentivized to set and meet environmental goals (although the effectiveness of this will change among the scenarios).

Scenario One – Minor Evolutionary Changes

By 2011 the citizens of the United States have become accustomed to the existing federal and state regulatory systems that have been in place starting in the 1960s through the early 2000s. Regulators, the regulated, citizens groups and communities have a good understanding of the processes under the regulations for identifying and dealing with environmental issues and concerns. No one group is especially powerful in the relationships as to be able to ignore the needs and concerns of any other group. There is in a sense a "balance of power" among the players. Court challenges and new laws introduce only minor changes in the balance of power, and no fundamental changes in laws, standards or regulations occur. Continuing evolutionary progress in reducing the need for hazardous materials in procurement, unit operations and base operations have cut the need for hazardous waste disposal. This has resulted in savings from both procurement and O&M accounts, which modestly help accelerate the Army transformation efforts. The senior Army leadership, in conjunction with Congressional leadership, sees the wisdom in returning some of these savings to incentive programs at the base, Corps and procurement project level. The Army is working with the American Petroleum Institute to develop better, longer-lasting lubricants that will reduce the amount of lubricant used and improve its ability to be refreshed.

By 2026 these incentive programs have resulted in innovative local and national projects that have further reduced waste disposal costs significantly. The introduction of graywater treatment systems have reduced water usage on arid Army posts by 20% and have reduced infrastructure demands for water in heavily populated areas by 15%. These accomplishments have earned base commanders the accolades of the local communities, with an ensuing goodwill and trust that the Army cares about the local community. Army efforts at used lubricant refreshing allows for a 60% reduction of lubricant costs as compared to the baseline year of 2015 when the project was introduced and 2020 when it reached full operational capability. Logisticians estimate the field deployable oil-refreshing unit will reduce lubricating oil that must be brought in theater for a Brigade Combat Team by 35%.

This scenario provides minimum efforts to Army planners to implement. It is primarily a continuation of doing business as done today. Key to the scenario is the requirement for senior Army leadership to provide incentives for meeting environmental requirements, for developing innovative ways of doing business, and for achieving environmental excellence. This will

require word, funds and deeds by senior leaders. This is already the Army policy[40] but will of course continue to require senior leadership attention and commitment to continue.

This scenario is considered the most plausible of the four scenarios presented. It is advantageous to transformation. It assumes current trends and opinions continue with minor positive evolution over the time frame of the scenario. No revolutionary technological advances are required for this scenario.[41]

Scenario Two – Minor Regulatory Changes, Accelerated Technology Advancement

This scenario builds on scenario one. As in scenario one, the Army's proactive and involved environmental management has earned it the trust and goodwill of the local communities, state and federal regulators, and the Congress. The evolutionary changes in technology allowing the Army to reduce water and lubricating oil requirements occurred in basically the same time frames. Our national leadership recognizes the Army transformation efforts as a promising vehicle to marry with innovations in technology to improve fuel efficiency, alternate fuels vehicle development, and improvements in other manufacturing processes. Consequently significant R&D program funding is made available starting in POM 2004 and continuing through POM 2019 for programs to improve the Army's environmental posture.

The first fruits of this R&D program are an improvement of fuel efficiency for the Brigade Combat Team (BCT) family of vehicles by 15% for vehicles purchased after 2011. This has the advantage of reducing the logistics tail, improving the reach of the vehicles before refueling is needed and minimizing emissions to the atmosphere. For a given level of training of a BCT, the reduction of emissions is significant, thereby reducing the environmental impact of training.

By 2020 the pre-production model of the multi-fuel vehicle engine is tested. It can run on traditional engine fuels (diesel and gasoline) as well as natural gas and hydrogen. The vehicles produced in 2026 and beyond will use this engine. Also the vehicles will no longer need lead-acid batteries, using hydrogen fuel cells instead. The fuel cell "batteries" are back fit into the entire BCT fleet. The issues related to disposal and management of lead acid batteries are now a thing of the past.

To improve the survivability of the BCT, while maintaining the required mobility and transportability, low observable technology is a critical enabling technology. The Army places R&D funds into developing the low observable, or stealth, coating for tanks and other vehicles. A development goal is to have the production of the stealth coatings involve the absolute minimum of hazardous materials and insignificant levels of hazardous waste. Additionally the coatings themselves will be environmentally benign in field usage. This would include the

application of repair coatings and ensuring any pieces which come loose are non-toxic to people and animals. This effort is successful, and by 2026 all BCT vehicles have this environmentally benign low observable coating applied.

Research programs in propellant development provide a "cleaner" smoke from bullets and artillery rounds, which is totally non-toxic and leaves little residue. Program managers are encouraged and enabled to look at the entire life cycle of programs, including demilitarization, and develop production facilities that have no hazardous components for cleanup at end of facility life. All weapons systems are designed for ultimate demilitarization and disposal if not used in training or battle. This design ensures minimal hazardous waste generation during the demilitarization activities including ultimate disposal or reuse of components and chemicals.

R&D focused on communications and simulation results in significant improvements in live training. Battalions can train as a brigade while actually geographically separated by means of a virtual battlefield, which makes distant training sites appear as co-located as far as each battalion is concerned. The simulation is robust enough that the command centers and communications appear to be near each other, even though perhaps states apart. Each battalion "sees" its colleagues on a display as nearby. Their own geography is represented as is on computer displays. These displays are compatible with maps and charts. However, the simulation translates the display to other battalions in the BCT to appear co-located with them. For example, one battalion may be training in Texas. It will see the other battalions as if at the same place, even though they may be training in Washington an Alaska. Similarly, those battalions will see each of the other two as if with them. This system will allow the more dispersed battalions to train on limited land, and perhaps impact training land less by reducing training density.

This scenario requires Army planners to ensure R&D funding, and more proactive approach to environmental planning early on in procurement and doctrine. As in the first scenario, the Army senior leadership must be committed - funding and processes are essential for this scenario to be feasible.

This scenario is considered plausible. It is considered third in likelihood of the four scenarios if status quo is maintained. The impact of this scenario is profoundly advantageous for transformation. It assumes current trends and opinions continue with minor evolution over the time frame of the scenario. Some revolutionary technological advances are required for this scenario. If the recommendations provided later in the paper are followed, it will become the most probable scenario

Scenario Three – Adverse Regulatory and Public Tone

In this scenario the regulatory participants and the public are dissatisfied with the Army's commitment to environmental excellence, due to the Army's repeated failure to meet environmental commitments and the public's perception of continual stonewalling on environmental issues by the Army. This is manifest in more difficultly in permitting for new facilities and in renewal or modification of permitting of existing facilities. Introduction of new systems is complicated by public demand for more significant improvements in environmental factors from more environmentally benign paints to greatly improved fuel efficiency. Public meetings, such as Restoration Advisory Boards and public outreach meetings, during the development of environmental impact statements (EIS) are adversarial as the norm. Groups who are opposed to national defense spending (and perhaps foreign governments) take advantage of this climate to cause procedural delays in implementing the Brigade Combat Teams. Congressional support is lessened due to the perceived slowness in how the Army addresses environmental concerns and the perceived difficulty of managing appropriated funds. This lessened support translates to more restrictive funding, and congressional micromanagement of the Army budget. All of this occurs within the framework of existing environmental laws.

To ameliorate public discontent, Army leadership provides extensive R&D funding (similar to scenario two) to "green" the Army. Public outreach, advertisement and base/community relations become a priority for senior leadership. After a period of years, the tone mutes somewhat. The public is beginning to respect the Army's environmental commitment, but trust is still tenuous.

Due to programmatic delays caused by this contentious atmosphere, the initial operational capability (IOC) and full operational capability (FOC) of the more efficient engines and the subsequent multi-fuel engine are delayed five years each. This is caused in part by Congress reducing funding and providing additional reporting and approval criteria in the appropriations or authorizations legislation. Also any NEPA decisions are more time-consuming, since the public mistrust of the Army requires more time to be spent to resolve issues and address the public's concerns.

This scenario provides greater challenges for Army planners and policy makers. The recovery of public trust, once lost, is a long and painful process. People will naturally remember how they were betrayed (or feel betrayed) longer and with more passion than they remember the (perhaps long-term) good relationships - the classic "what have you done for me lately?" situation.

This scenario is considered plausible. It is the second most likely scenario unless the reports recommendations are followed. The impact of this scenario is deleterious to the transformation efforts. The public good will we predominantly enjoy in the Army today could be easily lost if we lose senior management commitment to critical elements of success of the Army Environmental Strategy.[42] The public and other stakeholders will not accept poor leadership in the environmental arena. There is already a degree of distrust between the Army and local citizens' groups.

Scenario Four-Hostile Regulatory and Intervener Attitude

In this scenario the regulators and intervener groups have gone beyond distrust to openly hostile confrontations on all issues. The pace of Transformation is severely impeded. Training on existing federal lands is being challenged by creative use of existing laws and regulations. This occurs both in the regulatory agencies and in the courts. Although the Army has a strong case to continue transformation and training, the procedural delays are having a noticeable impact on readiness, morale and retention. Congressional and executive branch confidence in the Army's leadership wanes due to readiness problems.

As in scenario three, funds that would have supported the transformation are diverted, now to improving basic and advanced training, retention and public outreach. The R&D needed to support enhanced engines is severely curtailed. Base infrastructure is allowed to deteriorate further as band-aid fixes are applied due to repeated failure of existing sewer and water systems. This lack of improvement further alienates the regulators, interveners, the public and congress. Due to senior leadership attention being focused on the operational shortfalls of the Army, environmental issues take a further back seat, suffering insufficient command attention and funding.

The challenge to policy makers in this scenario is to ensure it never happens. The consequences are so dire that early indicators must be developed and used to keep the public trust, the confidence of the local and state governments and at least reluctant acceptance by interveners. Senior leadership in deed not just word is essential.

This scenario is considered implausible. The deterioration of relationships and the hostile environment should be recognizable before it reaches this point, and senior leadership will address the deterioration. An attitude of openness, and addressing environmental issues early on should preclude this scenario completely.

RECOMMENDATIONS

Based on the scenarios and implied operational impacts, these conclusions are provided. They focus on answering "what can be done now to maximize fielding the BCT in an environmentally responsible manner?" and "how does the Army ensure the public is aware of these efforts and agrees with them?"

ADDRESS LIFE CYCLE COSTS, NOT SIMPLY PROCUREMENT COSTS

To make fundamental improvements in any technology is expensive. Initial costs may be high. However, the life cycle cost is what must be managed. It is not trivial to convince Congress and DoD to look at the costs beyond a given fiscal year or the future years defense plan (FYDP), let alone within the 30+/- year life cycle of a system. Program managers already address life cycle costs in their plans, but disposal costs, and even O&M are rarely given anywhere near the consideration of the procurement cost. Since the other costs are spread over many years, but procurement over a short period, thus it appears huge in relation to other aspects of life cycle cost. By soliciting the assistance of contractors, environmental interest groups and concerned legislators, the Army may be able to refocus the attention from short-term costs to life-cycle costs. This could enable R&D funding for environmental-related improvements from waste minimization, new fuel technology, environmentally benign coatings, etc. Demilitarization considerations of weapons must also be addressed. This will assure we don't have issues of large stockpiles of unstable aged munitions awaiting disposal because the disposal path was never addressed up front (issues we have in both chemical and nuclear weapons today).

PROVIDE FUNDING FOR ENVIRONMENTALLY RELATED TECHNOLOGY

The Army is not alone in pursuing the goal of environmentally friendly technology. We could partner with other government agencies (for example Energy Department for alternative fuel engines) and industry (again, an efficient alternative fuel engine with a good range could be commercially viable and would get car manufactures attention). These types of partnerships could significantly leverage the Army's R&D funds to see rapid incremental progress toward our goals. This said, it is still important for a degree of R&D supporting the BCT to address environmental concerns. This will ensure the Army stays ahead of regulatory drivers, is a leader in environmental stewardship, and grows in the esteem of the public. Some areas the Army would have to be the sole provider of R&D, such areas would include more benign propellants for projectiles, low observable vehicle material and coatings, and battlefield

simulation. Alternative fuel engines should be developed. Partner with other federal agencies and manufacturers to bring this technology to birth in time to be used by objective force assets.

DEVELOP WAYS TO PROACTIVELY REDUCE NET USEAGE OF WATER AND PETROLEUM PRODUCTS

As noted in the scenarios, graywater systems can provide a significant payback to the Army in the out years as water issues become more apparent. Early management of this issue can pay large dividends by 2026. The Army should begin addressing graywater management in its base operations and improvement projects.

The Army needs to conduct oil recovery and refreshing on post, either by contracting or by government provided service. Pilot programs could be initiated immediately on small, medium and large posts to assess how this will work and to refine the methodology used. In the near term oil refreshing could be a standard practice on all Army bases.

ENHANCE PUBLIC OUTREACH

The Army needs to increase outreach to the local community, local and national interest groups and news organizations. This will ensure that people will know what the Army is doing and that the Army is a responsible neighbor. It will put the Army's actions in a good light, and ensure the public does not think the Army is trying to hide things. Surprise is worse than bad news. Public confidence will be maintained or improved and trust will increase.

SUMMARY

If the recommendations given above are followed the probability of scenario two, the most advantageous to transformation, is increased. The probability of scenario three, which is deleterious to the transformation, is reduced. In short, this is because the Army will have the public confident that it is an environmentally responsible organization. The advances in technology will be properly focused to not only improve the military mission, but to also reduce the environmental consequences of keeping and employing the Army.

SCENARIO	LIKELIHOOD	IMPACT ON TRANSFORMATION	LIKELIHOOD IF RECOMMENDATIONS FOLLOWED
I	HIGH	↑	MEDIUM
II	LOW	↑↑	HIGH
III	MEDIUM	↓	LOW
IV	VERY LOW	↓↓	VERY LOW

Table 1. Likelihood And Impact On Transformation Of The Scenarios

CONCLUSION

This paper began by looking at the strategic need for transforming the Army and the reasons to address environmental concerns early in the transformation process. These reasons included current policies and regulations, results of past failures to address environmental planning early in the process, and public concerns.

Four futures scenarios were developed to show the possible settings under which transformation may occur. The three scenarios the author considered plausible involved differences in how the Army was perceived by the public, regulators and congress. The amount of progress toward more environmentally benign systems was impacted by public trust and R&D decisions made during the 25 years of the scenarios. Several opportunities and potential problems were presented in the scenarios.

Finally, four major recommendations were made. These are provided to the Army leadership for use in developing the Strategic Environmental Assessment, planning R&D expenditures, creating the objective force, and getting the word out. The first recommendation involves focusing on life cycle costs, not just short term-procurement cost. The second recommendation is to pursue technology that will minimize the environmental impact of Army training and operations. The third recommendation is to develop ways to proactively reduce petroleum products and water during training and operations. The fourth recommendation is to reach out to the public and ensure the Army is seen as responsible and trustworthy. Following the four recommendations will positively impact Army Transformation.

Word count: 6613

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