

Demilitarization — Reclamation vs. Destruction

Cold War Munitions Build-Up Creating Challenges for Program Managers

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With the close of World War II, the United States and the Soviet Union (now Russia) began a 44-year rivalry known as the Cold War. In their hopes of thwarting the other's ideology and increasing their respective influence, the two superpowers began stockpiling tactical missiles. Because the Cold War did not escalate into World War III, most of those missiles were never used.

Today, the end of service life for many of those missiles is rapidly approaching, and creating a challenge for program managers, who must find safe, cost-effective ways to demilitarize these weapons. Because of Foreign Military Sales (FMS) customers, this is a worldwide problem (Figure 1).

CCAWS Develops Plan

Life Cycle Cost (LCC) models are developed and used to support acquisition activities by Program Managers (PM) and acquisition executives, according to an article by Army Brig. Gen. Joseph L. Yakovac and Wesley L. Glasgow. Although they are well focused for development, acquisition, and deployment ownership cost, most LCC models do not include the cost to demilitarize assets. Yet, PMs' responsibilities truly encompass "cradle-to-grave" functions. The Close Combat Anti-Armor Weapon Sys-

tems (CCAWS) project office has recognized this challenge and developed a plan to reduce Tube-Launched Optically Tracked Wire-Guided (TOW) missile demilitarization cost — potentially to zero — with industrial partnerships. These costs will be comparable to Open Burn/Open Detonation (OB/OD) without incurring environmental liabilities.

Demilitarization — A Costly Battle

Demilitarization cost threatens force modernization objectives with signifi-

cant budgetary pressures. In August 1997, Dr. Kenneth J. Oscar, Acting Assistant Secretary of the Army (RDA) and Lt. Gen. Paul J. Kern, Military Deputy to the Assistant Secretary of the Army (RDA) challenged the Program Executive Officer (PEO) Tactical Missiles to develop a plan that reduces or eliminates demilitarization cost.

The Army has a compelling need to develop a cost-effective, environmentally safe alternative to OB/OD because within five years, the shelf life of over 80,000

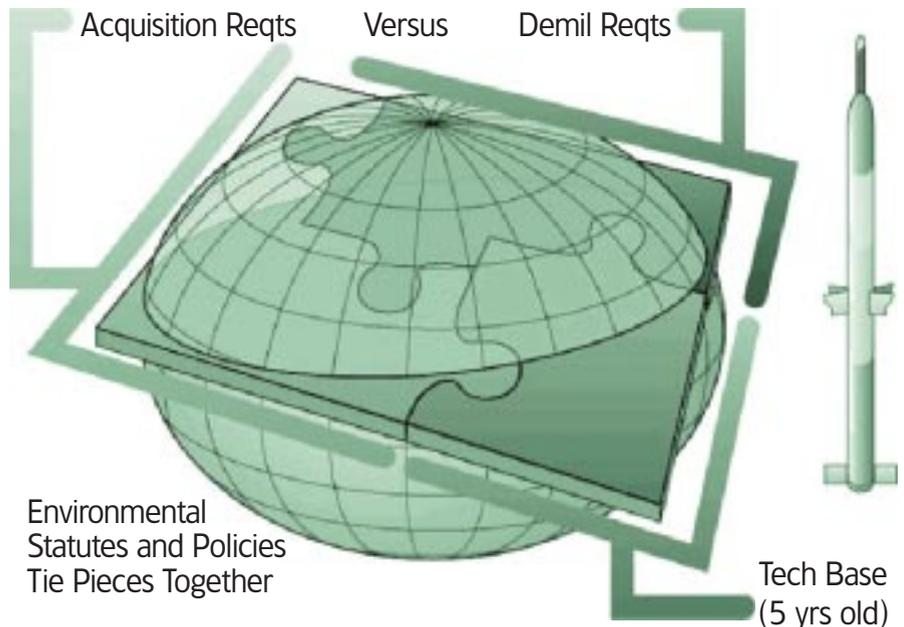


FIGURE 1. Worldwide Implications

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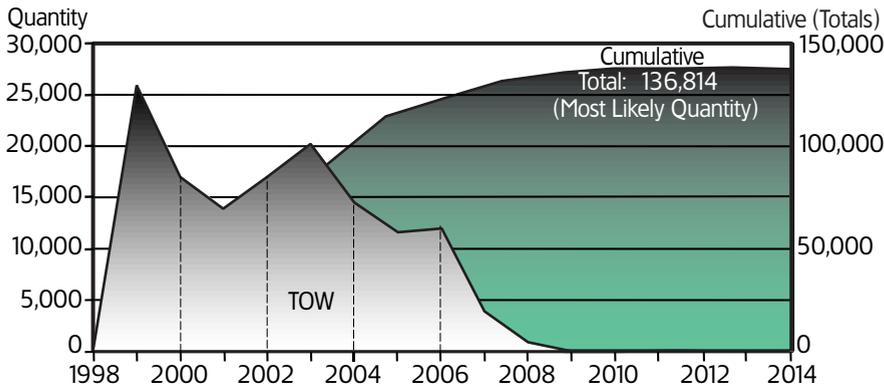


FIGURE 2. TOW Missile Demil Requirement

U.S.-owned TOW missiles will expire with others soon following. Due to potential environmental liabilities and compliance to criteria established in the new Munitions Rule Implementation Policy, the cost to demilitarize the Army's TOW inventory will most likely approach \$200 million. This is a worldwide problem because over 42 countries own TOW missiles.

The CCAWS project office developed discretionary initiatives (i.e., live fire training, or FMS "give aways") and incorporated Resource, Recovery, and Recycling (R3) technologies to reduce the cost to demilitarize TOW missiles. The discretionary initiatives can potentially reduce the quantity for demilitarization by approximately 10 to 20 percent. However, over 140,000 TOW missiles would remain. The R3 technologies can generate a revenue stream from the inherent value of energetics, electronics, and metallic components in the missile. Applying R3 technology will permit CCAWS to turn an unfunded bill into a revenue source.

Because of mature technologies that recover the high value of the energetics, TOW and Chaparral can now be demilitarized at a cost significantly less than OB/OD. We estimate the total cost for the TOW inventory to be less than \$24 million with a significant portion contributed by industrial investments. These technologies have been sponsored by the Joint Ordnance Commanders Group and managed by Jim Wheeler, Defense Ammunition Center (DAC). The Department of Energy (DOE) recycling technology for electronics, plastics, and precious metals at Oak Ridge, Tenn., will

be leveraged to increase recovery revenues. This path has great management and revenue potentials that can be developed economically in the near-term for emerging requirements. Clearly, demilitarization activities must be aggressively managed to maximize force modernization acquisitions.

Tactical missile demilitarization presents a formidable task to manage within the next decade and must be executed with zeal as new acquisitions compete for resources. Currently, OB/OD is encumbered with environmental constraints.

PMs' responsibilities truly encompass "cradle-to-grave" functions. The Close Combat Anti-Armor Weapon Systems (CCAWS) project office has recognized this challenge and developed a plan to reduce Tube-Launched Optically Tracked Wire-Guided (TOW) missile demilitarization cost — potentially to zero — with industrial partnerships.

$$D_{(mil)} = \{ Inv \} (-) \{ Tac_{(reqts)} \} (-) \{ Disc_{(init)} \}$$

- where:
- $D_{(mil)}$ = Demil Quantity
 - Inv = Inventory Quantity
 - $Tac_{(reqts)}$ = Tactical (+) Training (+)
Engineering Base (+)
Contingency Quantities
 - $Disc_{(init)}$ = Increased Training (+) FMS
"Give Aways" (+) Parts Reuse (+)
Contractor Sales Quantities

FIGURE 3. Demil Equation

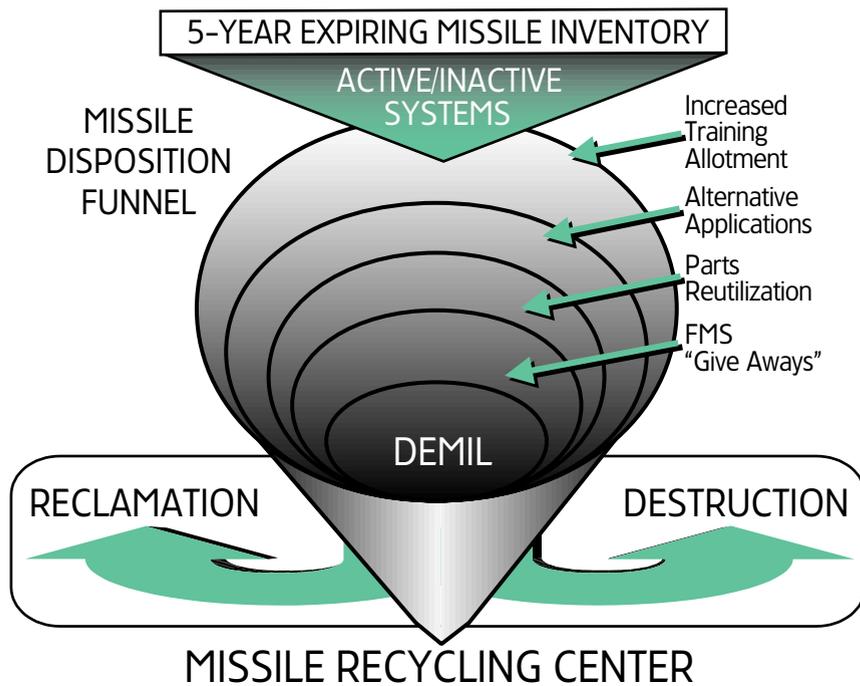


FIGURE 4. Initiatives to Minimize Demil Requirements

OB/OD will remain as an alternate course of action that needs continuation for unsafe munitions. However, environmentally safe methods that reclaim valuable materials are the “smart” way to execute demilitarization of our aging missile stockpiles.

Time Is Running Out

During the next 10 years, the shelf life of approximately 140,000 of U.S.-owned TOW missiles will expire (Figure 2).

During FY98, the PEO Tactical Missiles and the Aviation and Missile Command’s (AMCOM) Deputy for Systems Acquisition (DSA) jointly validated quantities for additional tactical missiles where requirements are excluded.

Program Manager’s Initiatives

In May 1998, the PM formally chartered an Integrated Product Team (IPT) to formulate alternatives to minimize TOW demilitarization cost. The IPT is comprised of representatives of PEO Tactical Missiles; AMCOM’s DSA; Missile Research, Development and Acquisition Center; DAC; Industrial Operation Command, including Anniston Army Depot (ANAD); and Test and Evaluation Command’s Redstone Technical Test Center. The IPT recommended four courses of action: Minimize the quantity for de-

militarization, utilize the maturing R3 technologies, accelerate OB/OD for the legacy missiles, and continue technology-based investments.

Discretionary initiatives are system-unique. This process should begin at least five years prior to the mean shelf-life expiration of the missiles. To date, these discretionary initiatives have reduced the demilitarization quantity 10 to 20 percent for TOW.

Increased training allotments were estimated and coordinated with the tactical user, resulting in strong support for ad-

ditional live firings. However, training needs, range availability, and support cost put a limit on the quantity that could be effectively used. Consideration was given to other alternative applications and reductions were made. FMS “give aways” contributed to the quantity reduction by offering old missiles for training. After identifying requirements for the PM initiatives, residuals became candidates for demilitarization (Figures 3 and 4).

This is a very complicated process because typically missiles are dispersed to numerous depots with mixed production lots. This approach was effective for TOW; however, its utility must be evaluated for other systems.

Proposed Path Forward

Demilitarization offers two options: destruction by OB/OD or reclamation. Destruction by OB/OD totally consumes the inherent value and offers nothing to the cost-reduction objective. This approach contains numerous liabilities: Subsequent real estate reclamation to ensure compliance with the Clean Air Act, Clean Water Act, and Toxic Substance Control Act (Figure 5) far exceeds the cost to execute OB/OD. Conversely, reclamation may not be economical.

R3 offers a revenue stream from the sale of piece parts and energy sources after processing for military and industrial applications. The most economic process is the reclamation of energetics from the

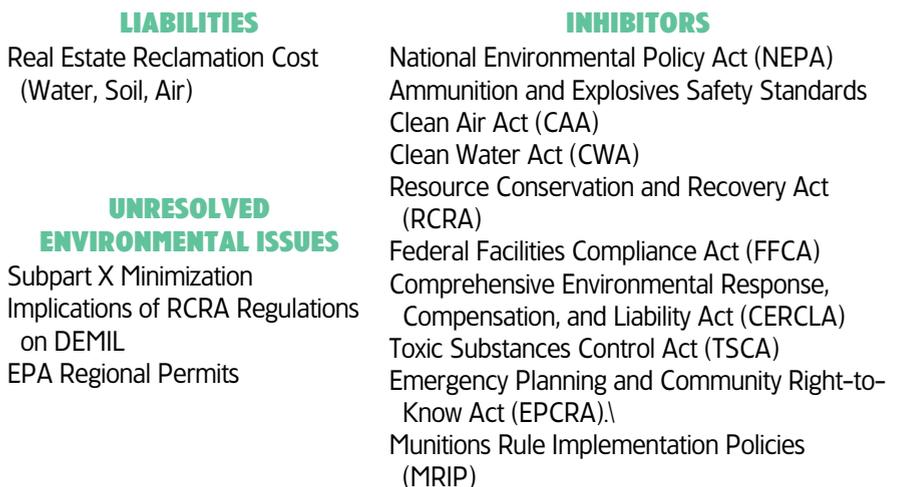


FIGURE 5. Environmental Considerations

propellant and warhead compositions. The 1.3 class of energetic sources typically contains nitroglycerine and nitrocellulose, which are low-value and are not economically viable for R3 considerations. Such can be found in Shillelagh, Dragon, and Nike Hercules, thus the need for OB/OD continues. The high-value, 1.1 class of energetics found in rocket motors and warheads economically warrants recovery. Non-recurring investments are needed for TOW to effect the economics of recycling TOW and Chaparral missiles were selected due to their age, quantity, and high-recovery value potential.

R3 technologies are being optimized for worldwide applications. The metal and automotive industries have already taken advantage of some of this technology by recycling to help recoup production losses. With its long-term history of recovering contaminated metals, DOE has established a pilot facility to recover precious metals and other products in the electronics industry, specifically to reclaim value of outdated personal computers (glass, metals, and plastics). Economics will mandate R3 activities in other industries as technologies are developed.

PEO Tactical Missiles and the DSA for AMCOM are proposing a missile recycling center at ANAD, consisting of four modules: disassembly, energetic recla-

mation, destruction, and processing (Figure 6). The missile will be delivered from the depot magazines to the disassembly module, where the high-value energetics and subsystems will be removed, segregated, and packaged to meet secondary market requirements. The energetics will then be shipped to the reclamation module. The warhead material (LX-14) will be separated, and the rocket motor propellant will be removed by dry machining or by ablation. These processes have been demonstrated as cost-effective, near-optimal techniques for recovery of energetics. A closed loop, liquid ammonia-based process will be used to extract and separate energetic ingredients. The destruction module will be used to expend squibs, safe and arm-

ing devices, and unsafe rocket motors. It also will contain an enclosed chamber such that unsafe warheads and explosive devices may be expended.

Recently, reclamation technology has shown some of its benefits by validating rocket motors and warheads. Upgrading the design of the pilot plant to an operational facility by using existing vessels and control equipment that exist in the chemical industry poses minimal risk. The engineering challenge will be to meet the throughput rate of 75 to 80 missiles per day (15,000 per year) for economic viability. The facility will be constructed with transportable modules and will accommodate emerging technologies. Technology is readily available

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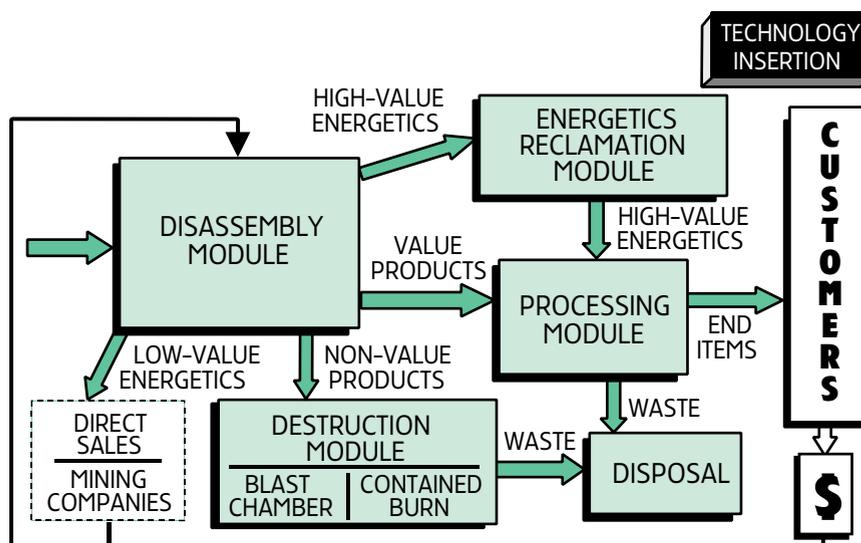


FIGURE 6. Missile Recycling Center

for the TOW missile; however, no “silver-bullet” exists for all tactical missiles.

Policy/Legislative Change Needed

Non-recurring investments (comparable to OB/OD) are needed for TOW demilitarization to preclude environmental liabilities. Revenue from the sale of recovered items will further reduce demilitarization cost.

Changes to policy and legislation will be needed to enhance the marketing and receipts from sales of materials. PMs need a readily available avenue to manage the revenue streams that will be derived from the sale of recovered products and precious metals.