

Contents

	<i>Page</i>
Chapter 1. Alternative Destruction Technologies-History and Summary	1
INTRODUCTION	1
SUMMARY AND FINDINGS	3
Opposition to the Army's Program	3
Approaches to Developing Technologies	4
Timing Questions	5
Risks of Developing Alternatives	6
Alternative Technologies	6
International Implications	10
CHAPTER 1 REFERENCES	11
Chapter 2. The Army's Chemical Weapons Disposal Program	13
THE U.S. ARMY'S CHEMICAL WEAPONS STOCKPILE	13
Geography and Distribution	13
History of Chemical Weapons Disposal	16
On-Site Destruction vs. Relocation of the CW Stockpile for Off-Site Destruction	17
Condition of the CW Stockpile-Potential of Increased Risk From CW Deterioration	17
DISPOSAL OF THE ARMY'S CW STOCKPILE	18
The Army's Demonstration Projects	18
DIFFICULTIES ENCOUNTERED BY THE CURRENT CW DISPOSAL PROGRAM	18
Local and National Opposition	18
Projected Program Schedule—Revised Deadlines	20
Cost Estimates—Cost Overruns	20
INTERNATIONAL IMPLICATIONS OF A SUCCESSFUL PROGRAM	20
ALTERNATIVE SCENARIOS FOR THE ARMY'S BASELINE PROJECT	22
CHAPTER REFERENCES	23
Chapter 3. Current Technology and Alternatives	25
CURRENT TECHNOLOGY	25
The Army's CW Disassembly and Incineration Technology	25
EXAMPLES OF ALTERNATIVE TECHNIQUES	25
Chemical Neutralization	26
Supercritical Water Oxidation	27
Steam Gasification	27
Plasma Arc Pyrolysis	27
Improved Interim Continued Storage-The CW Demilitarization Alternative	28
Alternatives Involving Transportation and Relocation of the CW Stockpile	28
CHAPTER REFERENCES	29
Appendix A. Selected Chemical Weapon Destruction Techniques	31
Appendix B. U.S. Army Risk Assessment for Off-Site Transportation of	
Chemical Weapons	36
Appendix C. Summary of the Chemical Weapons Workshop	39

Boxes

<i>Box</i>	<i>Page</i>
1-A. Federal Laws Addressing Chemical Weapons Disposal	2
1-B. State Authority Over the Siting, Construction, and Operation of Incinerators for Chemical Weapons Destruction	4

1-C. Condition of the M55 Rockets	7
1-D. Programs for the Promotion of Alternative Technologies for Hazardous Waste Destruction	9
2-A. Properties of chemical Weapons Agents	14
2-B. Some Regulatory Hurdles for CW Destruction	19

Figures

<i>Figure</i>	<i>Page</i>
1-1. M55 Rocket, Filled With Agent GB or VX	7
2-1. U.S. Chemical Weapons Stockpile Distribution	13
2-2. Structures of Chemical Weapons Nerve (Organophosphorus) and Blister (Mustard) Agents	15

Tables

<i>Table</i>	<i>Page</i>
1-1. Revised Programmatic Chemical Disposal Schedule	3
2-1. Characteristics of Chemical Agents	14
2-2. Physical Characteristics of Chemical Munitions	16
2-3. U.S. Chemical Weapons Disposal Program Implementation Schedule	21