

SDI: Technology, Survivability, and Software

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Foreword

In its 1985 report, *New Ballistic Missile Defense Technologies*, OTA attempted to place those technologies against a useful policy background for the Congress. While that report introduced the major subject areas of Strategic Defense Initiative research, the amount of detailed technical evaluation it could offer was limited. The chief limitations were the relative newness of the SDI program and the lack of specific BMD system architectures to examine. Since that report, the SDIO has conducted enough additional research and, in particular, identified a sufficiently specific system architecture that a more detailed OTA review of the relevant technologies should be helpful to Congress.

Public Law 99-190 (continuing appropriations for fiscal year 1986) called for the Office of Technology Assessment to conduct a ". . . comprehensive classified study . . . together with an unclassified version . . . to determine the technological feasibility and implications, and the ability to survive and function despite a preemptive attack by an aggressor possessing comparable technology, of the Strategic Defense Initiative Program." In addition, the accompanying Conference Report specified that ". . . "This study shall include an analysis of the feasibility of meeting SDI computer software requirements."

This unclassified report completes OTA's response to that mandate. It puts SDI technologies in context by reporting the kinds of ballistic missile defense (BMD) system architectures that the SDI organization has considered for "phased deployment." It reviews the status of the various SDI technologies and system components. It analyzes the feasibility of producing dependable software of the complexity that advanced BMD systems would require. Finally, it summarizes what is now known—and unknown—about the probable survivability of such systems against concerted enemy attacks of various kinds.

The study found that major uncertainties remain concerning the probable cost, effectiveness, and survivability of the kinds of BMD system (which rely on kinetic rather than directed-energy weapons) that might be deployable in the "phase-one" proposed for the mid to late 1990s. In addition, OTA believes several more years of SDI research would be needed to determine whether it is feasible to construct the kinds of directed-energy weapons contemplated as follow-ons to SDIO's "phase one" BMD system. The survivability of both short-term and longer-term BMD systems would depend heavily on the outcome of a continuing competition in weapons and countermeasures between the United States and the Soviet Union. Finally, developing dependable software for advanced BMD will be a formidable challenge because of the difficulty of testing that software realistically.

OTA gratefully thanks the hundreds of individuals whose contributions of time and effort helped make this report possible. OTA, of course, bears the final responsibility for the contents of the report.


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NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the Advisory Panel members. The views expressed in this OTA report, however, are the sole responsibility of the Office of Technology Assessment. Participation on the Advisory Panel does not imply endorsement of the report.

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Workshop on SDI Software, January 1987

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