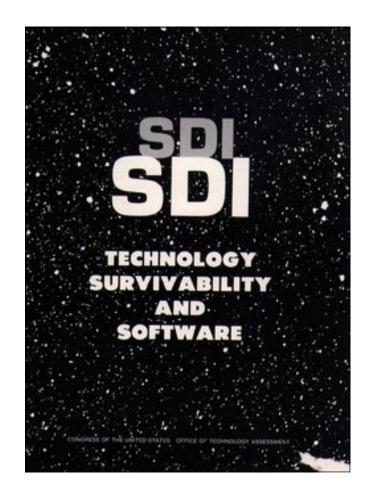
SDI: Technology, Survivability, and Software May 1988

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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.

JOHN H. GIBBONS

Director

Advisory Panel on SDI: Technology, Survivability, and Software

H. Guyford Stever, *Chairman*Foreign Secretary, National Academy of Engineering

Robert Clem

Director of Systems Sciences Sandia National Laboratories

Malcolm Currie

Executive Vice President Hughes Aircraft Company

Gerald P. Dinneen

Corporate Vice President for Science &

Technology Honeywell, Inc. Peter Franken Professor

Optical Sciences Center University of Arizona

John Gardner

Vice President for Engineering &

Operations

McDonnell Douglas Astronautics Co.

Richard L. Garwin

IBM fellow

IBM T. J. Watson Research Center

O'Dean Judd1

Chief Scientist for Defense Research &

Applications

Los Alamos National Laboratory

Michael M. May

Associate Director at Large

Lawrence Livermore National Laboratory

Stephen Meyer Associate Professor

Center for International Studies

Massachusetts Institute of Technology

David Parnas

Department of Computing and Information

Science

Queens University

Charles Seitz Professor

Computer Sciences

California Institute of Technology

John Shore Director

Washington Research Lab Entropic Processing, Inc.

Jeremiah D. Sullivan

Professor

Department of Physics University of Illinois

Samuel Tennant Vice President

The Aerospace Corporation

Victor Vyssotsky

Director

Cambridge Research Laboratory Digital Equipment Corporation

Gerold Yonas Vice President

The Titan Corporation

Charles A. Zraket

President

The MITRE Corporation

Invited Observer: Chief Scientist

Strategic Defense Initiative Organization

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^{&#}x27;Currently, Chief Scientist, Strategic Defense Initiative Organization.

OTA Project Staff—SDI: Technology, Survivability, and Software

Lionel S. Johns, Assistant Director, OTA Energy, Materials, and International Security Division

Peter Sharfman, International Security and Commerce Program Manager

Thomas H. Karas, Project Director

Anthony Fainberg
C. E. "Sandy" Thomas
David Weiss

Administrative Staff

Jannie Coles Cecile Parker Jackie Robinson

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Nichols Research

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Aerospace Corporation American Physical Society, AT&T Bell Laboratories Avco Systems/Textron **Boeing** Booz-Allen & Hamilton Ford Aerospace and Communications General Research Corporation **Hughes Aircraft Company** Lawrence Livermore National Laboratory Lockheed Missiles & Space Company Los Alamos National Laboratory LTV Martin-Marietta McDonnell-Douglas M.I.T. Lincoln Laboratory MITRE Corporation

Rockwell International SAIC Sandia National Laboratory **Sparta** Strategic Defense Initiative Organization **System Planning Corporation** TŘW University of Texas, Center for Electromechanical Engineering U.S. Air Force Electronic Systems Division U.S. Air Force Space Division U.S. Air Force Weapons Laboratory U.S. Army Strategic Defense Command U.S. Naval Research Laboratory U.S. Naval Sea Systems Command W. J. Schafer & Associates

Westinghouse Marine Division

Workshop on Soviet Response to SDI, January 1987

Sidney Graybeal, *Chairman*Vice President, System Planning
Corporation

Alex Gliksman, *Convener/Rapporteur* Consultant

Arthur Alexander The RAND Corporation

Mark M. Lowenthal Director, INR/SFA US Department of State

Arthur F. Manfredi, Jr. Assistant National Intelligence Officer Central Intelligence Agency

John A. Martens ITA/Office of Foreign Availability U.S. Department of Commerce

Stephen Meyer Professor Center for International Studies Massachusetts Institute of Technology Robert Nurick

Co-Director RAND-UCLA, Soviet Studies Center

The RAND Corporation

Sayre Stevens

President, System Planning Corporation

Keith Taggart¹

Assistant Director/Countermeasures Strategic Defense Initiative Organization U.S. Department of Defense

Robert D. Turnacliff

Principal Director, Threat Analysis Office

The Aerospace Corporation

Vann H. Van Diepen

INR/SFA

U.S. Department of State

'Currently with SAIC, Inc.

Workshop on SDI Software, January 1987

Larry Druffel, Chairman Director, Software Engineering Institute Carnegie-Mellon University

Speakers

William Ainsley Logicon, Inc.

Mack Alford Senior Software Scientist General Electric Corporation

Karl Dahlke Technical Staff AT&T Bell Laboratories

Discussants

Bruce Arden Dean of Engineering & Applied Science University of Rochester

Richard Kemmerer Department of Computer Science University of California, Santa Barbara Butler Lampson Corporate Consulting Engineer Digital Equipment Corporation

Brian Reid Consulting Engineer Digital Equipment Corporation

Panelists

David Parnas
Professor
Department of Computing and Information
Science
Queens University

John Shore Director, Washington Research Lab Entropic Processing, Inc.

Victor Vyssotsky Director, Cambridge Research Laboratory Digital Equipment Corporation