

DEFENSE AND ARMS CONTROL STUDIES
PROGRAM

ANNUAL REPORT

ACADEMIC YEAR 1986-1987

Defense and Arms Control Studies Program
Center for International Studies
MASSACHUSETTS INSTITUTE OF TECHNOLOGY



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DIRECTOR'S OVERVIEW

The Defense and Arms Control Program continues to reflect MIT's priorities in education, research and public service. Our primary raison d'etre is the education of graduate students. The program serves faculty and students as a locus for research and analysis of relevant technical, strategic, and political aspects of vital national and international security questions. Our public service outreach activities provide analyses for policy makers, educators, journalists, and the general public who want to participate in the political process affecting national security.

In the past year, the technical potential and strategic role of nuclear defense systems again occupied center stage nationally and internationally. Quite naturally, the national interest in SDI has been reflected in the activities of the DACS program. We believe such close attention is warranted since the controversy and debate about strategic defense involves fundamental national policy issues and perceptions of the dynamics of US and Soviet strategic programs.

The Defense and Arms Control Studies Program has also been affected by glasnost, which has increased the level of candor that we find in our discussions with Soviet defense specialists. In time, this may provide US analysts, including our own Soviet Security Studies group, with new insights into Soviet thinking and activities in the defense area. Although significant studies have been done using currently available data, the prospect of improved information from the Soviet Union is exciting.

If indeed an INF agreement is ratified and we see the total elimination of a class of nuclear weapons, then the conventional military balance in Europe and the possibility for negotiated limits on conventional weapons become much more important subjects for study and analysis. The military, political, and economic issues involved here are far more complex than those involved in the nuclear balance. We are fortunate to have Prof. Barry Posen, who is particularly interested in conventional weapons issues, as a new member of our tenured faculty. He will be teaching in this area at MIT starting with the 1987-88 academic year, and will also continue his research on conventional force modelling.

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I am pleased with the work accomplished by the faculty members and staff of the program in this past year. We also have the benefit of excellent graduate students who, we are confident, will make significant contributions to the field of defense and arms control.

Finally, the support of the Carnegie Corporation, the Hewlett Foundation, and the Ford Foundation has been essential for our current work. We continue, however, to seek stable, long-term funding to facilitate planning for doctoral student and faculty research.

JACK RUINA
Professor of Electrical Engineering
Director, Defense and Arms Control
Studies Program

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ADMINISTRATION AND FINANCIAL SUPPORT

The Defense and Arms Control Studies Program is part of the MIT Center for International Studies, a research center in the School of Humanities and Social Sciences. Its core funding in fiscal year 1986-87 was provided by MIT, the Carnegie Corporation of New York, the William and Flora Hewlett Foundation, and the Ford Foundation. Specific projects were funded by the Alfred P. Sloan, Jr., Foundation, and the Department of Defense.

ASSOCIATED FACULTY AND STAFF (November 1987)

Faculty

William E. Griffith, Professor of Political Science.
Stephen M. Meyer, Associate Professor of Political Science.
Marvin M. Miller, Senior Research Scientist, Ctr for International Studies and Department of Nuclear Engineering.
Steven E. Miller, Lecturer in Political Science.
Barry R. Posen, Associate Professor of Political Science.
(On leave, 1986-1987.)
George W. Rathjens, Professor of Political Science.
Jack Ruina, Professor of Electrical Engineering and Director, Defense and Arms Control Studies Program.
Harvey Sapolsky, Professor of Public Policy and Organization.
Eugene Skolnikoff, Professor of Political Science and Director, MIT Center for International Studies.

Research Staff

William Durch, Research Associate
Lynn Eden, Visiting Scholar
Charles Glaser, Research Associate
Herbert Lin, Post-doctoral Fellow
Edward Linenthal, Visiting Scholar
Christopher Paine, Visiting Scholar
Don Rakestraw, Colonel, U.S. Air Force Research Associate
Marc Trachtenberg, Visiting Scholar

Administrative and Support Staff

Amelia Leiss, Assistant Director, Center for International Studies
Frances Stefan Scanlon, Research Administrator
Patricia Allaire, Administrative Assistant
Natalie Weinberger, Administrative Assistant

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RESEARCH PROGRAM

Collaborative Research

The Navy and Nuclear War

Charles Glaser and Steven Miller continued to coordinate the work of several expert contributors to this pathbreaking study of the history, doctrine and operation of naval nuclear weapons. Work in progress covers the origins and evolution of the nuclear Navy; U.S. and Soviet naval missions and capabilities; evaluations of conventional naval operations (including offensive and defensive sea control, strategic ASW, and power projection) in the context of a superpower war; the risks of nuclear escalation growing out of such operations; assessments of the role of nuclear weapons in accomplishing certain naval missions; and the implications of limited nuclear weapons use for wartime naval missions. The study is scheduled for completion in early 1988 and has been accepted for publication by Cornell University Press.

Soviet Security Studies Working Group

The working group is a research project directed by Professor Meyer and staffed by post-doctoral and graduate research associates. Its principal focus is the study of Soviet military and arms control policies, with particular attention devoted to such topics as: defense decision making, force planning and analysis, threat forecasting and analysis, military technology programs, and military economics. The Working Group meets weekly to discuss ongoing work. It maintains an extensive collection of original Soviet source materials. This year, under contract to the Office of Net Assessment in the Department of Defense, the working group analyzed Soviet assessments of the military balance (or "correlation of forces") and the NATO alliance, and the relationship between Soviet military assessments and Soviet military doctrine.

Small Intercontinental Ballistic Missile (SICBM) Study

Professor Ruina and Scott Berg continued their investigation of the technical, economic, and strategic implications of the SICBM, popularly known as "Midgetman," with the writing of the final project report. Midgetman presents new command, control and communications problems for the U.S. Air Force. Providing security for hundreds of nuclear warheads, on mobile launchers dispersed over thousands of square miles, will be a challenge. The system will be the costliest strategic system, per operational warhead, ever developed by the United States. That anticipated cost led to pressure for

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multiple warheads ("MIRVs"), which would increase its weight and restrict its mobility. The missile's twin attractions, however, have been its mobility (which would reduce its vulnerability to attack) and its single warhead (which some see as a step toward desirable "deMIRVing" of strategic arsenals). Decisions on size, payload, and basing mode remain to be made, but it is precisely these characteristics which would make this weapon the most expensive strategic system, per warhead, in the U.S. inventory. Most important it is not clear that this system will ever be produced for deployment.

Individual Research Activities

William Durch continued research on the desirability and feasibility of continued restraints on U.S. and Soviet missile defense programs. An Adelphi paper and a book on that subject neared completion.

Charles Glaser worked on a book about nuclear weapons theory and policy and on issues related to the concept of a "transition" from an offense-dominant to a defense-dominant strategic posture. He co-chaired the project on the Navy and Nuclear War.

Herbert Lin completed his analysis of the software requirements of strategic defense; authored a lengthy study of technical problems facing the ABM Treaty; and completed work on the impact of new technologies on strategic nuclear command, control and communications. Dr. Lin began work on a technical assessment of verification issues relating to nuclear sea-launched cruise missiles; and on the theater land-attack capabilities of the U.S. Navy.

Stephen Meyer completed research on possible Soviet responses to the American Strategic Defense Initiative, and also completed a study of Soviet nuclear operations and command and control for inclusion in a book on the management of nuclear operations. He continued research on his own book on defense economics in the USSR.

Steven Miller continued his work on political constraints on the pursuit and achievement of arms control agreements. He edited a book on conventional forces, and wrote on the relationship of arms control and strategic defense, and on security issues pertaining to NATO's northern flank.

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George Rathjens completed a study of the Strategic Defense Initiative and arms control, and continued work on the nature and utility of deterrence theory, and on the avoidance of nuclear war.

Jack Ruina wrote and spoke widely on strategic defense systems and the technologies of arms control verification.

Harvey Sapolsky completed a study of defense procurement policy, and worked on a history of the Office of Naval Research, and a comparison of U.S. government procurement policies in the defense and health fields.

Don Rakestraw completed a study of U.S. dependency on foreign sources of strategic minerals.

Graduate Student Research Interests

Peter Almquist	Policy Influence of Soviet Military Industry
Jorg Baldauf	Military Decision-Making in the United States and the Federal Republic of Germany
Scott Berg	Technology and Strategic Implications of the Small Intercontinental Ballistic Missile
John Brown	Conflict and Cooperation in NATO
Marco Carnovale	NATO Nuclear Command and Control
Jeffrey Checkel	Soviet Foreign Policy Decision Making
Dean Cheng	Northeast Asian Security Issues
Owen Cote	Nuclear War at Sea
Neta Crawford	Soviet Tactical Air Technology
Ivo Daalder	Western Europe and SDI
William Durch	The ABM Treaty and Western Security
John Fenske	European Security and Domestic Politics in France, 1974-1984
Brian Finn	Soviet Use of Mathematical Modelling Techniques in Military Planning
Sybil Francis	The U.S. Congress and Control of Space Weapons
Catherine Girrier	No First Use of Nuclear Weapons
Thomas Graham	Public Opinion, Government Policy, and Arms Control
Thomas Homer-Dixon	Causality in Social Science
Heinz Kern	Comparing Alternative Defense Concepts for Central Europe

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Shannon Kile	NATO Northern Flank Maritime Policy and Operations
John Lepingwell	Evolution of Soviet Strategic Air Defense
Peter Liberman 1980s	New Arms Control Initiatives for the
Katherine Magraw	Assessing the Nuclear Test Ban Debate, 1958-1963
James W. Moore	Defense of the North Atlantic Sea Lines of Communication
Kimberly Nolan	U.S. Assessments of the Military Balance in Europe
Kevin Oliveau	Computer Modelling of Security Issues
Matthew Partan	Soviet Strategic Defense Sensor Programs
Laura Reed	Nuclear Weapons-Free Zone Issues
Eugene Rumer	Soviet Military History
Jeffrey Sands	Soviet Strategic Defense Forces
Daniel Shepard	Evolution of Soviet Ground Forces Strategy, 1967-1987
Ronald Siegel	Modelling Conventional Land Warfare
Jeffrey Starr	Command and Control of Tactical Nuclear Weapons
Jonathan Tucker	Antisubmarine Warfare Issues
Robert Zirkle	NATO Command and Control

Degrees Completed, Academic Year 1986-87

Peter Almquist	Ph.D., June 1987 "The Organization and Influence of Soviet Military Industry, 1965-1982."
Jorg Baldauf	PhD., June 1987 "Implementing a Flexible Response: The U.S., Germany, and NATO's Conventional Forces."

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SEMINARS

DACS Visitors Seminars

- 2 October 1986 Prof. Marvin Miller, MIT, Center for International Studies and Department of Nuclear Engineering, "U.S. Nuclear Non-proliferation Policy."
- 30 October 1986 Prof. Edward Linenthal, Department of Religious Studies and American Culture, University of Wisconsin-Oshkosh, "Political Revivalism and the Nuclear Age: the Worlds of the Committee on the Present Danger and the Physicians for Social Responsibility."
- 17 December 1986 James DeMontmollin, Sandia National Laboratory, "International Atomic Energy Agency Safeguards and U.S.-Soviet Arms Control."
- 14 January 1987 Prof. Edward Linenthal, "Changing Symbolism of War in American Society."
- 12 February 1987 Col. Don Rakestraw, USAF Research Associate, "Fighter Pilots: Vietnam and Europe."
- 19 February 1987 Prof. Marc Trachtenberg, Department of History, University of Pennsylvania, "Making Sense of the Nuclear Age: Assessing the Value of Historical Analysis."
- 5 March 1987 Dr. Johann Galtung, Visiting Fellow, Center of International Relations, Princeton University, "Alternative Security Policies in Europe."
- 12 March 1987 Vann Van Diepen, Analyst, Bureau of Intelligence and Research, Department of State, "The Intelligence Process: The View from Foggy Bottom."
- 18 March 1987 Robert Zalisk, producer of, "SDI: The Technical Challenge."
- 2 April 1987 Prof. David Alan Rosenberg, Strategy Department, U.S. Naval War College, "The Limits of Maritime Strategy: Prospects for U.S. Naval Power Since 1945."

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- 9 April 1987 Robert Nurick, Associate Director, RAND-UCLA Center for the Study of Soviet International Behavior, "Soviet Responses to Emerging Technology."
- 22 April 1987 Edward Linenthal, "Symbolic Defense: SDI and American Political Culture."
- 30 April 1987 Randall Forsberg, Director, Institute for Defense and Disarmament Studies, "Arms Control versus Alternative Defense."
- 7 May 1987 "Continuity and Change in the Soviet Union Under Gorbachev," a panel chaired by Prof. Stephen Meyer and including Prof. Loren Graham, MIT Program in Science, Technology and Society; Prof. Philip Hanson, University of Birmingham, England; and Dr. Elizabeth Teague, Radio Liberty, Munich, West Germany.
- 14 May 1987 Robert Perry, Senior Staff, RAND Corporation, "What is Wrong with Current Acquisition Reform?"
- 19 May 1987 Dr. Stephen Flanagan, Executive Director, Center for Science and International Affairs, Harvard University, "NATO Nuclear Doctrine and Arms Control."

DACS/CSIA Defense Technology and Policy Working Group

- 14 October 1986 Mr. Scott Berg, DACS Graduate Research Assistant, "Status of the Small Intercontinental Ballistic Missile."
- Dr. Stephen Fetter, Post-Doctoral Fellow, Harvard CSIA, "Issues Related to a Comprehensive Test Ban Treaty."
- 18 November 1986 Dr. Benoit Morel, Science Fellow, Center for International Security and Arms Control, Stanford University, "An Analysis of Anti-Tactical Ballistic Missile Systems."
- 25 November 1986 Maj. David Glasgow, Air Force Systems Command, "Future Technologies in the Air Force: Project Forecast."

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- 9 December 1986 Dr. Theodore Taylor, "Third Generation Nuclear Weapons."
- 10 February 1987 Dr. Arthur Charo, Post-Doctoral Fellow, Harvard CSIA, "U.S. Air Defense Programs."

Mr. John W.R. Lepingwell, DACS Graduate Research Assistant, "Soviet Air Defense Programs."
- 24 February 1987 Dr. Robert Selden, Head, National Security Section, Los Alamos National Laboratory.
- 10 March 1987 Dr. Marvin Miller, MIT Department of Nuclear Engineering and CIS, "IAEA Safeguards: Past Practice and Future Applications"
- 7 April 1987 Dr. Richard Garwin, IBM, "Topics in Defense Technology."
- 14 April 1987 Prof. Ashton Carter, Harvard CSIA, Prof. Jack Ruina, MIT, Dr. Stephen Weiner, MIT Lincoln Laboratory, "A General Discussion of Ballistic Missile Defense Technology."
- 28 April 1987 Lt. Col. Thomas Johnson, Director, Scientific Research Laboratory, West Point, "Recent Developments in Military Technology."

MIT/Harvard Defense Technology/Defense Policy and Arms Control Dinner Seminar Series

- 28 October 1986 Prof. Thomas Jordan, MIT Department of Earth and Planetary Sciences, "The Current Status of Verification and Nuclear Test Limitations."
- 1 December 1986 Prof. John Deutsch, MIT Provost, "Current Issues in Chemical Warfare."
- 2 March 1987 Prof. George Carrier, Harvard University, Division of Applied Sciences, "What's New in Nuclear Winter?"
- 6 April 1987 Hon. James Schlesinger, former U.S. Secretary of Defense (1973-75), "Deterrence, U.S. Nuclear Strategy, and SDI."

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MIT MacArthur Foundation Grantees Seminars

- 17 February 1987 Prof. Hayward Alker, Department of Political Science, "The Dialectical Logic of Thucydides' Melian Dialogue."
- 3 March 1987 Prof. Thomas Sheridan, Department of Mechanical Engineering, "Experiments on Human Foibles in Command and Control."
- 10 March 1987 Prof. Philip Khoury, Department of History, "Perspectives on the Impact of World War Two on Egypt and Turkey and the Impact of the Lebanon War on Lebanese Politics, Economy and Society."
- 17 March 1987 Prof. Jean Louis, Department of Aeronautics and Astronautics, "Approaches to Curbing the Arms Race in Space."
- 31 March 1987 Prof. Lawrence Susskind, Department of Urban Studies and Planning, "Designing an International Mediation Service."
- 7 April 1987 Prof. Eric Chivian, Medical Department, "An International Survey of Teenagers' Attitudes About the Future."
- 14 April 1987 Prof. Harvey Sapolsky, Department of Political Science, "The Political/Historical Origins of SDI."

DACS Research Seminars

- 3 October 1986 Thomas Homer-Dixon and Roger Karapin, "Following Political Debates: A New Approach to the Window of Vulnerability Controversy."
- 26 February 1987 Scott Berg, "Midgetman: The Players, Deterrence, and Arms Control."
- 17 March 1987 Eugene Rumer, "Soviet Response to Threat in the Theater."
- 23 April 1987 Charles Glaser and Steven Miller, "The Navy and Nuclear War."

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CONFERENCES

MIT/HARVARD Summer Program on Nuclear Weapons and Arms Control

For the fifth consecutive summer, the Defense and Arms Control Studies Program, in cooperation with the Center for Science and International Affairs at Harvard University and with the sponsorship of the Alfred P. Sloan, Jr., Foundation, hosted fifty college faculty from the United States and Western Europe who teach courses on nuclear weapons and arms control issues. An intensive, two-week resident program, it is designed to give participants a firm grounding in the technical aspects of nuclear arms control issues, plus an opportunity to meet and get to know their peers. Participants come from a wide range of backgrounds, from the humanities to the natural sciences. The lecturers were primarily from the faculty and staff of MIT's Defense and Arms Control Studies Program and Harvard's Kennedy School of Government.

Other lecturers included Prof. Robert Art, Brandeis University; Prof. McGeorge Bundy, New York University; Prof. Robert Ehrlich, George Mason University; Ms. Randall Forsberg, Institute for Defense and Disarmament Studies; Mr. Sidney Graybeal, System Planning Corporation; Rev. J. Bryan Hehir, U.S. Catholic Conference; Gen. David C. Jones, U.S. Air Force (Ret'd); Prof. Catherine Kelleher, University of Maryland; Prof. Edward Linenthal, University of Wisconsin-Oshkosh; Prof. Richard Pipes, Harvard University; Dr. William Shuler, Lawrence Livermore National Laboratory; Mr. Leonard S. Spector, Carnegie Endowment for International Peace; Dr. Edward L. Warner, RAND Corporation.

Participants' formal evaluations of the summer program once again gave it high marks for both content and organization.

The "Nuclear Age" Television Project

WGBH -- Boston's public television station -- is completing a thirteen-part television series about the technology, politics and history of nuclear weapons. Although MIT has no administrative responsibility for the project, planning for such a series started within the Defense and Arms Control Studies Program and MIT's Science, Technology and Society Program, then headed by Carl Kaysen. Professors Kaysen and Ruina, along with Steven Miller, William Durch, Shannon Kile, Katherine Magraw and Laura Reed, have been working closely with WGBH, advising on program content and helping to create the supporting written materials.

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OTHER VISITORS TO THE DEFENSE AND ARMS CONTROL STUDIES
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- 23 October 1986 Jurgen Scheffran, pre-doctoral physicist from Marburg University, West Germany, discussed analytical models for control of anti-satellite weapons.
- 15 January 1987 Informal meeting with Ambassador Paul Nitze, Special Assistant to the Secretary of State for Arms Control, on current issues in nuclear arms control.
- 5 February 1987 Meeting with a group of senior academics and public officials from NATO countries to discuss SDI, and its implications for European Security. Visitors included: Prof. Rafael Bardaji, Department of International Relations, University of Madrid; Dr. Luciano Bozzo, Researcher, International Sociological Institute of Gorizia, Italy; Prof. Michel Fortmann, Department of Political Science, University of Montreal, Canada; Dr. Alan M. Fox, Deputy Director, Intelligence for Resources, Ministry of Defense, UK; Prof. Dr. Bernd Kubbig, Goethe University, Frankfurt, West Germany; Dr. Mathias Schoenborn, Research Associate, Social Science Institute of the Bundeswehr, Cologne, West Germany; Mr. Knut Soerlie, Secretary of the Board, Federation of Norwegian Industries; Col. William C. Weston, Senior Policy Analyst, Ministry of National Defense, Canada.
- 8 April 1987 Prof. Zhuang Qubing, Fellow of the Institute of International Relations, Beijing, China, and Visiting Scholar, Fletcher School of Law and Diplomacy, to discuss U.S.-China security interests.

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RELATED PROFESSIONAL ACTIVITIES

William Durch attended the November 1986 Conference of the Section on Military Studies, International Studies Association, in Cambridge, Massachusetts, and participated in a panel on Interdisciplinary Education Programs at the Annual Meeting of the Northeast Political Science Association in Boston. In December, he attended the Colloquium on Science, Arms Control and National Security, sponsored by the American Association for the Advancement of Science, Washington, D. C. Mr. Durch managed DACS activities during MIT's Independent Activities Period (IAP, January 1987) and chaired an IAP crisis management simulation. He gave a presentation on "Education for the Nuclear Age" at the Annual Meeting of the American Association for the Advancement of Science, February 1987, in Chicago; reprised the "Crisis Game" video for the MIT Medical Department; and lectured on "The Navy and Space" to the assembled Navy ROTC Midshipmen of MIT, Harvard, Wellesley and Tufts Universities. Mr. Durch also coordinated the fifth annual MIT/Harvard Summer Program on Nuclear Weapons and Arms Control, held 21 June - 2 July 1987, in Cambridge.

Lynn Eden attended a MacArthur Fellows Conference at Williamsburg, Virginia, and the Social Science Research Council Meeting on "What's Right and Wrong with Security Studies?" in November 1986. In December, she spoke at Carnegie Mellon University, Pittsburgh, Pennsylvania on "Interests, the State, and American Military Policy During the Early Cold War," and on the same subject in January 1987, at Williams College, Williamstown, Massachusetts. In February, Dr. Eden chaired a panel and gave introductory remarks on "The New Cold War" at the Institute for Peace and International Security Conference, "The New Security Debate," Cambridge, Massachusetts.

Charles Glaser spoke on the Reagan Administration's strategic policies at the annual meeting of the Lawyers' Alliance Against Nuclear Weapons, June 1986. In November, he spoke at the MIT Program in Science, Technology and Society on "Reagan, Reykjavik and Arms Control." He was a commentator on a panel at the conference entitled, "A World with Strategic Defense," held at the University of Michigan. Dr. Glaser also attended a November meeting for new members of the Council on Foreign Relations in New York. In December 1986, along with Steven Miller, he hosted a meeting of the "Navy and Nuclear Weapons" study group to discuss authors' first drafts.

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In May 1987, Dr. Glaser attended an authors meeting to discuss chapters for the forthcoming book, Fateful Visions, a product of the Avoiding Nuclear War Project at Harvard. He also participated in a year-long seminar/study group on Alternative Defense at the Institute for Defense and Disarmament Studies, and prepared a paper for presentation at the 1987 annual meeting of the American Political Science Association. In August 1987, Dr. Glaser took up an appointment as Assistant Professor of Political Science at the University of Michigan.

Herbert Lin was invited to talk to the Raytheon Corporation's Research Division in October 1986, attended a Workshop on Arms and Artificial Intelligence sponsored by the Stockholm International Peace Research Institute (November 1986), and attended a symposium on Arms Control and National Security sponsored by the American Association for the Advancement of Science Symposium (December 1986). In January 1987, Dr. Lin left MIT for a position on the staff of the Armed Services Committee, U.S. House of Representatives.

Edward Linenthal gave a lecture based on the article "A Reservoir of Spiritual Power: Patriotic Faith at the Alamo," at the American Academy of Religion Annual Meeting, Atlanta, Georgia, November 1986; and a lecture on "Political Revivalism and the Nuclear Age: The Worlds of the Committee on the Present Danger and the Physicians for Social Responsibility," at the Annual Meeting of the Society for the Social-Scientific Study of Religion. Professor Linenthal also gave talks entitled "Symbolic Defense: SDI and American Political Culture," at Tufts University and Harvard University in April 1987, and to the MIT/Harvard Summer Program on Nuclear Weapons and Arms Control, in June.

Stephen Meyer gave a talk on "Soviet Perceptions of SDI," at the Institute for Defense Analyses, Alexandria, Virginia (July 1986); was interviewed by ABC World News Tonight and the CBS Evening News on the Reykjavik Summit (October 1986); lectured to U.S. Army ROTC at MIT on "The Warsaw Pact as a Military Alliance" (November 1986) and to the Russian Research Center at Harvard University on "Soviet Technological Options with Regards to SDI" (December 1986); and gave a talk to the National Security Fellows at Harvard's Kennedy School of Government, on "Soviet Security Policy."

Professor Meyer was also a member of the Advisory Panel on SDI of the Office of Technology Assessment, Washington, D. C., and attended its meetings in June and November 1986, and January 1987; and of the Aspen Strategy

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Group, whose annual meeting was held in Aspen, Colorado, August 1986. He served, in addition, on the editorial board of International Security, and as a consultant to U.S. government agencies.

Steven Miller gave presentations on "Security and Stability in Northern Europe" to the Norwegian Advisory Board on Arms Control and Disarmament, Bodo, Norway (June 1986); on "Maritime Defense of the Northern Flank" at a Symposium of the Research Center for Defense History, Norwegian National Defense College, Oslo, Norway; on "The Maritime Strategy and Norwegian Security," at the Norwegian Institute for International Affairs, Oslo; on "Allies and Arms Control" at the U.S. Arms Control Policy Conference sponsored by the Royal Institute of International Affairs, London, England; and on "Implications of the U.S. Maritime Strategy for Northern Europe" at the Finnish Institute for International Affairs, Helsinki, Finland (all August 1986). In addition, Mr. Miller attended a Conference on "Maritime Strategy in the Pacific Basin," sponsored by the Current Strategy Forum, U.S. Naval War College, Newport, Rhode Island (June 1986); and MacArthur Foundation Meetings on International Peace and Security, Chicago, Illinois (September and November 1986). He also co-hosted an authors' review meeting of DACS-sponsored Navy and Nuclear War Project in December 1986. Mr. Miller served as consultant to the Nuclear Age Project at Boston's Public Television station, WGBH, and as co-editor of the journal International Security.

Christopher Paine was a member of the joint Federation of American Scientists/National Resources Defense Council delegation to Moscow that negotiated an in-country seismic monitoring agreement with Soviet Academy of Sciences (June 1986), and a member of the October 1986 FAS Delegation to Moscow for bi-annual arms control discussions with Soviet Academy of Sciences. Mr. Paine attended the Annual Meeting of the Federation of American Scientists, Washington, D. C., December 1986, and in February 1987 was an invited witness, legislative hearing on University of California management of the national nuclear weapons laboratories (Livermore and Los Alamos), before a special panel of the California State Senate.

Don Rakestraw attended the four-day USAF Research Associates Mid-Tour Conference, held at the Pentagon in Washington, D. C. (January 1987), and the annual Spring Conference of the Fletcher School of Law and Diplomacy.

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George Rathjens lectured both in the United States and abroad on nuclear weapons and arms control-related issues. He was Co-Director of the four-day Teaching Workshop on International Security Issues, Dubrovnik, Yugoslavia in June 1986. He attended meetings of the Aspen Strategy Group at Aspen, Colorado in August 1986 and at the Wye Plantation, Maryland, in November. He attended a meeting of the Exploratory Project on the Conditions for Peace (EXPRO), Cohasset, Massachusetts, in September; and a conference on "Nuclear Ethics" held at the Wye Plantation in October. Also in October, Professor Rathjens spoke to the League of Women Voters, Lincoln, Massachusetts, on nuclear arms and nuclear power issues; lectured at Columbia University and New York University on arms control negotiations; was the featured guest on a radio talk show on WGN, Chicago; lectured at Argonne National Laboratory on nuclear winter; and participated in a debate on a Comprehensive Nuclear Test Ban Treaty at Ohio State University, Columbus, Ohio.

In November, Professor Rathjens attended a meeting on nuclear arms questions in Hamburg, West Germany, and lectured on arms control negotiations at the University of the Ruhr. In December, he attended a meeting on the Strategic Defense Initiative sponsored by the Max Planck Society, in Tutzing, West Germany and a meeting of the American Academy of Arts and Sciences' Committee on International Security Studies in Washington, D.C. He also lectured on arms control negotiations at Boston University. In January 1987, Professor Rathjens taught at the Workshop on Nuclear War-Peace Issues, University of Miami, Florida; participated in a television debate on the Strategic Defense Initiative, Indianapolis; lectured on avoiding nuclear war at the University of Rochester, Rochester, New York; and participated in a debate on nuclear arms issues at Princeton University. In February, he debated the issue of Nuclear Winter at the Annual Meeting of the American Association for the Advancement of Science, Chicago; spoke on the same topic at Harvard Medical School, Boston; and briefed U.S. senators on arms issues.

In March 1987, Prof. Rathjens participated in a debate on SDI at Cape Cod Community College, and gave a series of talks and interviews -- to the Rotary, Kiwanis, and various university groups -- sponsored by the Committee on National Security. In April, he gave a talk at the University of California-San Diego on the negotiation of arms control agreements, and lectured on arms control at the University of Miami. In May, he attended the annual Pugwash meeting, held this year in Poland, and went on to Moscow,

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where he participated in a conference on arms control with American and Soviet lawyers.

Jack Ruina participated in a number of conferences both in the United States and abroad. In October 1986, he spoke to MIT's 1986-87 Vannevar Bush Fellows (science journalists from the US and Italy visiting the Institute for the academic year) and Fellows from World Press International on SDI and other urgent strategic weapons questions; and spoke on SDI at a meeting of the MIT Alumni Association, Bedford, New Hampshire. In November, he spoke on a panel entitled "Arms Control After Reykjavik: Can U.S. and Soviet Positions on Star Wars and the ABM Treaty be Reconciled in the Context of Comprehensive Agreements?" at the International Law Weekend, a joint meeting of the American Branch, International Law Association; the American Foreign Law Association; the American Society of International Law; and the Association of the Bar of the City of New York, in New York. He also gave the H. Kendall Reynolds Memorial Lecture, State University of New York, Courtland, on "SDI, 'Star Wars': Opportunity or Danger for U.S.A."; and spoke on "Technological, Military, and Arms Control Issues of SDI (Star Wars)" at the Technology Studies and Peace Studies Programs, Wellesley College. In December, Professor Ruina addressed a session on "The Scientific Community and Defense Research" at First Annual Colloquium on Science, Arms Control, and National Security of the American Association for the Advancement of Science, Washington, DC; and participated in the workshop, "Directions in the Study of Crisis Management," sponsored by the Center for Strategic & International Studies, Georgetown University. He lectured on "South Africa's Nuclear Capacity," at Boston College, sponsored by the Faculty African Studies Group and the Department of Physics, in February. In March, he served as moderator for a panel focussing on the Politics of SDI, part of a two day symposium to discuss the technology and politics of the Strategic Defense Initiative, at Wellesley College; and spoke at Bryn Mawr College, Bryn Mawr, Pennsylvania, on various problems in defense and arms control. In April, Professor Ruina gave a talk at the Miller Center, University of Virginia, entitled "What's Happened to Arms Control?" and lectured at Lafayette College, Easton, Pennsylvania. He spoke to the MIT Alumni Association of New York City in May.

Dr. Ruina is a member of the National Academy of Sciences Committee on Contributions of Behavioral and Social Science to the Prevention of Nuclear War, the American Academy of Arts and Sciences Committee on International Security Studies, and the Advisory Panel of the Congressional

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Office of Technology Assessment on Seismic Verification of Nuclear Tests.

Harvey Sapolsky was commentator on a panel on bureaucratic entrepreneurship at the 1986 Annual Meeting of the American Political Science Association.

Peter Timbie attended the November 1986 conference on "The Soviet Response to New Military Technology," Harvard University Center for Science in International Affairs, and the December 1986 conference on "The Soviet Approach to Strategic Defense," Harvard University Russian Research Center.

Marc Trachtenberg attended the November 1986 MacArthur Fellows Conference, Williamsburg, Virginia.

TEACHING PROGRAM

MIT faculty associated with the Defense and Arms Control Studies Program offered the following courses in academic year 1986-87:

Defense Politics (Sapolsky) surveyed the structure of U.S. defense policy making, reviewing decision-making in the civilian defense bureaucracy and the National Security Council system, as well as in the military services. The course is intended to give students a feel for the workings of the contemporary defense establishment, with particular emphasis on weapon procurement policies and politics.

Nuclear War: Threat and Avoidance (Rathjens, Ruina, et al.) is a School-wide elective course designed to introduce undergraduate students to the history and technology of nuclear weapons, arms control, and related contemporary issues.

Nuclear Weapons and Arms Control (Rathjens, Ruina) is a basic introductory course for graduate students that reviews technical issues bearing on nuclear weapons policy, the arms race, and arms control. Contents include the description of fission and fusion weapons and their effects; basics of nuclear proliferation as a technology and policy issue, and of nuclear delivery systems, ballistic missile defense and air defense technologies, monitoring technologies for verification of arms control agreements, and measures of the strategic balance.

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Quantitative Approaches to Defense Problems

(Rathjens) introduces students to the methods of systems analysis for decision-making in defense and arms control policy and weapons procurement. Techniques reviewed included Monte Carlo modelling, linear programming, nuclear exchange models, and indifference curves.

Research Seminar in Soviet Security Studies (Meyer)

is an advanced-topics seminar in Soviet security, which examined historical and contemporary issues in Soviet defense planning.

Seminar on European Security (Griffith)

addressed contemporary security issues affecting modern European states, with a focus on the international politics of security.

Statecraft, Strategy, and War (Miller)

reviewed the main ideas and concepts of the most influential strategists of land, sea and air warfare, from Machiavelli to Mahan; considerations affecting the choice of military strategy by states and statesmen; and factors determining the likelihood, the course and the outcome of war. The course acquaints students with the major works in the literature on strategy, warfare, and the modern state.

Theory and Politics of Arms Control (Miller)

is an historically-oriented seminar on the early development and evolution of disarmament and arms control theory and practice, from the first Hague Conference of 1899 to the SALT agreements of the 1970s. Arms race theory, bureaucratic and domestic politics, and the role of technology are examined for their impact on arms control efforts, and lessons from past efforts are applied to current negotiations.

Theory and Practice of Soviet Decision Making (Meyer)

examines the structure and process of Soviet national-level decisionmaking, with special attention to the national security related decisions. The first part of the course covers issue formation and agenda building; advocacy; decision; and implementation. The second part studies specific cases in defense and arms control policy, foreign policy, and economic and industrial policies.

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