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EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

March 10, 1993

MEMORANDUM FOR JOHN H. GIBBONS

THROUGH: **J. THOMAS RATCHFORD** JR

FROM: **JOHN F. O'NEIL** JFO

SUBJECT: **ADDRESSING S&T ISSUES AT THE VANCOUVER SUMMIT**

Pursuant to our meeting on March 9, 1993, attached is a short proposal for a concurrent meeting on S&T policy issues at the Vancouver Summit. This proposal as written does not directly address space technology issues. The results of this meeting would form the basis for a more comprehensive session, chaired by you and Saltykov, approximately one month later.

Alternatively, the summit statement could briefly address S&T policy issues and commission the more comprehensive session chaired by you and Saltykov.

The site of the comprehensive session could be either Washington or Moscow.

We understand that other Departments and Agencies (e.g. DOE and State) are also working on proposals for S&T summit initiatives. Additionally, the Russians may raise other S&T issues at the Summit. Coordination of S&T issues for this Summit is problematic. You may decide to have OSTP provide that coordination by soliciting issues, analyzing them, and formulating recommendations for your consideration and recommendation to the President. A separate memo will address this issue.

OK. Sounds appropriate + defensible.

The attached material provides a basis for considering S&T issues at the Summit. The material covers:

Background
Objectives
Issues
Participants
Draft Agenda

Based on your decision on the proposal for a concurrent S&T meeting, or summit S&T statement, and subsequent comprehensive meeting and your guidance, I will prepare a memo for Anthony Lake.

Attachments

cc: **Skip**
Holly
D. A.
Karl
Nancy
Jeff
Rich
Gerald

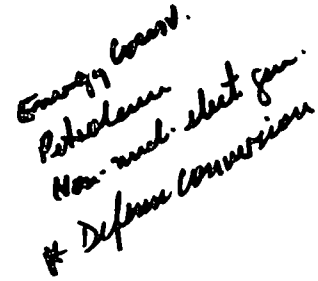
BACKGROUND

S&T in Russia is suffering through a most trying time. Bloated organizations accustomed to receiving state financing are forced to generate their own income during the beginnings of a market economy. The results to date include some success stories, but more commonly one finds poor morale; unemployment; poverty-level salaries; lack of equipment, supplies, journals and the means for communications; and a shortage of funds for even essentials such as electricity. Potential undesirable outcomes from the current situation include proliferation of technologies and expertise for weapons of mass destruction to rogue countries, the loss of capabilities essential to the development of a democratic society with a viable market-based economy, and the destruction of basic research groups of unique and world-class quality.

A vibrant science and technology sector is vital to the development in Russia of a market-based economy responsive to the needs of the population. Historically, scientists and engineers have played a prominent role in Russian society and were called upon by both the Tzars and the communists to lead important national developments. In terms of supporting a market-based economy, the S&T communities will be expected to develop the technologies that drive economic advancement and provide employment in the civil sector, and weapons scientists and engineers must successfully transition from defense work. Conversely, failure in the S&T sector could retard economic development based on market-based principles, accelerate unemployment, and possibly drive weapons scientists and engineers to other countries.

At present, the U.S. Government fosters cooperation with S&T entities in Russia through nine bilateral S&T agreements:

- Agriculture
- Artificial Heart
- Basic Scientific Research
- Environmental Protection
- Medical Science and Public Health
- Oceans Studies
- Peaceful Uses of Atomic Energy
- Space
- Transportation



Rough estimates of spending in these and related areas indicate a level of approximately $13-15 million of U.S. government funding in the past year.

The private sector, both non-profit and for profit, has undertaken a variety of steps to assist the plight of their Russian colleagues and to capitalize on emerging business opportunities in Russia.

Last March, upon the request of OSTP, the National Academy of Sciences held a conference to discuss the situation in the former Soviet Union (FSU). The conference report entitled, "Reorientation of the Research Capability of the Former Soviet Union," is Attachment 1. The report concluded that $25 million should be made available for immediate support to civil science in the former Soviet Union.

In August of last year, OSTP hosted two meetings with the private sector to assess and discuss with representatives of both for profit and non-profit organizations their S&T related activities in the FSU. Notes on these meetings are Attachments 2 and 3.

Again, upon request of OSTP, the FCCSET Committee on International Science, Engineering, and Technology (CISET) produced a report on "U.S. Government Science and Technology Interactions with Russia." It is found at Attachment 4.

The Congress has passed two noteworthy pieces of legislation relating to Russian S&T. Approximately $800 million was appropriated pursuant to the Nunn-Lugar Act (the Soviet Nuclear Threat Reduction Act of 1991) for uses in dismantlement and defense conversion. A George Brown initiative for a foundation to address civil science needs was included in the Freedom Support Act. Defense is authorized to commit up to $25 million from Nunn-Lugar funds for this foundation. This corresponds to the amount identified in the Academy report as needed immediately for support of non-weapons scientists in the FSU (p.2 Attachment 1).

As for support for weapons scientists, the International Science and Technology Centers were established in Moscow and Kiev to help transition scientists and engineers from weapons work to civil pursuits. The U.S. contributed $25 million. Russia, Japan, and the EC also contributed funds for a total of $75 million. Unfortunately, grants have yet to be made to scientists by the Centers.

In the private sector, George Soros last month announced that he will donate $100 million to support basic scientific research in the FSU. This follows successful efforts by the American Physical Society and other groups to provide emergency aid to their colleagues in the FSU.

Information available to this office and past interactions with Minister Saltykov indicate that he is a progressive, reform minded individual committed to reforming the S&T structure in Russia. His position has been enhanced since he first entered the Yeltsin government (he is now a Deputy Premier) and the U.S. should continue to interact with him on US-Russian S&T matters.

OBJECTIVE OF THE MEETING

To address the question of what is needed for Russia to effectively capitalize on its science and technological strengths for economic stability and growth.

The desired outcome would be a set of agreed upon broad principles that would be considered in detail at a more comprehensive meeting a month or so later.

DISCUSSION

Clearly technology is crucial to the long-term stability and growth of the Russian economy. There are, in fact, some very rough parallels between what the Russians need to do and the Technology Initiative announced on February 22. The discussions at the meeting would focus on how Russia harnesses its technological capabilities to support economic growth and what the U.S. can do to support Russian efforts.

A selective list of issues that need resolution in order for US-Russian S&T relations to flourish in the private sector would be agreed upon in advance of the meeting. Representative candidates for this list include:

- Dealing with immediate crisis in Russian S&T
- Defense Conversion
- Energy Efficiency Assistance
- Non-proliferation and related issues
- Reform of Russian S&T system: merit review, individual investigators
- Problems facing commercial S&T interactions: IPR, banking, customs, taxation, ownership, legal system, communications, etc.
- U.S. export controls
- U.S. policies with respect to defense contractors
- U.S. Governmental assistance: financial and technical

Initiatives have been proffered to the Russians by U.S. Government over time, and these may surface unexpectedly during the Summit. For example, DOD has proposed funding cooperative aerospace research and development with Russia. Proposals in eight dual-use technical areas were advanced to the Russian Ministry of Foreign Affairs last October. There is a need to establish a framework agreement under which such cooperative projects could be undertaken. DOD's on going TOPAZ program is the largest project (monetarily) with Russia. Last year $10 million of the $25 million annual program was spent in Russia, including hardware purchase and scientific services.

This raises the issue of the need to for better coordination between our U.S. Government agencies in their dealings with the FSU. They often initiate S&T related projects (such as Topaz and other dual-use technologies) that are not reviewed in the context of overall U.S. S&T policy.

PARTICIPANTS

Participants in the meeting would be drawn from government and the private sector (industry, non-profits, and academia). Approximately eight to ten participants would be optimal. Candidate representation, based on the meetings held last year, could include:

GOVERNMENT*

Dr. Gibbons
Secretary O'Leary
Ambassador Strobe Talbott
Dr. William Perry

INDUSTRY OFFICIALS

Texaco or other energy company
Honeywell of other energy efficiency company
Sun MicroSystems or other electronics/computer company
Fancy Electronics or other small business
Pittman-Moore or other agricultural company

NON-PROFIT ORGANIZATIONS

David Hamburg, Carnegie Corporation
Ed Henley, American Physical Society
MacArthur

ACADEMIA

Frank Press, NAS
Don Langenberg, U. Maryland System
Princeton

In addition, observers would be invited to hear the discussions first hand. A representative of each principal participant would be invited plus additional government representatives from technical agencies such as Agriculture, DOC/NIST, HHS/NIH, and NSF. Selected representative from other companies, non-profit organizations (including the Soros Foundation) and academia would also be invited.

*** Government representation is dependent upon availability of newly nominated principals.**

DRAFT AGENDA

I Welcome

A. President Clinton

B. President Yeltsin

II Remarks

A. Dr. Gibbons

1. Introduction

2. S&T and Economic Growth under the Clinton Administration

3. US-Russia S&T Activities
   a. Government
   b. Private Sector (Non-profit/For-profit)
   c. Academia
4. What's needed in the future

B. Minister Saltykov

III Discussion

A. U.S. Technology Initiative

B. What's needed to harness technology for Russia's economic growth

C. What the U.S. can do to facilitate

IV Clinton-Yeltsin charge to Dr. Gibbons and Minister Saltykov for further work

The meeting would last approximately three hours; Presidents Clinton and Yeltsin would participate for the first 10 minutes and the last 10 minutes.

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NATIONAL ACADEMY OF SCIENCES

2101 CONSTITUTION AVENUE, NW WASHINGTON, D. C. 20418

OFFICE OF THE PRESIDENT

March 13, 1992

Dr. D. Allan Bromley
Assistant to the President for Science and Technology
Executive Office of the President
Office of Science and Technology Policy
Washington, D. C. 20506

Dear Dr. Bromley:

As you requested, we brought together on March 3 approximately 120 leaders of the U.S. science and engineering community to consider how to preserve the basic science capability of the former Soviet Union (FSU). At that meeting, working groups were constituted in four areas: weapon scientists and engineers, basic research, commercialization of technology, and interdisciplinary problem-oriented research (e.g., health, ecology, energy, polar, etc.). Attached are the reports of these four working groups along with the list of attendees.

As co-chairs of the meeting, we are providing in this letter a summary of the key recommendations and observations drawn from the discussions. Because of the urgency of providing this response, we have not circulated this letter to the attendees for review prior to sending it to you. We take full responsibility for the contents below, and believe that they represent a reasonable and accurate summary of the major recommendations and the views of most participants. More complete details are provided in the working group reports.

Preservation and Reorientation of FSU S&T Is in the U.S. Interest

Scientists and engineers in the FSU will play a key role in the economic revitalization necessary for a successful transition to open and stable market-driven democratic societies, which is in the economic and security interests of the U.S. New scientific and technological challenges in civilian areas for FSU specialists can help divert technical talent away from military pursuits. Achieving U.S. goals of shrinking and redirecting the FSU military R&D effort and developing the S&T component of the civilian economy will require providing new opportunities for both FSU weapon scientists and non-weapon scientists, especially in collaborations with American scientists. These opportunities for collaborative efforts will also allow FSU specialists to help expand frontiers of knowledge in areas of direct interest to the American scientific community and to U.S. business.

Time Is of the Essence

Without opportunities and financial support to address technical challenges, FSU S&T human capabilities are being rapidly eroded through an external and internal "brain drain." Of special concern, temptations are increasing for FSU military scientists to look abroad for opportunities to use their capabilities. Many of the best S&T facilities which are standing idle may soon atrophy. The window of opportunity for U.S. commercial interests to draw on FSU S&T achievements may close as other countries select the best commercial targets. The new FSU leadership will soon be making critical decisions in areas such as research priorities, intellectual property rights, and education accreditation and related policies; and there are one-time opportunities to influence these decisions. The U.S. can play a leadership role among western countries in revitalizing FSU science and technology if we act quickly. Cooperative projects with U.S. scientists and engineers will encourage FSU specialists to remain in place and to help in building a civilian market-oriented economy.

Summary of Key Recommendations

1. The national security, economic, and scientific interests of the U.S. can significantly benefit by expanded cooperative programs in the next several years that provide new research opportunities for critical FSU weapon scientists and the best FSU non-weapon scientists. The existing $400 million that Congress appropriated pursuant to the Nunn-Lugar Act (the Soviet Nuclear Threat Reduction Act of 1991) within the Department of Defense (DOD) budget is an appropriate source for funding many of these programs this year.

2. Criteria for funding through the new International Science and Technology Center proposed by Secretary Baker and Foreign Minister Genscher should include a broad definition of "weapon scientists and engineers," including relevant specialists at academic and research institutes who have worked on Soviet military R&D efforts. Special attention must, of course, be given to those specialists with critical weapons knowledge and skills. Center-supported proposals that are collaborations of FSU weapon scientists, FSU non-weapon scientists, and U.S. researchers would be the most effective means for achieving U.S. goals of shrinking and redirecting FSU weapon R&D programs and in increasing the transparency of FSU weapon laboratories.

3. In addition to the funds available in this and future fiscal years for key FSU weapons scientists and engineers through the new Center, funding at least on the same order of magnitude should be made available for programs outside the Center for FSU non-weapon scientists and engineers. Thus, at least $25 million for weapon scientists through the Center and $25 million for non-weapon scientists through other programs are needed in this fiscal year; even more would be appropriate considering the urgency of the

situation and available opportunities. Expanded funding should be made available in future years as justified through reviews of the programs. Awards should be based on scientific merit and potential contributions to U.S. objectives.

4. The extramural research programs of the National Science Foundation (NSF), the National Institutes of Health (NIH), the Department of Energy (DOE), and the Office of Naval Research (ONR) offer the important opportunity of scientist-to-scientist collaborations, which can be implemented rapidly. U.S. researchers know the best specialists in the FSU in their fields who would make excellent research partners. Funds should be allocated to these agencies (from the $25 million for non-weapon scientists) for use by their grantees for the purpose of direct scientist-to-scientist collaboration. U.S. researchers could provide travel funds, short term stipends, reagents, and spare parts from their supplemented grants. Joint publications would result from these activities.

5. A portion of the new funding for non-weapon scientists should also be made immediately available through the nine existing intergovernmental agreements that support civilian research and development (R&D) between the U.S. and FSU. This new funding would be added to existing cooperative programs of the NSF, NIH, DOE, USGS, EPA, NRC, NASA, and other federal agencies. This is an effective mechanism for near-term impact in terms of improving collaboration with competent scientists in the FSU on projects of interest to the U.S.

6. Existing procurement regulations and other administrative guidelines inhibiting research contracts from U.S. agencies to research units in the FSU should be reviewed and minimized. The recent contracts negotiated by DOE with FSU research institutes in fusion research and high energy experimental physics provide useful guidance.

7. The President's proposal for assistance to the FSU in agriculture, health, and energy should be strongly endorsed. The U.S. government should examine the science and technology (S&T) needs and opportunities, including R&D needs, associated with these assistance efforts.

8. The U.S. government should promptly modify the apparent restrictive policy concerning acquisition of advanced technologies and technical expertise from the FSU by American firms, including those with large DOD contracts. Reducing U.S. governmental impediments to appropriate activities of the U.S. private sector in the FSU can have immediate impact in terms of increasing collaboration with FSU scientists and engineers, reducing the FSU military industrial complex by redirecting many of its scientists and engineers to civilian projects, and promoting improvements in the economies of the FSU republics. The U.S. government should continue its related efforts to reduce unnecessary export controls,

particularly in the fields of computers and telecommunications, in close consultation and coordination with its CoCom partners.

9. Additional funding from anticipated foreign aid programs and the $400 million could be effectively used to facilitate conversion of FSU non-nuclear military technologies to civilian applications through such mechanisms as providing venture capital for U.S.-FSU projects, supporting feasibility studies by U.S. firms interested in investing in conversion projects, and providing technical assistance to FSU firms that are assessing marketing and technical opportunities for reorienting military technology to civilian applications.

10. As part of the U.S. economic assistance program to the FSU, the U.S. government should consider high technology R&D as a target for investment support. Such an effort would build on the emerging entrepreneurial abilities of FSU scientists and engineers while stimulating high value-added commercial activity.

11. The U.S. should strongly encourage FSU authorities to promptly enact legislation concerning real property ownership rights and intellectual property rights; to eliminate tax on foreign currency coming into FSU to support S&T; and to continue on the path to ruble convertibility and privatization.

12. A special fund of $50 million to $100 million should be established to help replenish and refurbish equipment, journals, and books used in FSU laboratories of special importance. The U.S. should take the lead in obtaining the necessary funds from bilateral and multilateral assistance agencies.

13. The U.S. representatives to international organizations (e.g., World Bank, UNIDO, FAO, WHO, UNDP, OECD, NATO) should urge greater support through these organizations for FSU S&T.

14. American and FSU specialists should undertake evaluations of FSU capabilities in selected areas of science and engineering of particular U.S. interest to assist in targeting cooperative activities and in utilizing the capabilities of unique FSU facilities and data banks of special importance.

15. Significantly expanded cooperation in environmental R&D would support U.S. goals of sustainable growth in the FSU and would enhance international efforts to understand global change.

Past U.S. Efforts Provide a Point of Departure for Expanded Programs

Many intergovernmental S&T agreements are hindered due to uncertainties regarding FSU collaborators. Air fares for FSU participation inhibit business as usual, and some important aspects

of S&T are not being addressed. Nevertheless, some of these agreements, as well as the extramural programs of some agencies, provide mechanisms for identifying and funding programs of great importance, and the partnerships within the FSU can be sorted out very quickly. For example, the programs of NSF, NIH, DOE, and ONR are well-suited to respond to the needs of basic research of interest to U.S. scientists, while programs of mission agencies such as EPA, DOE, USGS, and NASA provide mechanisms for Americans to gain access in a highly cost-effective way to important FSU specialists and facilities of direct interest to the programs of these agencies.

U.S. businesses are prepared to take advantage of many technical opportunities in the FSU, but many hesitate due to uncertainties regarding U.S. policies on technology transfer as well as inadequacies in the legal/economic framework within the FSU. Meanwhile, competitors from Germany and other countries receive stronger financial incentives from their governments and are gradually establishing business alliances with many of the most promising organizations in the FSU.

The new Center for support of FSU nuclear weapons scientists should offer many opportunities for FSU specialists to redirect their activities to civilian purposes and thereby shrink the size of the FSU military R&D effort. It also provides a base for rapidly expanding cooperative programs in other areas of science and technology.

Many FSU S&T activities are linked to programs of international organizations in which the U.S. plays an influential role (e.g., World Bank, UNIDO, FAO, WHO, NATO, OECD), and these organizations are in a position to direct additional resources to the FSU with encouragement from the U.S.

Several major U.S. private foundations are interested in helping to preserve the science and technology community in the FSU, and they can launch new programs very quickly. Their resources are limited, but they should be encouraged and complimented for their efforts to select special niches for their support (e.g., providing journals and electronic mail equipment).

American scientific professional societies are also rising to the challenge and creating innovative programs to assist their colleagues in the FSU. The American Astronomical Society has raised funds from its members to provide small research grants to FSU astronomers. The American Association for the Advancement of Science, with support from the MacArthur Foundation, will be providing help in maintaining journal subscriptions. Individual American scientists are seeking mechanisms for donating their journals and used equipment to FSU colleagues.

The National Academy of Sciences, National Academy of

Engineering, and Institute of Medicine are examining ways in which they can contribute to the revitalization of FSU scientific and engineering capabilities. The National Academy of Sciences has already changed its long-standing cooperative program to ensure that FSU participants are selected on the basis of evaluations by their American colleagues. In addition, consideration is being given to: undertaking evaluations together with FSU colleagues of FSU capabilities in important fields of science and technology (including those of potential commercial importance such as materials), sponsoring workshops for FSU and American researchers to develop collaborative research agendas and proposals in selected subfields, and working with counterpart organizations in Europe to improve coordination of western initiatives. The American Academy of Arts and Sciences is also pursuing, through a recently-created special committee, ways in which it might help the FSU communities in the sciences, social sciences, and humanities.

Special Considerations for New Programs

Programs supported by the United States should be based on mutual benefit and should not simply be responses to the economic plight of FSU specialists and institutions. Programs should be a mix of: (a) collaborative projects developed jointly by FSU and U.S. researchers and/or teams of researchers with the projects selected competitively on the basis of merit and (b) targeted projects designed to preserve and utilize the capabilities of unique FSU facilities and data banks of special importance to U.S. science and technology interests. Coordination of bilateral approaches with activities of other countries and international organizations is important and synergistic, but should not slow down the U.S. response. Whenever possible, implementation should begin within the next several months. Programs should be subject to careful review after the first year, with attention both to technical payoff and financial accountability. If benefits of these programs to the U.S. are as high as we believe they will be, the programs should be supported with increased funding over the next several years.

Other Promising Approaches that Deserve Careful Study

The proposal of Representative George Brown to establish a binational science foundation between the FSU republics and the U.S. is a welcome initiative with the possibility for long-term mutual benefit. The Brown proposal deserves careful study by the U.S. government. The policies and activities of the Export Import Bank, OPIC, and the Trade and Development Program might offer greater incentives for American investments in the FSU. Expanded authorities of U.S. agencies to enter into contracts with FSU organizations, when such arrangements are particularly beneficial to the missions of the agencies, can be very important; and the administrative details need to be carefully worked out.

In conclusion, we appreciate very much your soliciting the advice of the U.S. science and engineering community on these important issues. We hope that the recommendations and comments in this letter and in the four working group reports will be helpful to you in developing U.S. initiatives to respond to challenges and opportunities provided by developments within the FSU S&T community.

We would like to thank for their efforts in leading three of the working groups: Dr. James Wyngaarden, Foreign Secretary of the National Academy of Sciences and Institute of Medicine (Basic Research Working Group); Dr. Gerald Dinneen, Foreign Secretary, National Academy of Engineering (Commercialization of Technology Working Group); and Dr. Alvin Trivelpiece, Director, Oak Ridge National Laboratory (Interdisciplinary Problem-Oriented Research Working Group). We would also like to thank for their help in organizing the meeting and preparing this report the Office of International Affairs of the National Research Council (Dr. William Colglazier, Executive Director; Mr. Glenn Schweitzer, Director, Office for Central Europe and Eurasia; Dr. Gary Waxmonsky, Associate Director, Office for Central Europe and Eurasia; and Peter MacDonald and Kathleen Trivers of their staff.) We are especially grateful to Dr. David Hamburg and the Carnegie Corporation which, along with the National Research Council, provided financial support for the meeting.

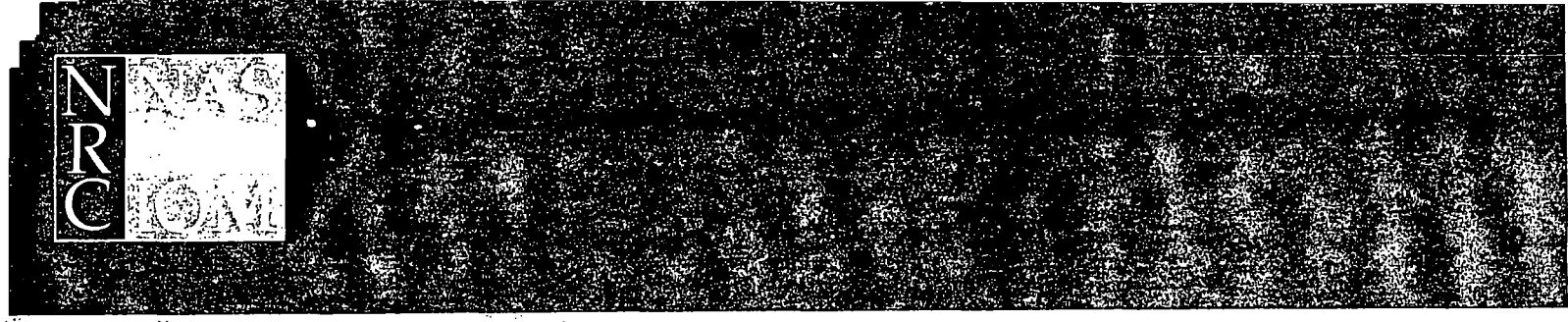
We believe that it is in U.S. interest to act immediately and aggressively. If we or the National Research Council can provide you with any further assistance, we would be pleased to do so.

Sincerely,

Dr. Guyford Stever
Commissioner
Carnegie Commission
on Science, Technology
and Government

Dr. Frank Press
President
National Academy
of Sciences

Dr. Ashton Carter
Professor
Harvard University



Reorientation of the Research Capability of the Former Soviet Union

A Report to the Assistant to the President for Science and Technology

REORIENTATION OF THE RESEARCH CAPABILITY OF THE FORMER SOVIET UNION

A Report to the Assistant to the President for Science and Technology

Results of a Workshop on March 3, 1992

Co-Chairmen of the Workshop

Frank Press
Guyford Stever
Ashton Carter

Chairmen of the Working Groups

Ashton Carter, Weapons Scientists and Engineers
James Wyngaarden, Basic Research
Gerald Dinneen, Commercialization of Technologies
Alvin Trivelpiece, Multidisciplinary, Problem-Oriented Research

National Academy of Sciences
National Academy of Engineering
Institute of Medicine

National Academy Press
Washington, D.C. 1992

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Frank Press is president of the National Academy of Sciences.

The National Academy of Engineering was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Robert M. White is president of the National Academy of Engineering.

The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Kenneth I. Shine is president of the Institute of Medicine.

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Frank Press and Dr. Robert M. White are chairman and vice chairman, respectively, of the National Research Council.

Support for this project was provided jointly by the Carnegie Corporation of New York and the National Research Council.

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Washington, D.C. 20418

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NATIONAL ACADEMY OF SCIENCES

2101 CONSTITUTION AVENUE, NW WASHINGTON, D. C. 20418

OFFICE OF THE PRESIDENT

March 13, 1992

Dr. D. Allan Bromley
Assistant to the President for Science and Technology
Executive Office of the President
Office of Science and Technology Policy
Washington, D. C. 20506

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1. The national security, economic, and scientific interests of the U.S. can significantly benefit by expanded cooperative programs in the next several years that provide new research opportunities for critical FSU weapon scientists and the best FSU non-weapon scientists. The existing $400 million that Congress appropriated pursuant to the Nunn-Lugar Act (the Soviet Nuclear Threat Reduction Act of 1991) within the Department of Defense (DOD) budget is an appropriate source for funding many of these programs this year.

2. Criteria for funding through the new International Science and Technology Center proposed by Secretary Baker and Foreign Minister Genscher should include a broad definition of "weapon scientists and engineers," including relevant specialists at academic and research institutes who have worked on Soviet military R&D efforts. Special attention must, of course, be given to those specialists with critical weapons knowledge and skills. Center-supported proposals that are collaborations of FSU weapon scientists, FSU non-weapon scientists, and U.S. researchers would be the most effective means for achieving U.S. goals of shrinking and redirecting FSU weapon R&D programs and in increasing the transparency of FSU weapon laboratories.

3. In addition to the funds available in this and future fiscal years for key FSU weapons scientists and engineers through the new Center, funding at least on the same order of magnitude should be made available for programs outside the Center for FSU non-weapon scientists and engineers. Thus, at least $25 million for weapon scientists through the Center and $25 million for non-weapon scientists through other programs are needed in this fiscal year; even more would be appropriate considering the urgency of the

situation and available opportunities. Expanded funding should be made available in future years as justified through reviews of the programs. Awards should be based on scientific merit and potential contributions to U.S. objectives.

4. The extramural research programs of the National Science Foundation (NSF), the National Institutes of Health (NIH), the Department of Energy (DOE), and the Office of Naval Research (ONR) offer the important opportunity of scientist-to-scientist collaborations, which can be implemented rapidly. U.S. researchers know the best specialists in the FSU in their fields who would make excellent research partners. Funds should be allocated to these agencies (from the $25 million for non-weapon scientists) for use by their grantees for the purpose of direct scientist-to-scientist collaboration. U.S. researchers could provide travel funds, short term stipends, reagents, and spare parts from their supplemented grants. Joint publications would result from these activities.

5. A portion of the new funding for non-weapon scientists should also be made immediately available through the nine existing intergovernmental agreements that support civilian research and development (R&D) between the U.S. and FSU. This new funding would be added to existing cooperative programs of the NSF, NIH, DOE, USGS, EPA, NRC, NASA, and other federal agencies. This is an effective mechanism for near-term impact in terms of improving collaboration with competent scientists in the FSU on projects of interest to the U.S.

6. Existing procurement regulations and other administrative guidelines inhibiting research contracts from U.S. agencies to research units in the FSU should be reviewed and minimized. The recent contracts negotiated by DOE with FSU research institutes in fusion research and high energy experimental physics provide useful guidance.

7. The President's proposal for assistance to the FSU in agriculture, health, and energy should be strongly endorsed. The U.S. government should examine the science and technology (S&T) needs and opportunities, including R&D needs, associated with these assistance efforts.

8. The U.S. government should promptly modify the apparent restrictive policy concerning acquisition of advanced technologies and technical expertise from the FSU by American firms, including those with large DOD contracts. Reducing U.S. governmental impediments to appropriate activities of the U.S. private sector in the FSU can have immediate impact in terms of increasing collaboration with FSU scientists and engineers, reducing the FSU military industrial complex by redirecting many of its scientists and engineers to civilian projects, and promoting improvements in the economies of the FSU republics. The U.S. government should continue its related efforts to reduce unnecessary export controls,

particularly in the fields of computers and telecommunications, in close consultation and coordination with its CoCom partners.

9. Additional funding from anticipated foreign aid programs and the $400 million could be effectively used to facilitate conversion of FSU non-nuclear military technologies to civilian applications through such mechanisms as providing venture capital for U.S.-FSU projects, supporting feasibility studies by U.S. firms interested in investing in conversion projects, and providing technical assistance to FSU firms that are assessing marketing and technical opportunities for reorienting military technology to civilian applications.

10. As part of the U.S. economic assistance program to the FSU, the U.S. government should consider high technology R&D as a target for investment support. Such an effort would build on the emerging entrepreneurial abilities of FSU scientists and engineers while stimulating high value-added commercial activity.

11. The U.S. should strongly encourage FSU authorities to promptly enact legislation concerning real property ownership rights and intellectual property rights; to eliminate tax on foreign currency coming into FSU to support S&T; and to continue on the path to ruble convertibility and privatization.

12. A special fund of $50 million to $100 million should be established to help replenish and refurbish equipment, journals, and books used in FSU laboratories of special importance. The U.S. should take the lead in obtaining the necessary funds from bilateral and multilateral assistance agencies.

13. The U.S. representatives to international organizations (e.g., World Bank, UNIDO, FAO, WHO, UNDP, OECD, NATO) should urge greater support through these organizations for FSU S&T.

14. American and FSU specialists should undertake evaluations of FSU capabilities in selected areas of science and engineering of particular U.S. interest to assist in targeting cooperative activities and in utilizing the capabilities of unique FSU facilities and data banks of special importance.

15. Significantly expanded cooperation in environmental R&D would support U.S. goals of sustainable growth in the FSU and would enhance international efforts to understand global change.

Past U.S. Efforts Provide a Point of Departure for Expanded Programs

Many intergovernmental S&T agreements are hindered due to uncertainties regarding FSU collaborators. Air fares for FSU participation inhibit business as usual, and some important aspects

of S&T are not being addressed. Nevertheless, some of these agreements, as well as the extramural programs of some agencies, provide mechanisms for identifying and funding programs of great importance, and the partnerships within the FSU can be sorted out very quickly. For example, the programs of NSF, NIH, DOE, and ONR are well-suited to respond to the needs of basic research of interest to U.S. scientists, while programs of mission agencies such as EPA, DOE, USGS, and NASA provide mechanisms for Americans to gain access in a highly cost-effective way to important FSU specialists and facilities of direct interest to the programs of these agencies.

U.S. businesses are prepared to take advantage of many technical opportunities in the FSU, but many hesitate due to uncertainties regarding U.S. policies on technology transfer as well as inadequacies in the legal/economic framework within the FSU. Meanwhile, competitors from Germany and other countries receive stronger financial incentives from their governments and are gradually establishing business alliances with many of the most promising organizations in the FSU.

The new Center for support of FSU nuclear weapons scientists should offer many opportunities for FSU specialists to redirect their activities to civilian purposes and thereby shrink the size of the FSU military R&D effort. It also provides a base for rapidly expanding cooperative programs in other areas of science and technology.

Many FSU S&T activities are linked to programs of international organizations in which the U.S. plays an influential role (e.g., World Bank, UNIDO, FAO, WHO, NATO, OECD), and these organizations are in a position to direct additional resources to the FSU with encouragement from the U.S.

Several major U.S. private foundations are interested in helping to preserve the science and technology community in the FSU, and they can launch new programs very quickly. Their resources are limited, but they should be encouraged and complimented for their efforts to select special niches for their support (e.g., providing journals and electronic mail equipment).

American scientific professional societies are also rising to the challenge and creating innovative programs to assist their colleagues in the FSU. The American Astronomical Society has raised funds from its members to provide small research grants to FSU astronomers. The American Association for the Advancement of Science, with support from the MacArthur Foundation, will be providing help in maintaining journal subscriptions. Individual American scientists are seeking mechanisms for donating their journals and used equipment to FSU colleagues.

The National Academy of Sciences, National Academy of

Engineering, and Institute of Medicine are examining ways in which they can contribute to the revitalization of FSU scientific and engineering capabilities. The National Academy of Sciences has already changed its long-standing cooperative program to ensure that FSU participants are selected on the basis of evaluations by their American colleagues. In addition, consideration is being given to: undertaking evaluations together with FSU colleagues of FSU capabilities in important fields of science and technology (including those of potential commercial importance such as materials), sponsoring workshops for FSU and American researchers to develop collaborative research agendas and proposals in selected subfields, and working with counterpart organizations in Europe to improve coordination of western initiatives. The American Academy of Arts and Sciences is also pursuing, through a recently-created special committee, ways in which it might help the FSU communities in the sciences, social sciences, and humanities.

Special Considerations for New Programs

Programs supported by the United States should be based on mutual benefit and should not simply be responses to the economic plight of FSU specialists and institutions. Programs should be a mix of: (a) collaborative projects developed jointly by FSU and U.S. researchers and/or teams of researchers with the projects selected competitively on the basis of merit and (b) targeted projects designed to preserve and utilize the capabilities of unique FSU facilities and data banks of special importance to U.S. science and technology interests. Coordination of bilateral approaches with activities of other countries and international organizations is important and synergistic, but should not slow down the U.S. response. Whenever possible, implementation should begin within the next several months. Programs should be subject to careful review after the first year, with attention both to technical payoff and financial accountability. If benefits of these programs to the U.S. are as high as we believe they will be, the programs should be supported with increased funding over the next several years.

Other Promising Approaches that Deserve Careful Study

The proposal of Representative George Brown to establish a binational science foundation between the FSU republics and the U.S. is a welcome initiative with the possibility for long-term mutual benefit. The Brown proposal deserves careful study by the U.S. government. The policies and activities of the Export Import Bank, OPIC, and the Trade and Development Program might offer greater incentives for American investments in the FSU. Expanded authorities of U.S. agencies to enter into contracts with FSU organizations, when such arrangements are particularly beneficial to the missions of the agencies, can be very important; and the administrative details need to be carefully worked out.

In conclusion, we appreciate very much your soliciting the advice of the U.S. science and engineering community on these important issues. We hope that the recommendations and comments in this letter and in the four working group reports will be helpful to you in developing U.S. initiatives to respond to challenges and opportunities provided by developments within the FSU S&T community.

We would like to thank for their efforts in leading three of the working groups: Dr. James Wyngaarden, Foreign Secretary of the National Academy of Sciences and Institute of Medicine (Basic Research Working Group); Dr. Gerald Dinneen, Foreign Secretary, National Academy of Engineering (Commercialization of Technology Working Group); and Dr. Alvin Trivelpiece, Director, Oak Ridge National Laboratory (Interdisciplinary Problem-Oriented Research Working Group). We would also like to thank for their help in organizing the meeting and preparing this report the Office of International Affairs of the National Research Council (Dr. William Colglazier, Executive Director; Mr. Glenn Schweitzer, Director, Office for Central Europe and Eurasia; Dr. Gary Waxmonsky, Associate Director, Office for Central Europe and Eurasia; and Peter MacDonald and Kathleen Trivers of their staff.) We are especially grateful to Dr. David Hamburg and the Carnegie Corporation which, along with the National Research Council, provided financial support for the meeting.

We believe that it is in U.S. interest to act immediately and aggressively. If we or the National Research Council can provide you with any further assistance, we would be pleased to do so.

Sincerely,

Dr. Guyford Stever
Commissioner
Carnegie Commission
on Science, Technology
and Government

Dr. Frank Press
President
National Academy
of Sciences

Dr. Ashton Carter
Professor
Harvard University

REPORTS OF WORKING GROUPS

AND

PARTICIPANT LIST

Working Group on Weapons Scientists and Engineers

The working group addressed the US interest in programs of assistance and cooperation with weapons scientists and engineers (S&Es) in the FSU and considered how such programs might be structured for maximum effect. While the working group foresees and supports sustained programs of assistance and cooperation extending over years, the group's deliberations focused on first steps that could be taken immediately and urgently. The working group took particular note of the applicability of the Soviet Nuclear Threat Reduction Act of 1991 (the so-called Nunn-Lugar Act) to the support of such a program in this fiscal year.

The group encourages a broad view of military-related work, urging that it not be confined to nuclear weapons but encompass all military-related technical work in the FSU. Moreover, since one of the objectives of the programs of assistance and cooperation is to foster the reorientation of weapons scientists and engineers to peaceful civil work, programs should not be confined to weapons scientists only, but should extend to other types of projects covered by other working groups in this meeting.

Objectives

The working group noted that the objectives of the programs of assistance and cooperation discussed and the interests of the United States in such programs are broad and diverse. They are not completely encompassed by the familiar stereotype that involves somehow preventing an FSU "weapons scientist" from emigrating to a country that is the target of US nonproliferation policy, though that is surely an objective. The full range of US objectives includes:

1. To promote the shrinkage and reorientation to productive, peaceful purposes of weapons-related activities carried out in laboratories, institutes, and state enterprises of the FSU;

2. To stabilize the situation of weapons scientists and to anchor them in peaceful projects designed to benefit their own homeland so they are not tempted or forced to seek employment or markets outside the FSU and thus to contribute to proliferation;

3. To assist the transition to democratic institutions and a market economy in the FSU by encouraging its S&E communities to conduct basic and applied research aimed at addressing pressing social needs and economic development;

4. To promote access and transparency in the hitherto closed weapons complex of the FSU;

5. To promote joint research of mutual benefit between S&Es in the FSU and American or other western partners; and

6. To demonstrate the respect of the American people and the international scientific community for the considerable technical capabilities of FSU S&Es.

General Characteristics of Needed Programs of Assistance and Cooperation

The programs should support projects that satisfy the above objectives and also the following criteria:

1. The projects are technically sound.

2. The results of research will address pressing social and economic needs of the FSU and/or are of mutual benefit to the FSU and the United States.

3. The proposing entities can demonstrate their ability to accomplish the work.

In terms of technical content, the working group judged that useful projects of technical assistance and cooperation could probably be devised in the areas of:

-- secure and environmentally safe interim storage and eventual elimination of nuclear weapons and other weapons of mass destruction;

-- storage and disposal of special nuclear materials;

-- nuclear safety, including biological effects of low-level ionizing radiation;

-- environmental monitoring and cleanup, including cleanup of military-related facilities;

-- civil energy, transportation, and telecommunications;

-- fundamental research and associated instrumentation in such fields as high-energy physics, nuclear physics, fusion, plasma physics, geophysics, and computer science; and

-- social systems science, technology assessment, and public policy (similar to the types of studies conducted by the US Office of Technology Assessment or the International Institute for Applied Systems Analysis that are focused on the relationship of science and technology to society).

The working group believes that useful assistance and cooperation projects can take many forms and that it would be premature at this time to focus them on a single model type. Useful projects might involve collaboration of FSU weapons laboratories/institutes/enterprises with selected US Government

laboratories, industry, or universities; three-fold collaboration among FSU weapons and non-weapons establishments and US partners; and projects undertaken individually by FSU weapons establishments and monitored by US entities. (The group recommends that when there is no US partner in a project, a US monitor be named to certify that the work proposed is being accomplished.) Likewise, projects might be proposed by FSU laboratories or other institutions or proposed by individual scientists or groups, provided that they can demonstrate an ability to carry out work.

While both individuals/small groups and institutions in the FSU should be encouraged to develop proposals (and some groups might want to separate themselves from their institutions and establish new civil/commercial entities), maximum effect will be achieved if weapons-related institutions are engaged as institutions in some programs, and if cooperative programs contribute to reorienting their programs and infrastructures away from military work to peaceful purposes. Thus, unlike other types of assistance and cooperation discussed by the other working groups, collaboration with FSU weapons communities requires emphasis on involvement of institutions (and their accompanying infrastructures) in addition to individual investigators. There are good reasons for this difference: first, emigration abroad of engineers and technicians from the FSU weapons establishment is no less serious than the emigration of key scientists; second, the infrastructures of the weapons laboratories are very well developed (generally better than those of the civilian sector); third, in many cases the shrinkage of the FSU weapons program will be promoted better by involving entire institutions (key scientists and infrastructures) in non-military activities. Identification of joint, multilateral, or FSU-only projects worthy of support should take account of these special circumstances. The working group believes that there are indeed worthy projects that take this form.

However, the working group is aware of the necessity to embolden investigators to act independently of existing bureaucracy and management. Thus, US-supported programs should also emphasize projects proposed by individual investigators and by new civil/commercial enterprises spun off from military enterprises, and such projects with spinoffs should be encouraged in addition to institutional projects.

Starting the Process: Catalytic Efforts

The working group recognized the very fluid situation in the FSU, the historic isolation of FSU weapons-related scientists, and the fact that western scientists are just beginning to explore the scientific strengths and weaknesses of the former Soviet system. Thus early attention must be given to the processes of expanding access to the FSU weapons establishment, promoting contact between potential collaborators, and developing project proposals.

These catalytic efforts could begin immediately and could include grants to support problem-focused workshops, joint conferences, and site visits; conceptual design of projects, test beds, and pilot projects; and electronic mail and other elements of telecommunications infrastructure (e.g., direct links via satellite dishes located at key collaborating facilities in the FSU). The working group recommends that such activities begin immediately. They should not await determination of the overall future scope of the program, and indeed they are a necessary prerequisite to such a program.

The working group did not attempt to estimate the dollar volume of useful projects that would likely develop in such a program but believes the program should not be confined to the $25 million under discussion in connection with the Center (see below).

The Moscow Center

The United States, Russia, and Germany (through the EC) have agreed to establish an International Center for Science and Technology in the Moscow area to serve as a "clearinghouse" for research projects involving entities in the FSU that have special weapons expertise. Discussion of the ground rules and modus operandi of the Center is just beginning. The working group was generally impressed with the preliminary US plans for the Center and urges prompt commitment of at least $25 million of Nunn-Lugar funds to the Center and prompt establishment of the Center. The working group makes the following additional observations.

The Center seems to be an appropriate vehicle for the "catalyzing effort" described above, and could become an institutional mechanism for the program of sustained assistance and cooperation with FSU weapons entities in future years. The Center's location in Moscow is important, given the need to gain on-the-ground acquaintance with the weapons enterprises and scientific communities of the FSU. The Center also can serve as "matchmaker" between scientists and appropriate projects and funders. Finally, the Center promises to engage the resources of European and possibly Japanese participants, which the working group regards as highly desirable. However, the working group believes that the Center should not be the sole or exclusive vehicle for such cooperation.

Present plans call for the Center to act on proposals in two steps. In the initial step, projects will be vetted for appropriateness and merit by the Center staff and board. In the second step, funders (governments and private parties) will choose projects for support on a case-by-case basis. The Center itself will have no power to make funding commitments apart from the national representatives on its board. The working group is concerned that unless some funds are committed to the Center from the beginning, the Center will be seen as a needless and powerless

middleman between proposers and funders rather than as a clearinghouse. More importantly, the establishment of the Center will not reflect the commitment and seriousness of purpose of its founding governments. The working group therefore recommends creation of a Director's Fund of committed funds, comprising perhaps one quarter of Center funding, to be obligated by the Center itself.

Finally, the working group noted that in order for projects to fulfill the objectives outlined above, involved scientists will need to make multi-year commitments to them. This commitment in turn calls for Center funding that extends beyond this year's Nunn-Lugar appropriation. The United States therefore needs to ensure continuing funding commitments to the Center. Additionally, the Center should be capable of making multi-year commitments.

Potential Role of Existing Bilateral Agreements

Several of the nine existing science and technology agreements also provide a mechanism for engaging FSU weapons S&Es in collaborative activities. For example, the agreements administered by DOE/NRC, NSF, and EPA could involve participation of FSU specialists who previously were not given the opportunity to collaborate in areas of obvious importance to these agencies.

Additional Steps in the United States

The working group believes that collaborative projects involving FSU weapons activities and western partners (public or private) will emerge spontaneously if veils of secrecy are lifted in the FSU. Projects of mutual advantage might even be supported through barter agreements between the collaborating parties. But substantial bureaucratic and legal barriers exist to such spontaneous collaboration in the United States, and the working group recommends that a complete review of such barriers be undertaken urgently to remove all those that derive from the cold war period and no longer serve US interests.

The working group also notes that legal counsel in different agencies is interpreting the Nunn-Lugar legislation in different ways and in a manner that seems excessively cautious and strict, especially regarding the so-called restrictions. Government-wide consensus on these interpretations should be reached soon, so that they do not remain a barrier to action.

Additional Steps in the FSU

The working group believes that for the proposed types of programs to succeed, the Russian government (and, where applicable, other governments of the FSU) must take the following steps, which are preconditions to success:

1. Participating weapons facilities need to open up to outside visitors and collaborators, limiting restricted security areas to the maximum extent possible ("higher fences around smaller areas").

2. Weapons laboratories must relax controls over individual scientists and engineers so they can communicate directly with western collaborators.

3. Participating FSU weapons facilities need to allow establishment of electronic communications with the outside.

4. Participating weapons facilities need to make laboratories, instrumentation, and other infrastructure available for non-weapons work. Access to that infrastructure will often be the principal attraction for western collaborators.

5. FSU governments need to establish appropriate tax treatment for foreign currency funds provided to institutions as part of this program.

Working Group on Basic Research

The working group on Basic Research proceeded from the position that it is in the economic and national security interests of the United States to preserve the strong scientific and technical capability of the Former Soviet Union (FSU) in order to sustain the transition to an open society and a market-oriented economy.

The FSU is in crisis. Dramatic changes in the region, although undoubtedly positive in a political sense, leave scientists in a precarious niche since there is very limited money for science. Salaries for scientists within and outside the academy structure are pitifully low, and FSU scientists are becoming increasingly isolated from their international colleagues owing to the virtual absence of hard currency necessary for western journals and for travel to meetings outside the FSU. Outstanding research groups are disintegrating, and some of the best scientists of all ages are leaving for temporary, and in some cases permanent, positions abroad. If the exodus of FSU scientists continues, and if FSU science and technology wither and flounder, it is difficult to see how the FSU nations can prosper. Science and technology, together with capital and free social institutions, propel a modern economy.

This situation is clearly a security issue for the United States. The United States has already invested huge resources in the "containment" of communism, and a comparatively small investment now could be very effective in stabilizing the FSU scientific establishment. This investment may also encourage scientists who have left for temporary positions to return to assist in the stabilization process. In our view, international disaster could ensue if the present political and economic restructuring of the FSU were to fail and new totalitarian regimes were to reemerge. An enlightened program that would help to stabilize FSU science and technology would make an important, perhaps decisive, contribution to the future of these burgeoning democracies.

Even though many prominent scientists have left the FSU, large numbers remain. The major scientific resources are to a large extent still intact and now free from bureaucratic strangleholds. They are free from undesirable interference, free to enter into collaborative agreements, and free to accept financial support open to accounting supervision. The cost of operation in the FSU (salary, maintenance, etc., but excluding equipment) is much less than the cost of comparable activities in the West. Moreover, the FSU possesses unique assets such as research ships, astronomy installations, botanical collections, and historic libraries, as well as world-class research groups.

The working group recommends that the United States undertake a number of initiatives that will help to stabilize science and technology in the FSU. We have based these recommendations on the concept of mutually advantageous binational collaboration. There are many competent and well known FSU scientists and high-quality research groups with whom American scientists could form collaborative research and technical projects. Such projects should not be viewed primarily as assistance programs; the working group is not proposing a welfare system for FSU scientists. We are proposing an expansion of international collaborative efforts, the results of which could be of substantial value to the American people and the American economy. There are, in fact, critically important projects to which both partners can make significant, complementary contributions.

The working group recommends identification of high-quality individuals and groups with whom to collaborate directly. Although many such are known to the American scientific community, the working group recommends that small teams of American scientists visit the FSU to assess first hand the current situation in institutes and university departments. Decisions regarding feasibility of productive collaborations should be based upon the judgment of such teams. These visits would also help to identify emerging younger researchers who could participate in collaborative activities, but may not yet be well known to American scientists.

The working group recommends that US contributions to collaborative research be principally in the form of supplies, such as equipment, journal subscriptions, travel funds, and communication systems (for example, e-mail), rather than direct transfer of currency or salary support (except during brief fellowships outside the FSU). Furthermore, the working group recommends that any form of assistance be provided directly to the individual scientists and groups, rather than to institute administrators or academy officials for distribution. Whenever possible, cooperation between scientific institutes and educational institutions in the FSU should be encouraged.

Decisions regarding potentially advantageous collaborations should be based upon principles of merit review now thoroughly familiar to US scientists. However, in recognition of the newness of such concepts to FSU scientists, merit review should give predominant weight to track records rather than to "grantsmanship." In addition, the application process should be kept relatively simple (short applications) and the review process should be expedited.

The discussion focused on an emergency, short-term approach to stabilizing science in the FSU and establishing collaborative projects between FSU and American scientists. The situation is urgent, and we believe that measures should be taken during this fiscal year. American support of selected FSU individual

scientists and research groups that qualify for extensions of peer-reviewed US research projects could be highly beneficial to both countries and would send a message of hope to FSU scientists far beyond the quantitative scope of initial efforts.

It is in our view equally important that the United States pay close attention to scientists in the basic physical, chemical, geological, biological and mathematical sciences. Clearly, American efforts to preserve science should not focus exclusively upon redirection of scientists who have participated in the creation and production of weapons of mass destruction.

Recommendations for the US Government

Within the next six months

1. Immediately allocate between $5,000,000 and $10,000,000 of additional funds for supplements to existing American grantees of agencies such as, but not limited to, NIH, NSF, DOE, and ONR. Such supplements might come from the $400,000,000 authorized by the Nunn-Lugar Act through interagency transfer to the research agencies or from other sources if more appropriate. These supplements will allow the grantees to initiate or expand collaborative activities with FSU scientists and rapidly provide some assistance. By using the best features of the NIH and NSF mechanisms to support the collaboration of American scientists with FSU scientists, immediate amplification of funds may allow these models to be expanded many-fold in the current fiscal year. Such an effort would represent a significant response to the present emergency and send much needed encouragement to beleaguered FSU scientists who are a main resource in rebuilding the societies and economies of the FSU. In addition, such efforts would substantially expand research projects of benefit to the American people.

2. Immediately develop an administrative mechanism for transfer to FSU scientists of equipment from US laboratories that has been displaced by more recent acquisitions and that remains capable of producing valuable research results. Such equipment should only be transferred to FSU scientists who qualify for collaborative projects with US scientists and who can effectively use the equipment in the approved collaborative research, thus ensuring that the US investment will further benefit domestic research objectives.

3. Facilitate the issuance of multiple-entry US visas for non-weapons scientists and engineers, such as are now offered to members of the business community, unless there are overriding concerns over potential violations of export controls. The Department of State should give special consideration to FSU scientists returning home for short

visits to assist in the improvement of working conditions in the FSU.

The near term

1. Support Congressman George Brown's proposal for a binational foundation, with the modification that the foundation be in the form of a withering endowment of 10 years. At the end of this period, both sides should evaluate the state of FSU science to determine if the continuation of this type of support for research cooperation is necessary and mutually beneficial. In order for a binational science foundation to have significant impact, it should be capitalized at a minimum of $200,000,000, with both interest and approximately 10 per cent of principal available for support of peer reviewed research projects each year. Many of the experiences and lessons of the US-Israel Binational Science Foundation (as well as experiences of the Binational Agricultural Research and Development Foundation and Binational Industrial Research and Development Foundation) can serve as general guidelines for the establishment and management of the proposed US-FSU foundation.

2. Initial assistance should be offered in the form of laboratory equipment, development of improved means of communication, and travel, but not in the form of salary assistance. When a banking system with appropriate accountability is in place, the United States should not rule out efforts to transfer foreign currency directly to FSU scientists for support of research programs.

3. Encourage efforts of non-governmental organizations that are seeking ways to assist FSU scientists by supporting their research.

The long term

1. Cooperate and coordinate with activities initiated by other governments, scientific societies, the European Community, the World Bank, and international organizations involved in science and technology.

2. Sponsor programs on the management of science for FSU research administrators and scientists. Such programs should include an introduction to peer review procedures and grant management for many colleagues throughout the FSU.

Recommendations for FSU Governments

Within the next six months

1. Encourage FSU scientists now working in the West to return

to the FSU to work with other scientists, and assure freedom to travel back to their jobs outside the FSU. The offer of a leave of absence is in the best interest of the home institution, and job security should be assured even beyond the one-year period of absence currently recognized by the Russian Academy of Sciences, at least for a portion of established FSU scientists.

2. Guarantee continued salary support to FSU scientists involved in collaboration with American scientists throughout the period of the collaboration.

3. Provide internal travel support to FSU scientists.

4. Provide tax exemptions for hard-currency grants.

5. Facilitate the issuance of multiple-exit documentation for FSU citizens working in the West who wish to return for frequent visits to assist their home institutions and/or scientific colleagues.

The near term

1. Assist in identifying promising young researchers who are not yet known to American scientists (i.e. in basic sciences such as genetics that are essential for advances in agriculture and medicine).

2. Establish a clearing house or secretariat that can assist FSU scientists to make contact with organizations, programs, and scientists in the United States and other countries.

The long term

1. Implement promised reforms as quickly as possible, including the reform of tax laws, intellectual property rights, and education.

2. Encourage academies, universities, and industries to establish cooperative linkages and to bridge the non-interactive traditions of the previous regime.

Recommendations for Non-Governmental Organizations

The near term

1. Scientific societies (national and international) should be encouraged to ask members to assist FSU scientists by sending journals, expanding electronic mail networks (especially outside Moscow), and providing funds for travel to meetings.

2. NGOs can help to identify individual scientists and research groups that are leaders in their fields with whom collaborative research could be established.

3. Private foundations and professional societies can help to publicize opportunities for collaboration of FSU scientists with American scientists.

4. Private organizations should establish mechanisms for the transfer of hard currency to the FSU, when accountable banking systems have been established.

The long term

1. NGOs and scientific societies are encouraged to identify and support similar organizations in the FSU and to promote their growth.

Recommendations for NAS/NAE/IOM

The NAS had more than 30 years of experience in cooperating with the Academy of Sciences of the USSR. The Academy complex should build upon this experience of cooperation with FSU institutes and scientists in the following ways:

The near term

1. Make recommendations to the US and FSU governments on new approaches to technical assistance based on experiences with the Support for East European Democracy Act.

2. Send small exploratory groups to the FSU in as many different fields as possible to assess the quality and viability of small research groups and the opportunities for productive collaboration.

3. Take an increasingly active role in counseling prospective American collaborators on available opportunities and programs.

The long term:

1. Establish a bilateral advisory committee to assist the FSU and US Governments to implement new programs of cooperation. The committee would include FSU scientists who know western science well. The FSU members of the committee should extend beyond the established academies of sciences in the FSU and should be supported by the FSU governments. Among its activities, it could assist in defining a framework for intellectual property rights.

2. Serve as a catalyst for assembling national and international experts to participate in peer/merit review of proposals of FSU scientists. Provide guidelines similar to those established and tested over time by NSF, NIH, and other US funding agencies.

Working Group on Commercialization of Technology

The working group included senior executives from companies with strong business interests in the FSU, specialists with experience in transferring FSU technologies to American firms, economists specializing in FSU developments, representatives of US federal agencies with strong engineering interests, and representatives of engineering societies.

There should be considerable opportunities for establishing commercially viable enterprises in the FSU. The FSU has developed many good technologies, particularly in military enterprises (e.g. opportunities for application of BW capabilities to vaccine production and for new applications of aerospace technologies). Many young FSU scientists and engineers have exhibited considerable grass roots entrepreneurship, although on occasion some of their enthusiasm may be misdirected. Also, there is widespread interest in the FSU in working with American businesses and learning western approaches to a market economy.

However, the paradox is that relatively few commercial arrangements have been made between American and FSU organizations. Companies of other countries seem to be more successful, particularly firms from Germany and recently Korea and Japan. This limited American involvement is particularly significant since the window of opportunity for joint ventures and other types of business alliances may be closing either because firms of other countries simply usurp the most attractive joint venture opportunities or existing FSU capabilities erode to the point that they are no longer interesting.

There are few generalized conclusions and recommendations that apply to all industrial sectors and all types of organizations. For example, large firms have specialized staffs for identifying business opportunities in the FSU whereas small companies cannot afford such specialization. Firms involved in development of hardware have different concerns than software firms. Also, service companies use different criteria than manufacturing companies when considering investment commitments. Nonetheless, a few desirable actions that are applicable on a broad basis and would be beneficial to both American and FSU interests can be identified.

Much of the discussion centered on foreign investment, but the importance of FSU efforts to commercialize their own technologies for the internal market was also highlighted. While many technologies developed with or without foreign partners can potentially serve both the internal and global markets, there are special considerations for FSU firms attempting internal commercialization without access to the expertise of foreign partners.

Throughout the discussions, the complexities of understanding

the many factors that affect business decisions or should affect decisions within the FSU were very apparent, and the need for more extended consideration of the likely impacts of any individual measure that is proposed was recognized. Adding to the complications are the uncertainties within the FSU military industrial complex associated with the process of conversion. Conversion affects not only individual firms and local areas but in some cases can have dramatic effects on large geographic regions where the defense industry has become the only source of possible employment for hundreds of thousands of workers.

Four suggestions for immediate consideration emerged from the discussions:

-- The FSU must clarify real property ownership rights as a first step toward any type of meaningful market economy.

-- If US firms are to become more seriously engaged in commercialization of FSU technologies, and especially technologies that have been developed within the military sector, the US government must clarify its policy, and particularly the policy of DOD, toward acquisition by US firms of high technology from the FSU.

-- A portion of the $400 already earmarked for dismantling of the FSU weapons complex (e.g. $25 million in addition to the $25 million allocated for reorienting the activities of the nuclear weapons scientists) should be made available to facilitate conversion of FSU non-nuclear military technologies to civilian applications through such mechanisms as providing venture capital for US-FSU projects, supporting feasibility studies by US firms interested in investing in conversion projects, and providing technical assistance to FSU firms that are assessing marketing and technical opportunities for reorienting military technology to civilian applications.

-- The US government should review its policies for sharing risks and financial burdens with American firms interested in investing in the FSU in the near term, including the policies, programs, and financial capabilities of ExIm Bank, OPIC, and the Trade and Development Program.

These and other suggestions for near-term actions by FSU and American institutions are set forth below.

Suggestions to Governmental Organizations of the FSU

The Legal/Regulatory Framework

1. Real property ownership rights need to be clarified as soon as possible.

2. The efforts that have been underway for many years to establish, implement, and enforce an appropriate legal framework for intellectual property rights should be revitalized.

3. Special steps are needed to ensure that regulatory agencies (e.g. organizations with responsibilities similar to those of FAA and FDA) do not become bottlenecks during the transition from Soviet to other institutions.

The Economic/Financial Framework

4. Establishment of a banking system that can serve as a reliable source of investment capital, including venture capital for innovation, and at the same time can help ensure the integrity of financial arrangements among FSU institutions and between FSU and foreign organizations deserves high priority.

5. Current efforts toward convertibility of the ruble should continue to receive strong emphasis.

6. Systems that encourage and reward economic competitiveness among firms should be strongly supported.

7. The current policy of heavy taxation on flows of foreign currency into the FSU should be modified.

Physical and Technical Infrastructure

8. Greater attention is needed at the national and local levels to providing access to electricity, heat, water, transportation, communication, waste disposal, and other services required for enterprises to operate on a competitive basis.

9. With the devolution of centralized responsibilities from the FSU to the independent states, special efforts are needed to ensure that there is no backsliding on the development and implementation of appropriate industrial standards which are consistent with international standards.

Attitudes and Approaches toward Science and Engineering

10. Scientific and engineering entrepreneurs, including key specialists spinning off from leading FSU research institutes, should be encouraged and not considered as an internal brain drain.

11. The size of many FSU research, development, and production organizations should be reduced to improve their economic competitiveness.

12. New systems of rewards are needed throughout the research establishment to foster projects that result in outputs which have clear relevance to economic needs of the FSU in addition to

resulting in publishable papers.

13. Greater attention to economics and management is needed in higher technical education institutions.

Suggestions for Agencies of the US Government

For NSC/OSTP/State/DOD/Commerce

1. US policy toward acquisition by American firms of high technologies from the former Soviet defense industry should be clarified, and American defense firms should be given a clear signal regarding those activities which are acceptable to DOD. This policy should be formulated on the basis of a careful evaluation of the many US interests that are involved, including the importance of high technology to a successful FSU transition to an open market economy, and the possibility that the current window of opportunity to acquire FSU technology may close as other countries increase their interest in FSU technologies.

2. A continuing relaxation of US export controls should be considered, particularly with regard to computer and telecommunication technologies.

For ExIm Bank, Overseas Private Investment Corporation, Trade and Development Program, AID

3. Consideration should be given to providing financial incentives through risk sharing and other approaches that will encourage American investment in the FSU. Among the approaches are support (through feasibility studies and guarantees) of local production of drugs and food processing equipment, possibly within the context of humanitarian assistance, export guarantees for investments in manufacturing equipment installed in the FSU, and encouragement of subcontracting of American firms with FSU institutions.

For Commerce/NSF

4. Cooperative research projects involving American industrial scientists spending time in the FSU and FSU scientists in the US should be encouraged.

5. Benchmark evaluations of selected subfields of FSU science and technology with potential for early commercialization should be carried out jointly between American and FSU specialists and institutions as a basis for targeting FSU internal financial support and American cooperative projects.

For State/Commerce

6. With the disappearance of services provided to foreign business by many agencies of the FSU, the US Government should strengthen

its supporting administrative infrastructure in the FSU to facilitate American business interests.

For State/NASA

7. A review of the opportunities for major collaborative space programs, including programs with commercial significance, should be undertaken before the FSU capability to participate disappears.

For AID/Commerce

8. Assistance in identifying opportunities for redirecting the enormous engineering capabilities of the military industrial complexes to commercially viable services and products, and particularly identification of marketability of services and products at home and abroad, is needed.

9. Assistance in the field of research management at the institute, laboratory, and enterprise levels is needed. This is in addition to the well recognized need for assistance in basic economics and cost accounting procedures in managing privatized enterprises. A major US initiative in this area could build on related US experiences in strengthening management capabilities in Central Europe, China, and other parts of the world.

Suggestions for US Industry

Becoming better informed of opportunities and impediments

1. Participation in trade fairs and exhibitions and in other activities organized by the FSU can open many doors in the FSU.

2. Special meetings devoted to developments in the FSU organized by trade and professional associations and other interested business organizations can help identify opportunities and problems.

3. Participation in consortia of business firms that establish offices in the FSU may be helpful to some companies.

4. Firms should take advantage of trade offices established in the US at the federal and state levels which follow developments in the FSU.

5. Business opportunities should be explored beyond Moscow -- throughout the Russian Federation and in other newly independent states as well.

Considerations for technology-based companies

6. Manufacturing and engineering staffs should explore possibilities for subcontracting in the FSU.

7. The experiences of companies which have established direct linkages among engineers and which have successfully defined subcontract tasks for component development should be reviewed by other companies with related interests.

Steps to improve the investment environment

8. Companies should bring problems and relevant experiences to the attention of the US Government with specific suggestions as to how to reduce legal, regulatory, financial, and other barriers to doing business in the FSU.

Suggestions for the NAS/NAE/IOM

1. The Academy Industry Program should consider organizing a meeting in Washington on commercialization of technology in the FSU.

2. The Academies should consider undertaking an evaluation together with FSU counterparts of FSU capabilities in one or two selected subfields of technology of potential commercial importance to the FSU (e.g. materials science).

3. The Academies should work with counterpart organizations in Europe to improve coordination of western initiatives related to commercialization of technology in the FSU.

Working Group on Interdisciplnary Problem-Oriented Research

The former Soviet Union (FSU) is undergoing a wrenching transition from a centrally planned to a market economy. In this process, it is imperative that the FSU successor states retain an ability to function in a complex technical world with the tools of a modern state. The FSU had a large and complex science enterprise that served its interests adequately. In the process of transition to a new economic structure, this enterprise is under serious threat of being dismantled in such a way that it may not recover. Without a suitable science and technology (S&T) base, the transition to a properly functioning, market economy will be difficult if not impossible. It is in the interests of the United States and of the entire international community that the S&T enterprise of the FSU be preserved and, as appropriate, reoriented, in such a way as to support the transition to a peaceful, modern, technology-based economy.

Part of the S&T enterprise of the FSU involves many areas of applied and interdisciplinary science and technology. These include management of biological diversity, preservation of the world's ocean resources, assessment of risks of earthquakes, stewardship of the Arctic regions, safe utilization of nuclear power, and the possible development of fusion power.

Collaboration between the United States and the FSU in many of these areas has a long history. For nearly twenty years, US mission agencies have collaborated with Soviet counterparts under a number of executive agreements. Known collectively as "S&T agreements," these instruments have facilitated bilateral collaboration in a number of areas including public health, environmental protection, space exploration, transportation, and energy. Activity under all such agreements was grounded in three principles, equality, reciprocity, and mutual benefit, and funded by each agency from its existing budget. An interagency working group on Soviet science and technology, known most recently as GOSSAT and chaired by the State Department, has sought to ensure coordination among the various programs and their conformity to US policy.

In general, the steps outlined below under the heading "Prompt Action" should be initiated by US Government entities. "Evaluations" and related activities, while they should include government specialists, should be organized by the non-governmental scientific community with financial support from agency supplements. "Events" such as workshops and colloquia could be undertaken by either governmental or non-governmental sponsors. "Longer Term Programs" will require greater involvement by the private sector, academic, corporate, and philanthropic, and will depend largely on the success of activities which have gone before.

Statement of Principles

1. It is in the interests of the United States to have a scientifically and technically strong FSU, so that when the former republics complete the transition to new political and economic structures, they have the capability to participate effectively in international scientific programs and also to establish modern science and technology-based commercial enterprises.

2. An important outcome of assistance should be maximization of mutually beneficial collaboration on important international problems of energy, the environment, public health, agriculture, and natural hazard mitigation.

3. The FSU is home to priceless scientific resources: collections, facilities, archives, data sets, and unique geographical sites.

4. Indigenous capacity to understand and manage environmental and energy processes and resources in the FSU is of interest to the international community.

5. Financial assistance should involve a mix of grants/contracts to individual researchers/small groups and core support for unique research facilities.

Steps FSU Authorities Should Take

1. Waive taxation on hard currency provided through contracts and grants and duty on all equipment and supplies provided in connection with collaborative research.

2. Facilitate open and unfettered access to research sites and data.

3. Inventory and make available appropriate former government/ party facilities as FSU contributions to bilateral/multilateral centers for interdisciplinary research, education, and training.

4. Seek PL-480-type arrangements for support for research collaboration if and when suitable resources become available.

Steps US Side Should Take

Prompt Action

1. To the extent possible, modify procurement regulations or other administrative guidelines inhibiting research contracts from US Government agencies to research units in the FSU. On the condition that FSU authorities act to ensure the integrity of USG research contract fund transfers, a US mission agency should be able to contract directly with FSU laboratories when the agency finds it cost-effective to do so from current accounts.

2. Existing cooperative S&T programs with the FSU should be augmented through supplements to participating US agencies via the NSC Working Group on FSU Soviet Science and Technology (GOSSAT).

3. Defray portions of FSU hard-currency costs associated with their participation in major international or bilateral research programs (e.g., ocean drilling, IIASA) in the current year.

4. Dispatch small team(s) to assess conditions affecting the most valuable FSU scientific collections, archives, facilities, data sets, and real-time networks. The most endangered of these would be targeted for priority attention via augmentation of existing agency programs (see above).

Evaluations

1. The US scientific community should both respond to requests from FSU authorities for evaluations of specific research sectors and initiate proposals to evaluate sectors, including those which best available information suggests are deficient (e.g., resource economics, epidemiology, multi-media ecological processes).

2. In advising on or carrying out research evaluations in the FSU, US participants should strive to enhance or create indigenous evaluation capabilities and more open, representative science policy processes.

3. In prioritizing among potential foci of research evaluation, an important consideration should be the goals and priorities of the larger US assistance effort.

4. In consultation with relevant technical agencies and the US scientific community, the Assistant Administrator for Research and Development within the Agency for International Development should undertake an assessment of the S&T needs and opportunities associated with the current US assistance effort vis-a-vis the FSU in the fields of health, food, and energy (e.g., technical infrastructure for maintaining standards of food and drug purity).

Events

1. Workshops on research management and grantsmanship to be held at various locations in the FSU.

2. Colloquia on ethical aspects of human/experimental subjects.

3. Specific problem-oriented symposia and conferences (e.g., Arctic methane emissions, die-back of marine mammal populations in Bering Sea) to be held in the United States or FSU.

4. Individual support for FSU researchers invited to participate

in activities outside the FSU concerning international scientific programs of major interest.

Longer-Term Programs

1. Young investigator exchanges on multidisciplinary problems (biodiversity, energy efficiency, coastal zone management, etc.).

2. Pilot-scale demonstrations of innovative low/non-waste or energy-saving technologies.

3. Establishment of interdisciplinary research and study centers within existing FSU facilities.

4. "Mentoring" or "sister laboratory" relationships between critical FSU research facilities undergoing restructuring or reorientation and US counterparts.

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Current as of 10/28/92
(Unfinished notes of August 13, 1992 meeting with U.S. Scientists on U.S.-Russia S&T relationship.)

CONSULTATIONS ON THE US-RUSSIA SCIENCE & TECHNOLOGY RELATIONSHIP

August 13, 1992

Meeting with Scientists

Introduction

D. ALLAN BROMLEY, OSTP: This is a very important area of discussion. We have unprecedented opportunities for progress and new methods of cooperation, as a direct consequence of the meeting between President Bush and President Yeltsin at Camp David last spring. At the time we issued a joint statement committing ourselves to advancing the state of S&T in Russia by broadening contacts and combining the talents and resources of both countries. I've been instructed to move this forward, as has my counterpart in Russia.

In both the U.S. and Russia, the talents and resources of greatest importance lie outside government. That is our primary reason for organizing this meeting -- to learn from you and to gain a broader perspective as to how the U.S. should move forward.

It's clear that the Russians consider S&T, specifically civilian S&T, crucial elements in the current "Russian revolution." As in the past, science is being called upon to play a leading role in advancing Russia toward democracy and a market economy. But Russians are understandably concerned about the possible, and probable, brain drain. We share that concern. We are working here in the U.S. and with other G-7 countries to take measures against what they call the external brain drain.

Also, many senior Russians refer often and with worry to an "internal brain drain": the flow of scientists and engineers from governmental academies into the private sector. They consider that a loss to Russian S&T. Obviously we have a different view of this. We are trying to convince them that this is precisely what's required to work toward a market-based economy. In discussions we must be careful to distinguish between the two forms of brain drain.

We in the U.S. have a critical role to play in maintaining the science and engineering capabilities of Russia. We have already initiated both unilateral and multilateral initiatives, in both the government and private sectors. In follow-up to this summer's summit, we are considering a range of new initiatives. For this we want your input.

The goal we share with Russia is nothing less than to redefine the entire framework of U.S.-Russian cooperation in S&T. We want to remove obstacles related to contract law, government regulations, and where possible, expand cooperative R&D.

There has been a major sea change in our interactions with them during the Bush Administration. We are making a determined effort to change the character of cooperation from top down to bottom up -- more like our own system.

So far we have made most decisions at high levels in both governments. Starting 2.5 years ago, however, we switched to a system based on proposals; where possible, joint proposals. We have 100 already being funded by our agencies, on the same footing as proposals submitted by American researchers. This is an important channel and should be expanded. It makes it possible to use funds to support young people, obtain equipment, support travel.

We hope to achieve reform in the entire Soviet S&T structure to provide a real focus on excellence. We want to bring higher education into closer touch with research laboratories.

One of the things of most importance is the character of private sector interactions. The extent to which the American private sector is involved will determine the success of our efforts to strengthen S&T in Russia. Right now, these interactions are severely hampered by the fact that Russia and other republics have not established a legal framework, for example, for ownership of the results of research done in labs. There is inadequate patent and copyright protection or a legal framework for resolving disputes in a timely fashion.

I have talked with Deputy Premier Saltykov about these matters. He says that before the end of the calendar year Russia will have these laws in place. Until then, it's not realistic to expect our companies to invest substantially in cooperation with Russia and the other republics. It is very important to move that process forward in any way we can.

S&T represents a critical part of our relations. During the coldest parts of the Cold War, S&T channels were sometimes the only ones that remained open. NAS deserves the most credit for keeping this going. Last March, as we worked on our efforts to help what has become a crisis situation in the FSU, we turned to NAS. I asked Frank Press to pull together a representative group of scientists and engineers from the FSU. The results of that meeting were enormously helpful to our federal government in putting together its plans for working with the FSU. Others were involved, including the Carnegie Institute, the Soros Foundation, and scientific societies.

(UNFINISHED NOTES OF AUGUST 13, 1992 MEETING WITH U.S. SCIENTISTS ON US-RUSSIA S&T RELATIONSHIP)

By maintaining stability in Russian S&T, we not only gain the obvious benefits of their talents and resources, but contribute significantly to stabilizing the economic and political systems.

This fall I will meet with Saltykov and attempt to lay out specific programs to expand cooperation and improve coordination. Today's meeting will contribute in a major way.

FRANK PRESS, NATIONAL ACADEMY OF SCIENCES: Since the time of Peter the Great, the Russian czars -- whether regal or communist -- have supported science well. Russia remains a superpower in science.

But the bureaucracy erected under communism cannot and should not remain intact in the midst of the turbulence in that country. The task is to manage change so that the best there can survive and contribute to building a new democratic Russia.

NAS published a report with recommendations broken down into four categories: weapons science, basic research, sciences whose products have potential for commercialization, and facilities pertinent to global issues (ecology etc.). Actions are now in process on those recommendations. Some have been implemented, some will be implemented, some have yet to generate a meaningful response. Many are reflected in the Joint Statement on Cooperation. The self-interest of American corporations can lead to more rapid realization of these goals.

In early November we will sign a new agreement in Moscow, promoting scientist-to-scientist cooperation, policy interactions, involving scientists in advising governments; as well as getting Japan's reaction to the March report, etc.

We also want our government to use its influence in the World Bank. The Bank played a big role in China, supplying funds to reequip the labs of Chinese academics. It has already begun similar, smaller programs in Eastern Europe.

The stakes of failing to achieve our goals are high, ranging from the loss of Russia's S&T resources as well as its minerals, natural gas, timber and other natural resources; to the possibility of seeing it again as an enemy state in possession of high-level nuclear weapons.

Question & Answer:

Q: Will these negotiations lead to a formal treaty?

BROMLEY: It's not clear, that may well happen later. The goal here is to reach a consensus on the most effective way that we in the U.S., both in the public and private sectors, can influence the development of S&T in Russia and, thereby, S&T's role in influencing economic development. Because our resources are limited, we want to figure out how to use them in the most effective way. We want to avoid having our aid eaten away by customs duties, for example, or maintaining institutes that we or even the Russians may not feel deserve to survive. And we want to develop trust, to identify excellence in the FSU and support it.

Q: Regarding the top-down issue, finding points of access is very complicated.

BROMLEY: One thing working very much in our favor is that we are not starting from scratch; we have worked on this for several years. A recent survey found over 3,000 senior Soviet scientists working in American universities right now. They were selected by their peers in the American academic community. They constitute a cut from the highest quality Soviet scientists and engineers. It's very important to utilize their knowledge and connections and we are getting input from them on which institutes in the FSU should be preserved. We especially want to identify the groups or particular schools that center on a particular individual -- a system that is a uniquely Russian contribution to world science.

Q: What about the lack of telecommunications?

BROMLEY: That is under discussion now. Given the sheer size of the investment that is required, we need to figure out if it is best to put it there or into immediate assistance to individuals. But it's clear we have to improve communication channels.

Presentations:

IRVING A. LERCH, AMERICAN PHYSICAL SOCIETY:

Programs:

Small grants program: We have formed a task force which has organized a committee on Russian problems. Their first goal is to organize a group of colleagues in Russia, capable of gaining the trust not only of their American counterparts but also of their colleagues in Russia and other republics. We asked the task force to nominate individuals for this group. We identified certain shortcuts to help find them: for example, most persons with immediate responsibility would be in Moscow. The Moscow committee then

had to organize subcommittees in republics -- Lithuania, Latvia, and Georgia -- to cover all the major disciplinary and geographic areas. Next, specialties within APS began negotiations with the task force to determine how individuals outside the favored institute structures could be involved.

Next problem was money. We appealed to fellows of the Society for funds, thus raising $30,000. Fortuitously, the Sloan Foundation offered a matching grant of up to $100,000. Even so, the need was enormous; we discovered there was no way to develop a program like this without more funds. Soros then offered a sizable grant to maintain the program. As a result, we hope to dispense $700,000 in small grants and fellowships in the FSU by the end of this year. Applicants must submit an application, references by two senior scientists, and sufficient information so the proposal can be reviewed by the Moscow committee or the subcommittees.

The process is just beginning. What has enabled us to move so rapidly is two developments: Soros offered us use of their facilities in Moscow to dispense the money; and two, a trip was made by the task force and Herman Feschbach of MIT to visit Moscow in June, have discussions with the Russian Academy of Sciences, the Space Institute and other institutes. They covered a broad spectrum of people and institutes and met with the Moscow committee.

During our visit Saltykov assured us that none of the funds we disburse to individual scientists will be taxed, even as income tax. This is very important. Also he agreed that the FSU government will respond with an equivalent in rubles to the local labs. In effect, this instantly doubled our money.

This has become a very important program to maintain the physics community in the FSU for at least one year. Hopefully, by then other efforts will be underway at higher levels.

Journals: AAAS will provide Russian libraries with subscriptions to physics journals.

Challenges:

Lack of internal coordination in Russia: The Russian government is not altogether coordinated between ministries. Saltykov, for example, has no authority over the finance minister. Although we have an agreement that no export-import taxes will be levied, it is conceivable that the finance ministry will present each of our grant recipients with a tax bill.

MERRILL W. BUCKLEY, PRESIDENT, IEEE:

Programs:

Membership development: IEEE has had a long interest in Russia. We are an international society with 320,000 members in 130 countries. We have had a long relationship with their engineers. Even with the political problems we have maintained good contact. Opportunities are really opening up now. We hope to have chapters in 10-15 parts of the FSU in the next three years.

Conferences: We conduct over 300 conferences per year throughout the world and will have quite a few there in the next few years.

Challenges:

Economic conditions in Russia: The main problem is money. We are a bottom-up organization, are encouraging Russians to become members. Their salaries are very low but we are doing everything we can to help them join. They want to join, they like our publications, they want to cosponsor technology conferences -- it's a matter of moving it on. We have an arrangement that if your salary is below a certain level you can pay half dues; even so it is difficult for Russians to join.

So we have started programs asking our other elements to contribute money. We believe it is an investment. Within 4-5 years we think that investment will be returned to the point that the Russian members are self-sufficient. That's our approach to moving ahead. We think it will be faster in Russia because of the high quality of the engineers.

We have the structures in place to follow up, money is the obstacle.

JAMES G. TOSCAS, AMERICAN NUCLEAR SOCIETY:

Programs:

Technical assistance: Independently of the dismantlement of the FSU, our involvement was spurred by the Chernobyl accident. There was an obvious awareness on both sides that technical assistance was needed. The Soviets could not afford a wholesale shutdown of all reactors of this type, yet at the same time they needed to satisfy world safety conventions. We sent a delegation to Moscow to discuss the latest information on the accident in 1987.

Reform: This began a chain of events that led to helping them to create a Soviet Nuclear Society. Having their own society would help them track persons in nuclear technology field, whether government, ex-government or private. At first we signed a memo of cooperation with the institute that then served as their governmental agency for nuclear affairs. Then in 1989 we helped them form the Nuclear Society, amending the memo of cooperation to make the Society the principle instrument for implementing our cooperative agreement. It's now called the Ex-Soviet Nuclear Society -- yes, that's the name they wanted. They are having their third annual meeting in September.

Exchanges: We exchange delegations to each other's meetings. As an outgrowth of this, this year we will bring back a Russian visitor to work on the ANS staff as communications liaison, learn how ANS functions, then go back and help them parallel this activity.

Journals: We are starting a service where select publications of their scientists will be translated and published by ANS.

Challenges:

Funding: Like everyone else, our main problem is money. Therefore we are focusing in pure technology exchange, looking at places where information they have may be of interest to our members and vice versa. They are very interested in our technical journals; conversely they have information on nuclear metallurgy that our scientists want access to.

WILLIAM H. JACO, AMERICAN MATHEMATICS SOCIETY:

Programs: The U.S. mathematics community has long, strong relationships with the Soviet one. going back to the late 1940s when our society was organized. From this, we began looking at actual formal help to the math community beginning in 1988.

Travel assistance and journals: We have established various joint ventures, mostly trying to assist Soviet mathematicians with access to travel. We are very involved in exchange programs. We also have an extensive publications and literature exchange program.

Reform: We're modeled very much on the APS approach -- we also won support from the Sloan Foundation to match dollars; we are setting up the same type of network of trusted colleagues. We are targeting "mathematics centers" which are city-, not republic-oriented. Also, we are trying to assist the formation of new scholarly institutes outside the existing institute

structure. We are helping set up departments of math and physics outside of Moscow State University and St. Petersburg University.

We have created keyboarding centers in the FSU, run by Russia mathematicians who are paid in American dollars.

Challenges:

Funding: We experienced a lot of frustration with money. Bob MacPherson of MIT, a member of our advisory committee, made a trip to the FSU and reported back to us. From that trip we got great impetus, realized there were numerous things we could do. But we still found that much of our assistance and guidance addressed issues of technology transfer and weapons conversion, but did not address the collapse of the basic science structure. We ran into great difficulty from NSF, AID, and DoD when we tried to really address this issue. This is the basic problem we see: recognizing the importance of keeping the basic sciences alive there. We're having tremendous exchanges with the math community. But we need to make sure there is support to try to maintain the basic sciences.

Urgency of problem: I want to emphasize the need for a quick reaction. We are having the same problems as others here today: control of intellectual property rights; communications; disbursement of funds. We also have run into the problem of the lack of an administrative and management structure that will sustain any effort we start. Much of what we do seems to dissipate.

STANFORD E. WOOSLEY, AMERICAN ASTRONOMICAL SOCIETY: NASA has major collaborations going on with the FSU. Our society is relatively small, but might be considered exemplary for other small organizations. We have 6,000 members, including 2,000 in active research. Our counterparts in the FSU are similar in size.

Programs:

Small grants program: Early this year the Council of the AAS was alarmed to hear of the rapidly disintegrating situation of our astronomical colleagues in the FSU and resolved to take action. We first formed our own committee of 13 prominent astrophysicists and astronomers here and in Canada, then formed a similar one of 14 persons there. We have undertaken 2 main programs: small grants and journals. The money has been entirely raised from our own membership: $46,000 from 400 members this year. We expect another $4,000 but it is petering off.

We asked Russian astronomers to submit three-page proposals to our advisory committee in Moscow. We expected maybe 200 proposals -- we received 570. We have funded 266 of them at $100 each. There is still a meaningful amount of funding left and we will fund 110 more next month.

Journals: We have started a program to exchange all major North American journals with the essential academies for arts and sciences there. United Parcel Service has given us two grants of $30,000 each -- we found that postage is much more expensive than the cost of the journals themselves, currently totaling about $3,000/month. We have taken the network approach to distribution: we mail journals to institutes in Moscow, which forward them to outlying regions.

Problems:

Disbursement of funds: The difficulty of transferring money, even if you have it, to the hands of the people you want to get it to is a chief problem. Taxes, exchange rates, unreliable banks, inflation are all problems. And the value of the ruble vs. the dollar has gone down by factor of 5 since January. So it's very urgent to act quickly, not just be planning.

Communications: Almost all our work is accomplished by electronic mail. However, it's reliable only with certain institutes in Moscow. Surface mail is unreliable. We are hoping that when Sabre and other services come onstream to Moscow this fall, the cost of surface mail will be about 35 cents/pound.

Long-term funding: We can't count on another $50,000 from our membership next year, but we will need that much and more. We are now turning to foundations for support.

Psychology: the FSU scientists are very good at what they do; they are very proud and they don't want charity. Funds from the U.S. must be in form of collaborative research, not be perceived as charity.

RICHARD W. GETZINGER, DIRECTOR OF INTERNATIONAL PROGRAMS, AAAS:

Programs:

Journals: Our major thrust has been in the journals area. We were able to take a small step with no outside financial support when we took our weekly magazine, "Science," and picked up the subscriptions to nine different republics. This is a total of only 20 subscriptions, but it is something we could do effectively and quickly.

Two, we started a newsletter for information sharing called "Scientist to Scientist."

Three, last winter the Macarthur Foundation asked us to look into creating a mechanism for picking up lapsed subscriptions and carrying them forward for 2 years. They gave us a grant of $25,000 to do this. We have made 2 trips to Russia to collect data on how to get such a program going. It will be a large program with over 100 scientific journals obtained from up to 15 of our affiliated organizations, available at cost or somehow made more feasible financially. They will go to three libraries each in St. Petersburg, Moscow, Kiev and Minsk. We have almost nailed down the details and will go back to the Macarthur Foundation in a couple of weeks for the money.

Technical seminars: These have been active for 6-8 years. We will be giving two, two-week courses on issues related to defense, security and peace -- for example, conversion of defense industries -- in Kiev and Alma Ata. Twenty policymakers, military personnel and diplomats will be the students at each course. They will be taught by local Ukrainians and Kazakhs, plus Americans we'll send over.

Reform: Finally, we have proposals out to work with FSU scientists to develop scientific societies. We'll bring them here to gain experience, then they'll go back and put that knowledge to use there.

JOHN MALIN, AMERICAN CHEMICAL SOCIETY:

Programs:

Journals: In response to appeals from the FSU, our board authorized us to pick up costs of existing journal subscriptions for $30,000/year over three years.

Task force: ACS has convened a blue ribbon task force to explore ways to assist the FSU. Some members will be there at the end of August, partly as representatives of NSF. They will discuss the following issues:

1) Transfer of surplus research equipment;
2) Donation of American books and journals;
3) Shipment of research reagents, chemicals, that are readily available here but not there;
4) Advancement of seed money for a "Russian Chemical Society";
5) Access to online databases;
6) Exchange of scientific personnel; and
7) Production of a directory of research projects.

Challenges:

Disbursement: The difficulty is identifying which subscriptions are the ones to pick up. We asked representatives of academies there to send us names, but many of the names don't correspond to the names of institutes that had subscriptions in the past.

Parochiality: Parochiality is a problem. If you ranked the top five priorities of the FSU they would look something like: the first three are Moscow; the fourth, Russia; the fifth, everywhere else. So we need to determine where we should put what we have available.

Funding: We want to send subscriptions to "Chemical Abstracts" to the FSU, but the 80 we want to send would cost about $1 million/year. We don't have that money now. Our bottom line in these efforts is about $40,000/year. But things are changing so rapidly that number could be obsolete quickly.

DAVID SIMPSON, RESEARCH INSTITUTE FOR SEISMOLOGY (IRIS): We represent university research groups in the U.S. We also have operating facilities in the FSU. IRIS is largely funded by NSF.

Programs:

We have a long history of involvement with the FSU, beginning with a program of earthquake studies in 1974 in Central Asia.

Joint seismic program: We put up seismic monitoring sites within the republics, which revolutionized our access to that part of the world. The program currently costs $6 million/year. $0.5 million of that goes directly to scientific activities there; the rest is equipment purchases.

Data center in Moscow: We operate a data center in Moscow which we've been extremely pleased with. It contains a variety of computer equipment that's open for anyone, Russian or American, in this program to use. It's run by a Russian group. We supply the support: some moderate salary support but mainly computer equipment.

We maintain a communications link south of Moscow for transferring data and E-mail. We hope to extend it directly into Moscow.

Exchange: We are encouraging greater exchange of scientists. The most exciting result of the revolution there for us has been seeing some of the people we have dealt with for years. There is a general change among many

younger scientists who now have an interest in making their work known worldwide.

A second enormous change is that we used to have enormous frustration that most of our visitors were bureaucrats, "science tourists." We had no control over whom to invite. Now our scientists can invite researchers they want to work with. We want to extend this in the future.

Challenges:

Funds: There are now years' worth of very valuable, continuous records from hundreds of monitoring stations in the FSU. These records will mold and eventually disappear if we can't rescue them. We need funding to do this. We are looking for ways to scan them or otherwise restore them through the Moscow data center.

Economic conditions in Russia: As one scientist put it to me, when you are searching for bread it's difficult to keep your mind on science.

Communications: We rely heavily on E-mail.

Government permission: is sometimes difficult to get, though it's easing now. One enormous inhibition to our earth sciences work was the Soviets' unwillingness to let us see classified maps. Many are being released now.

VIRGINIA HAMMELL, NATIONAL ASSOCIATION OF STATE UNIVERSITIES AND LAND GRANT COLLEGES:

Programs:

The National Association of State Universities and Land Grant Colleges is the association of 150 major research universities. From Cornell and MIT in the East to the Universities of Florida, Texas, California, Michigan, Maine, Alaska, and Arizona, on our borders most of these public universities have three objectives: research, education and extension.

NASULGC universities have a long history of student and faculty exchange and cooperative research programs with Eastern and Central European higher education institutions. The content area ranges from theoretical physics to the arts and includes the social and practical sciences and includes their Universities, Scientific Institutes and Polytechnical Institutes. The problems that we found in answer to your inquiry, Dr. Ratchford, are remarkable in their consistency. Other than the tremendous need for money, I have

lumped into four related categories the problems we find in the newly emerging republics.

Challenges:

1. An inadequate physical infrastructure in places is so deficient as to impede health and safety. These conditions obviously affect the general population, but uniquely impede U.S. universities' abilities to effect positive change.

   a. Transportation is unpredictable and expensive, impeding the movement of people and material.

      Aeroflot will infrequently accept local currency, making exchange activities twice as expensive for U.S. institutions who must purchase all international tickets.

      Local transportation is unreliable as schedules are uncertain, roads decaying, and vehicles in disrepair.

   b. The public water supply is unreliable.

      Western level of public health standards are largely nonexistent. Avoidable diseases are frequently contracted (and, of course, medical treatment is feeble). Faculty on many exchanges/cooperative research activities live without domestic hot water.

      With the breakup of collective farms there is no substitute plan for distribution of irrigation water, threatening yields and other improvements.

   c. Food is expensive and variety limited. There is a total lack of organization, structure, and knowledge about preserving, processing, storing, distributing, and marketing food in a non-centralized economy.

   d. Communications are difficult, slowing the flow of information, formal and informal. E-mail works where available.

      Inadequate telephone service. Local equipment and local calls are as cumbersome as international service.

      Postal service is expensive and unreliable and erratic, where it exists.

2. Bureaucratic bungling suboptimizes progress.

   a. Dilution of funds from U.S. entities intended for individuals or institutions are "taxed" or disappear all together. An independent, but fairly simple banking system is needed to serve the individuals and small institutions.

   b. Local laws and decrees tax oil and gas joint ventures resulting in "export tariffs," of $5 to $9 per barrel. These taxes severely dampen enthusiasm by third party investors.

   c. Obtaining visas remains a problem in most places.

3. Lack of local governing capabilities impedes growth.

   a. Inexpensive chemical supplies and equipment have disappeared. Under the centralized system they were available; now while a supply might be available in one republic but will not be in a neighboring state due to import/export uncertainties, lack of convertibility of currency.

   b. Both sides of cooperative research efforts need exchanges of scientific material, but in the new republics, these materials have historically been shrouded in secrecy and compartmentalized. They, and we, need to know what the inventory is in, say, rare crop species seed. These have been considered national secrets, but now depending on the physical locale of the material--what nation holds the secret? Why?

4. Many universities are attempting to revamp administration and curriculum without the guiding hand of a central planner or an alternative model.

   a. There isn't a tradition of cooperative processes that shares information and attempts to reach consensus.

   b. There are no low, or middle level administrators with training or experience in accounting, planning, management. These functions are traditionally not the responsibility of each institution and they don't have a Western style model to follow. The notion of cost accounting, for instance, is a new concept. High level administrators are the old central system people.

   c. From course content, teaching load and credits needed for graduation, only a few areas are intact. How, when and where

do faculty adapt from the "Historical Materialism" courses to Western-style economics?

d. Traditionally, there is very narrow training in sciences. This orientation impedes ability to transfer training to applied fields and frustrates attempts to build multi-disciplinary teams.

e. Major shortage of social science education: sociology, economics, at every level. These are areas that need to be established to support private sector reforms.

f. New commercial ventures in academe are disrupting existing exchange agreements.

On the U.S. side of the equation, there are pressing problems that we can and need to solve quickly. I will not go into detail about the enormous financial requirements that everyone in the field recognizes. These problems are:

Lack of sufficient consular services at the U.S. Embassies and lack of access to Embassy medical personnel in emergencies involving U.S. participants in U.S. Government funded programs.

Slowness in responses from USAID/USIA in grant proposals. A realistic vision from USAID/USIA of time-frame and nature and extent of external inputs required.

Unrealistic notion of level of reliable funding need to support cooperative efforts.

Lack of sufficient medical insurance for outbound U.S. citizens. Usual policies often cover only medical care received abroad and does not cover stateside care following evacuation to the U.S. The quality of medical care available in the former republics often dictates immediate evacuation in even the simplest cases.

Need for access to institutes of intensive language training in, say, Russian, Ukrainian, Georgian, and other local languages. Too few Americans with needed skills are fluent in necessary languages.

And finally, need at all levels of sensitivity to regional issues. Many republics/satellite always resented Russianification and don't want to have to relate to Moscow.

ANTHONY RICHTER, EXECUTIVE DIRECTOR, SOROS FOUNDATION:

Programs:

We have a network of 35 entities in Central and Eastern Europe. I direct 12 offices in the CIS. We are also involved in establishing a Central European University. Through these connections we became aware of the enormous problems of the scholarly community in all the sciences.

Technical assistance: Early this year we were charged by our board with identifying strategic areas where we could make a difference. We identified two: a long-term strategic need for technical assistance, via advisors in education and S&T, to new government officials who are reformulating their priorities and needs. The World Bank, the European Community and other entities are helping with project development, management and implementation skills. We have made openings to a number of government officials both in Russia and Ukraine, but it's slow going because there is really not a proper framework for this.

Small grants program: Our second effort has been very successful: to establish small and other grant-making mechanisms to serve as models for later action by western governments and international financial institutions. Soros cannot provide sustained funding to actually create viable long-term programs -- the needs are too long-term and deep. But we can identify functional mechanisms to serve as models for multilateral institutions and governments.

Through the small grants program we have funded:

1) Dr. Lerch's program - we were very impressed by APS's professional objectives and the very swift understanding they brought to this problem. Thus we made a grant of the unusual size of $525,000 to underscore what a model we think this program is. The American Astronomical Society and the American Chemical Society are cooperating with Dr. Lerch and his colleagues.

2) A $150,000 grant to the American-Russian Biomedical Research Foundation, a project of the New York-based Public Health Research Institute. This is similar to APS in that it is a small grants program and also sponsors collaborative research, in this case between Russia and American biomedical labs.

3) Journals: We have allocated $111,000 for the purchase of 154 1-year subscriptions of science journals for the library of the Academy of Natural Sciences in Moscow. We hope to expand this kind of activity.

Challenges:

Funding: Our small grants program is both emergency and limited in nature. Our hope is that both the private and public sectors will rally to programs such as those of the APS, AAS and ACS. They deserve solid governmental backing.

Every group sending funds would appreciate assistance with help in securing federal relief, e.g., through taxation or through guarantees for both grant recipients and in the equipment area.

"Double-dipping": We have heard so much today about duplication of effort. In my experience double-dipping is an enormous problem. The need or opportunity I'd like to bring to your attention is coordination of those emergency actions.

FRANK HUBAND, EXECUTIVE DIRECTOR, AMERICAN SOCIETY OF ENGINEERING AND EDUCATION:

Programs:

Reform: Two years ago, a dozen of our deans went to visit several technology institutes in the Soviet Union. A few months later, a similar group of rectors of Soviet institutes came here. It became clear there was a need for restructuring Soviet engineering education. Their programs were five years in length, 35 classroom hours/week, but very narrow specialties. This was because institutes often were owned by ministries which used them as training centers for production facilities. In an economy that is moving toward freer travel, this is not a successful long-term approach.

We agreed to attempt to support them in restructuring. I visited 8-10 schools which were independently working toward restructuring. We offered central support.

Additionally, the Soviet government was offering a limited degree of independence to those institutes that could establish some accredited status.

Last year, another 15 of our engineering educators visited them. They split into groups of 2-3 and visited 35 institutes in Russia, Ukraine, and Moldova. This was post-pusch so things were more complicated. We published an analysis of the status of these schools. In the spring of this year, we held a workshop with about a dozen of their people, partly funded by NSF, and produced a report describing their current status.

Our counterpart there is what's now called the Russian Society of Engineering and Education (formerly the Soviet SEE).

Journals: We will be sending our journal, along with IEEE's Transactions journal, to other Ukrainian schools.

Challenges:

Disbursement of funds: As mentioned earlier, it is difficult to support individuals without institutes acting as intermediaries. How can we get resources into the hands of individuals?

GARY WAXMONSKY, NAS OFFICE OF CENTRAL EUROPE AND EURASIA:

Programs:

Exchanges: We have had exchanges with the FSU for more than 30 years. Now, we want to take that institutional capability and make it relevant to today.

We have the distinction of having gotten some federal funding from USAID. The purpose of the AID-funded program is to identify and bring to the U.S. for one academic year up to 150 applied scientists/engineers from the FSU (which AID defines as excluding the Baltics), to undertake applied research with an American colleague in a university with a strong engineering slant.

Elements of the program include defense conversion, technologies with commercial potential, and research that will improve the quality of life in the FSU - such as environmental technologies or pharmaceuticals.

We get around the problem of finding these people partly by assuming in advance that the American community already knows 150 English-speaking, talented scientists. So we accept applications only from American posts. We are running three competitions, have 24 proposals in hand for the current one. By the end of the third deadline next March, we expect to make 150 awards. They will cover travel and maintenance in the U.S., up to about $11,000 per person over nine months. If you multiply that by 150 and add indirect costs you can judge the total cost of the program.

Another aspect: AID has included a small amount of money to field teams to go out to the FSU prospecting for bilingual talent in places we may not have had much experience with before -- e.g., many of the sectoral and defense related institutes whose members couldn't publish or travel abroad before. These teams of several individuals each will go out in the fall. We have

tentatively identified five fields of technology to focus on: high performance computing, advanced materials, opto-electronics/photonics, biotechnology, and advanced manufacturing techniques. We would like your input: are these the right fields? If so, where should we go? Who should go?

This and a sister program in the Commerce Department hopefully will prove to be the camel's nose under the tent.

DANIEL MATUSZEWSKI, CARNEGIE CORPORATION OF NEW YORK:

Programs:

Identify and support excellence in the social sciences: We are prospecting for fresh talent, especially in the worlds of science that have a policy impact not only for the world of science but for American relations with Russia and the rest of the FSU. For example, they are currently trying to set up an early warning system for nationalities conflict in the FSU. There are 20 offices for such nationalities review and negotiations, each with a director and deputy director. But none of these staff people know what they are doing or supposed to do. They are asking us for training, assistance, etc.

In the last two years, there is a new concern for professional communities that are now in disarray. The problem is to try to find a concerted way to identify centers of excellence, fresh talents who are not somehow beholden to the old establishment. The old establishment -- the academies, the Russian Ministry of Higher Education -- has been very quick to package stuff as new when it's really the old structures, persons and values behind it.

So we will try to find those communities that are vulnerable, marginal, at risk. We are looking at the social sciences and humanities, with the idea that if priority is being given to weapons science and high science in general, these may be seen as dispensable.

Together with other foundations here and in Europe and Japan, the Carnegie Corp. will put new emphasis on finding new points of entry and developing open and creative forms of grants-making -- that is, how to get money from the American partners to the people who really need them. How to develop patterns of peer review, open competition, new scientific foundations and mechanisms to ferret out those pockets of talent we haven't been able to touch so far, and that aren't dominated by the central authorities. In short, how to design open research patterns in communities dominated for 70 years by top-down management. It's a very complicated issue.

JAMES A. BRODRICK, AMERICAN SOCIETY OF SAFETY ENGINEERS:

Programs:

Visit to FSU: We are the rookies here. Last fall, we took a delegation of 34 safety and health professionals to the FSU. We had a lot of government clearance so our trip was very rewarding.

In Moscow, government and trade union officials were very open about their needs. They showed us their lab research in many areas of safety and health. But we also saw the primitive levels of it. They are trying to supplement their research with that of Scandinavian and Eastern European countries; they would like very much to include the West in that interface. They have targeted OSHA and NIOD as two agencies they want to network with. They think they need direct help with codes and regulations.

Kiev - We found a totally different situation there. There is an intense interest in worker safety. The emphasis has been on education and training and they are developing a certification program. They were very open, warm, interested in dealing with the U.S.

Minsk - We visited V.I. Lenin University. Industrial safety, public health, insurance, safety legislation, research. They are very interested in the academic area mainly. We also toured the largest tractor factory in the FSU.

St. Petersburg - we met with government researchers, scientific researchers and medical doctors. Again, they were very free about their shortages, problems with water purification and delivery, life expectancy in the FSU and the value of human life. We also met with seaport managers from all over the FSU and toured their port.

Journals: At home, we went through ASSE's library to see what books, articles, a/v and journals we could send them. That has been done.

Set up new institute: This spring, one of our delegations went back to Moscow and Kiev. In six weeks, they set up an Institute of Safety and Environmental Health, complete with a curriculum, to teach practical applications and to develop an environmental certification program.

Challenges:

1) They need to come here more than we need to go there. They need to see the quality of life here, the results of our efforts to protect people and the environment.

2) They did not want us to see the real problems they were having in industry: lack of safety, lack of quality. In the tractor factory we were allowed only into one portion of one building. There and everywhere, we saw enough hazards to convince us of the overall low level of safety.

DAVID SOUKUP, AMERICAN SOCIETY OF MECHANICAL ENGINEERS: We have cooperated with the Russian Academy of Sciences since 1987.

Programs:

Research: There is an active research community there, for example, in developing methods for clean combustion of waste. We found a group in Uzbekistan that is involved in this, hope to develop joint research programs with them.

Publications: We've translated a number of publications from Russian into English, but there isn't much demand for them here.

Challenges:

Visas: In trying to invite scientists here on short notice, the strong demand at the American embassy in Moscow leads to complications with airline tickets.

Funding: In the past, we got pretty good response from companies and universities to help with visits. Lately it's been a challenge to get corporate funding for that.

U.S. codes and standards: We go to Russia with a view toward harmonization of standards. It's a big problem for American companies whose equipment meets ASME standards, but now must meet Russia standards.

LAWRENCE L. GOOD, ASSOCIATION OF ENERGY ENGINEERS: We run an energy management training and certification program. We want to be a vehicle of energy management and technology transfer in the FSU. We want to start chapters there.

Programs:

We are spending no money on the FSU right now; we are not offering grants, don't do science research. Our members want to do business in the FSU, but we're not getting far at all. We are hands-on rather than academic.

Their energy efficiency is terrible. They need American expertise. A byproduct of poor efficiency is environmental degradation. If we can't find a way to become involved soon, it will become too late to undo some of the bad decisions in creating this energy management infrastructure.

We will look for subsidies from AID to establish contracts in Czechoslovakia; if we succeed there we will try in the FSU. If we fail with AID, we'll find another way. One proposal: American chapters adopt sister chapters in the FSU and subsidize their startup with seed money.

Challenges:

Communications: Three years ago we sent a delegation to the Soviet Union, met with researchers at universities. We invited them to come to our World Energy Engineering Congress in Atlanta. But every year for three years, they have canceled their attendance. We don't understand this.

Locating individuals to work with: We need to find more hands-on engineers. We are not an academic society.

Collapse of the ruble: Russia is trying to prop up its business enterprise, but it's not working. We or someone needs to find a way to educate Russians to do business. Their ownership and taxation requirements are prohibitive, for example.

RICHARD FRENCH, AMERICAN WELDING SOCIETY:

Programs: We have been doing business in the FSU for five years. The bulk of our exchanges are with the Ukrainian Academy of Sciences. These take three forms:

Delegation exchanges and reports: We have sent six, hosted 10. Fifty American companies have been involved, either by hosting Ukrainians here or by visiting plant sties in Ukraine and Russia. We have an ongoing program to invite senior Paton Institute persons here and report on given topics. We expect to produce several reports a year.

Conference: We cosponsored a conference with the Paton Welding Institute here last fall, with strong support from NASA Goddard.

Joint venture: Based on this success, we are forming a joint venture with the Paton Institute to do cooperative research and expedite the ability of American companies to do business there. We have the beginnings of several cooperative research programs, have identified a number of markets where technology that is developed there can be marketed here.

We are spending $25-50,000/year.

SEYMOUR G. EPSTEIN, TECHNICAL DIRECTOR, ALUMINUM ASSOCIATION, MINERALS, METALS AND MATERIALS SOCIETY:

Programs:

Technical and financial assistance: The FSU has a large aluminum industry. We have attempted to assist with technical information; we sent a delegation to a St. Petersburg conference and gave a number of technology presentations. We have also offered financial assistance on travel and registration to conferences here. We have made journals available at a subsidized price.

Challenges:

Currency shortage: We find that because of the critical shortage of currency the exchange has been mostly one way.

Competition: We are concerned that there is a good deal of Russian metal being "dumped" into the U.S. through the London metal exchange. We may be offering an even greater competitive advantage to an industry that already doesn't have to meet wage guidelines or environmental regulations. Any further subsidies should be used for carefully directed purposes. We want to help with technical advancement, but be careful not to destroy our own industries in the process.

CLIFFORD G. DOKE, AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS: We have had contact with colleagues in the FSU mainly through our membership roster.

Challenges:

Currency shortage: In the last three years, however, our membership there has dropped almost to zero. We had up to 75 institutes getting publications, which are also down to almost zero. Money is the problem.

Funding: We have entire libraries, very rich collections, ready to ship but no money to ship them. We have found some ways to do it but not to the degree we'd like.

Psychology: There is no one alive in the FSU who has known a system which serves its members. There, the organization does not exist to serve the members, it's the other way around. So one of our first tasks is to reorient the thinking of the individuals. It's an ongoing problem as we try to help set up societies in these countries. Sometimes you are not communicating as you think you are.

U.S. coordination: There is a need to identify coordinating mechanisms here so we are not duplicating services -- grants, publications, or whatever. If we have a scarcity of resources we can't afford to squander them.

SAM GUY, AMERICAN SOCIETY OF CIVIL ENGINEERS:

Programs:

Exchanges: We have had a number of exchanges. One idea we sought to pursue was to bring Russians to work with our consulting engineers here. We signed an agreement to do this, but we have been overtaken by events both here and there and it hasn't gotten off the ground. A few Russian engineers have been placed; hopefully they will carry back their knowledge of our system. We believe this kind of exchange is a sound concept. We have also invited delegates to our technology meetings at minimal costs of registration.

Challenges:

Justifying our input: It is still not clear what is in it for us -- how can we justify the cost; is there really enough business there?

WAYNE WORRELL, PRESIDENT, ELECTRICAL CHEMICAL SOCIETY:

Programs:

Journals and invitations: We are spending from $1,000-5,000/year on the FSU, mainly through journals and inviting them to our symposia as speakers.

Challenges:

Communications: A major problem. Both between us and them, and the amazing lack of communication between research groups in the FSU -- partly because many are in defense or proprietary programs. In the high-temperature coatings area, my specialty, there are real gems of discoveries that very few people even in the FSU know about.

* * * * *

Summation

DR. RATCHFORD: Patterns here seem to be:

- Very good competitive grants programs
- Membership building
- Technical assistance, educational assistance, and literature
- Attempts to assist reform, e.g., by helping establish institutes there
- A need for competent coordination among Americans providing assistance. Perhaps this is best done by those involved in voluntary cooperative relations. One idea is to develop a clearinghouse to provide at least an opportunity for Americans to avoid "double dipping."

We have a request: for those who made presentations or wanted to, to give us a summary in writing. Checklist:

1) Your current activities and dollars you are spending on them or some other indication of size.
2) A summary of your plans for the future.
3) Lessons you have learned.
4) Problems you have identified.
5) Specific advice to Dr. Bromley for his discussions with our Russian colleagues.
6) Summary materials on the organization you represent.

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CONSULTATIONS ON THE US-RUSSIA SCIENCE & TECHNOLOGY RELATIONSHIP

August 14, 1992

Meeting with Industry

Introduction

J. THOMAS RATCHFORD, OSTP: This meeting is a direct consequence of a summit between President Bush and Yeltsin last June. It committed Dr. Bromley to meet with his Russian equivalents no later than this fall in order to negotiate a new framework for S&T between the two countries.

Science is being called on to play a leading role in leading Russia to democracy. Time is of the essence, since the scientific situation is deteriorating in Russia.

Time is of the essence in another way: other countries are competing with American industry for access to Russian markets.

In discussions this fall, President Bush's goal is to redefine the entire framework for S&T interactions between Russia and America. Also, he hopes to influence the ongoing reform of the Russian S&T establishment so that it will be built on excellence, respond to the technological needs of the country, and enhance the growth of democracy. In particular, he hopes to catalyze private sector interactions, as the greatest hope for getting things done.

This fall Dr. Bromley and I and other officials will meet with our Russian counterparts to discuss these issues. Our purpose at this meeting is to receive input from outside the government, specifically from U.S. industry. We hope to learn more about the magnitude, nature and future of current industry interactions with the Russian S&T establishment.

Presentations:

DAVID C. WENSLEY, WESTINGHOUSE: The state of the Russian aerospace industry represents both good news and bad news for our company. Reductions at the Department of Defense and at NASA are causing the U.S. to reexamine what our priorities should be in the future. At Westinghouse we have been struggling for quite a few

years to make commercial space a significant part of our business. It is not easy for us or anyone else in this industry. But the overall growth in revenues in commercial space and space commerce have been increasing, especially with respect to the overall economy.

Our involvement with Russia offers the opportunity to stimulate this growth further, but at the same time carries the danger of destroying the opportunity for us to benefit from that growth. We are one of only two remaining commercial launch vehicle manufacturers in the U.S. and we do not want to undermine our abilities in that product area.

Possible dumping: Russia was recently given the opportunity to bid on a U.S. launch vehicle. Their price was 40% below the U.S. market value. Clearly we cannot compete if there is flooding of the market at that rate. When negotiating anything with the Russians, price is a key variable. Price is not determined by cost on their side, because they don't have an effective accounting system for determining cost. So there is the possibility they can undercut almost any American bid.

Superior Russian capacity: Another factor we have to recognize is that for many years the Soviets have launched about 8-10 times as many satellites per year as we have. That tells you what their launch vehicle capacity is -- more like 8-10 times the total world capacity. Demand for launch vehicles in the commercial market is only about 1/10 of that, so they could easily swamp the market. This would destabilize the U.S. industry and raise the cost of our space products to our own government, because we operate on a combined base of government funded and commercial activities. It would also undermine our ability to develop further technologies.

I have only been there once to view their space capabilities, but my visit was comprehensive. I saw energia rockets and their launch facilities. Any citizen of the world, I think, who saw this rocketry sitting there gathering dust would feel that it's very important to the world to take advantage of those tremendous assets, scientific capabilities, and the energy behind them. It is important to find a constructive use for that capability.

In that regard, we have been pursuing possibilities for exchanges and joint ventures in a variety of technological areas -- not necessarily for finished products, but for the technologies inherent in them. Do they have techniques, materials, or methods that offer benefits we don't currently have? We have focused our attention on areas having to do with composite materials and advanced welding capabilities. It's an

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interesting dichotomy between the innovation they have and some of the things we demand, as well as things which we take for granted, refinements, that they don't have. They are much more functionally oriented, not as interested in the fine points of safety or elegance.

One Russian technology that is of interest are bonding adhesives and fasteners that might have general applications. In thermal detection, of interest are their concepts, materials, adhesives, the chemistry involved, and insulation. Also in the area of lubricants.

They have spent far more time in space than we have. They have had men and women in space almost continuously over 20 or more years while we've had great periods of inactivity. They have learned a lot about how to make things last a long time in a hostile environment. They haven't done a super job, but they have learned a lot. We look also for possible ground applications in the commercial arena, techniques, materials etc.

We've struggled to keep Congressional support going for our investigations. By looking at how these things function in a weightless environment we can learn a lot more about how things work on the ground.

We are not ready to sign anything with them at this time.

Current contracts: There are bidding contracts in the technology exchange and joint cooperative technological development areas, with institutes of applied mechanics and various individuals in academic technology areas. I am not personally familiar with exactly who or where.

Challenges include:

> Protecting U.S. technologies: The U.S. concern for protecting our own technologies, and the regulations to ensure that, have not caught up with today's political environment.
>
> Streamlined technology transfer: There is a need to streamline our method of access to the Russians. Approval for technology exchange is a difficult and lengthy process. Streamlined methods for acquiring their technology would be beneficial. It is my understanding that academic organizations don't have to go through this process.

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Communications: are a nightmare. Much could be done to improve this. As an interim step the U.S. could sponsor a joint process to establish communications centers accessible to both of us. These centers would allow transmission to a central site that has people adept at working within their cumbersome system, to make phone calls and send faxes.

Finally, greater partnership between U.S. government and industry: Finally, many of the excursions to Russia occurring now are dominated by U.S. agencies and their personnel. The ultimate implementers of much of the Russian S&T we want to utilize are in the industry sector. We want to encourage greater partnership between the government and industry so that we can ride on their coattails.

CHARLES F. LARSON, INDUSTRIAL RESEARCH INSTITUTE: This morning's paper reported that Boeing has established a base/laboratory in the Moscow area, employing 30 Russian engineers and scientists. This differs dramatically from what most companies have done so far.

JOHN KISER, KISER RESEARCH: Challenges include:

Restrictions on sensitive information, standards: To expand on what Mr. Wensley said, a crucial problem to advanced technological interactions is the data transfer problem. I'm directly involved with this because our company has been working for the last 1.5 years in Zelenograd. We have our first joint venture, working on a unique form of Russian thrusters. There are also some government organizations interested in accessing this product. We are running into a very serious problem, in that you can't do any serious discussions without transfer of a tremendous amount of information on standards, etc. Anything that falls into categories of sensitive information is very difficult to transmit to Russian partners for them to work with. Without some process of exception or some way to cause various controlling organizations in this country to ease up, it will be very difficult to complete our project.

By standards, I mean all kinds. For example, if the Russians are going to supply an electric propulsion assembly for an American satellite, combined with an American power unit -- they must know the functional requirements of the American equipment.

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It involves a lot of technical details. I cannot think of almost any area of data transfer which doesn't need some sort of easing-up. American companies are under all kinds of restrictions because Russians might extract certain data to do a comparative test.

?: The question of what is on the list is a serious one, especially regarding the R&D level with Russian academies of the sciences. If the relationship is based on their trying to provide research capabilities which complement what we have here, then we must be able to tell them where we are. In the last two months or so we have had a number of Russian visitors and it is hard to be reasonably sure that what we say we will not be in violation.

ESTHER DYSON, EDVENTURE HOLDINGS: Even trying to ship over standard issue workstations requires months of paper work. This allows other countries to succeed ahead of us.

PAUL G. SLADE, WESTINGHOUSE S&T CENTER: It is very difficult to bring in a Russian scientist. One must go through a lot of regulations and have someone with them even when they go to the bathroom.

RONALD ROBINSON, TEXACO: Contrary to a previous comment, we've been very successful with research and cooperative ventures. We have installed a major computer center in Moscow, and we have had four research projects in place for more than a year now. We have been very successful in the research aspect. The timing of getting sensitive computers through the Departments of Defense, State, and the Navy moved so fast that we actually were not ready to use the computers for a year, except for research projects. The people in the government were very good at getting the permits and the information we needed.

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Challenges:

Ownership questions: The problem we are encountering now, once the research projects are in place, is identifying who the research belongs to. It is not an intellectual property issue but a general property issue. The software has been written, the mapping systems put together, all of that -- the obstacle to commercializing is who should be our partners.

LARSON:

DoD restrictions on defense-oriented collaboration: The CEOs of the major defense contractors will not allow any interaction with the FSU because DoD has not yet said this is an acceptable practice. DoD needs to give a strong green light. This will impact the Sabit program, which will bring outstanding scientists from the defense establishment over here for 3-6 month internship programs. It is paid for by USAID through Commerce -- transport plus stipend -- but the companies must put them to work and show them how our system operates. Then they return and practice what they've learned here, maintain communications with persons here, and establish joint R&D. The problem is one of perception rather than regulation.

C. KUMAR N. PATEL, AT&T BELL LABORATORIES: What we are doing with the Russian scientists is slightly different. We work in areas of physics, chemistry, new materials. For communications, electronics, the photonics industry. To give you a brief outline, in late May we reached an agreement with a physics institution in Moscow that allowed for their scientists to do contract work with us in the U.S. We have known them for almost 30 years because they are the premier laser group in Russia. Having done that, we are expanding that relationship to include the area of crystal growth.

Challenges:

Restrictions on sensitive information: Many of the issues brought up so far apply to us. If we want to have relations with Soviet scientists to help the U.S. in research, it is not possible for us to tell them exactly where we stand. Surprisingly, they have done a fair amount of analytic studies at

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a much higher level than ourselves. How do you match their capabilities without telling them what our technologies are.

Intellectual property rights: There are significant issues on the Russian side also. Lack of understanding of intellectual property rights is one. During four months of negotiating international property rights we had to convince them they own something. We have a legal document which I think binds them, but we can't be sure they will adhere to it.

Disbursement of funds: A significant problem we face, which is partly solved, is how to transfer funds in a way that the Russian government doesn't take 30-40% off the top. Any help at government level would still be useful. How we solved it: we opened an account in a Russian bank, transferred money there in dollars, and gave the physics institution authority to draw against the amount. We also needed an specific agreement from the Russian ministry of science that the money was being transferred for scientific purposes and that the Russian government could not take any off the top. It was a one-time deal and we don't know if it will work again.

Another IPR issue is who is in charge. In our IPR agreement with the physics institute, we granted rights to our Russian partners to use the technology inside Russia, but it will belong to AT&T. It is not clear that they understand that distinction. And none of us is sure that the director of the institution even had the authority to sign a piece of paper like that.

JOHN GAGE, SUN MICROSYSTEMS LABORATORIES, INC.: Every statement made by Mr. Patel we totally agree with. For example, we hired certain FSU scientists and brought them to California to help design the next generation of supercomputers. We spent two weeks learning from each other and went through the designs for the next generation of FSU supercomputers. As it turned out, they were the designs from our 1993-94 desktop machines. The machines we now sell as workstations passed the supercomputer definition for them.

As far as access is concerned, we allow anyone in the world to make machines like ours, we license our technology broadly. Clones of our machines are now very difficult to move from the U.S. to Russia, but can be easily moved from Taiwan to Russia.

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The second group we invited, from Zelenograd, build satellite devices that are sometimes used by the KGB. They are some of the world's best antenna people. Thus, in advance of Motorola-Iridium we have access to Russian experimental satellites. It is likely that we are breaking some laws doing this.

The third group was nuclear scientists. Some of the world's best FORTRAN people, but we can't send them the details of the compiler optimization technology for the kinds of reasons mentioned by others.

E-mail: We could not communicate with the Russian academies of science or the Ukraine academy of science without it. Suggestion: install electronic networks throughout all the republics.

JOHN MORRISON, TECHNOLOGY TRANSFER: Just as there is a problem with DoD clearing cooperation with defense companies, there is a similar problem with the Department of Energy, which still lists the Soviet Union on their restricted country list. Any communication or contact is highly restricted. It is a very much an impediment on the weapons production program side.

JOHN GAGE, SUN MICROSYSTEMS LABORATORIES, INC.: Encryption is another problem. The export of encryption technology is forbidden. We are planning to place encryption devices on all the machines we ship two years from now. We must prepare for a regime in which everything there is encrypted.

ROBERT L. MOSER, JR., INNOVATIVE RESEARCH CORP.: The Russians also would like to protect their technology. They are concerned about the proliferation of it and want to protect it from third world exploitation. The only way to get around that problem is to go to the Swiss and others. It's a major problem and one we all have to be cognizant of.

Bush and Yeltsin need to solidify a technology and information transfer agreement and follow it through down to the education process. If they don't do this at the top levels it is going to take a very long time to resolve.

> Taxation problem: The 20% tax taken off the top is a problem. Yeltsin's agreement said that the government would not be

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taking it off anymore, but the funds still have to be converted into rubles. Russian scientists want to do away with the money off the top, but they get concerned if we try to do away with the 38.5% that goes into their pension fund.

EDWARD DOWDY, STATE DEPARTMENT: Both the salaries of scientists themselves, and goods and services in and out of Russia, are taxed. Part of our agreement will be to set up two offshore bank accounts, but at some point the money will have to be accessible to the scientists. We are getting a lot of cooperation from the Finance Ministry and the banking ministry both, and are working at the highest levels to do this.

JOHN KISER, KISER RESEARCH: These issues of the Russians selling at any price and confusion over ownership -- to put it in perspective, ownership problems happen all the time in the U.S. too. It is just that in Russia they are not used to it. The problems are not that different from this country's when we started to get a lot of entrepreneurial professors. Theirs is an early manifestation of a process we've already gone through in this country.

American companies have a lot of leverage over there. You should tell your Russian partners, sort this out or we're not going to do anything with you. Have some legal substance to it.

There are not any problems I've encountered that can't be solved with imagination, flexibility, and a commitment to do things.

On the question of Russians selling at any price: there is no question there is a fire sale mentality there, but there are also some very tough negotiators who don't bend an inch. We have negotiators we're involved with now who will not go below certain prices.

On the issue of who's in charge: You run into this all the time in this country. The Russians are extraordinarily frustrated with our management.

The issue of privatization: Americans should keep in mind that this is an ideological reason for working with them that they may not really agree with or understand. Free markets are getting a bad name there because of the association with hucksterism -- they consider buying-selling to be a non-productive activity. We should be conscious of these attitudes in dealing with them, especially since there is a strong

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tendency for funding recipients to mouth whatever they think you want to hear. Many organizations in Russia are setting up things that sound private, like joint stock companies. But the fine print comes in a wide variety of hues; many are in fact mixed with the government. Their commitment to foreign joint stock companies may have nothing to do with privatization. They are interested in the pragmatic considerations of how to make the most money, not the ideological considerations. Our government should soft-pedal this.

ROY D. TAYLOR, PITTMAN-MOORE, INC.: We are an animal health and nutrition company. I am also director of the U.S. feed grains council and chairman of our industry association's Export Opportunities task force. I've visited the FSU 35-40 times over 10 years.

As Mr. Kiser suggested, you must be flexible. The locals pay lip service to a free-market transition. The only way to really make that transition is to let commercial companies get in there and set the example. It's nice to have government agencies, academics, individual bureaucrats go over, but to execute these ideas requires leadership by example. We should be realistic: this will take 10-20 years. The children growing up now will establish a free market there.

Two, if the general food supply does not improve, no matter how many agreements there are the political instability will continue. Here is a weakness in coordination. In the farming sector, USDA's Extension program is trying to set up a model farm program; also the Feed Grain Council, individual companies like ours, Iowa and Indiana, farmer to farmer -- each effort in its own way has an impact on one small segment of the Russian economy. Can we coordinate to make a hell of greater impact on the food supply? Existing aid programs are not structured to accommodate the total range of agricultural products.

We are doing more than making a sale, we are trying to transfer product technologies and management approaches. We have to educate them how to function in our economy. But it's very difficult to close the loop -- to actually use these programs in a constructive manner. I encourage more coordination, easier access to the range of technical assistance programs, to give private companies freedom to function without major interference by the bureaucracy.

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DAVID M. BINNS, FOUNDATION FOR ENTERPRISE DEVELOPMENT: I share the skepticism that's been expressed about what they think we mean by privatization. The U.S. government could be a big influence in the short term. In any case it will be two to three years out before privatization gets underway in companies with sensitive technologies. Until they have some form of de facto privatization they can't get independence from the central ministries. A push by our government, whether it's public relations or increased technical support, is essential in the next six to twelve months.

DYSON: The issue is hierarchical. It's a question of everyone trying to grab what he's got control over, rather than industry versus government. It's incredibly complicated.

LINDEN BLUE, GENERAL ATOMICS CORP.: We have the highest regard for their physicists, they are truly world class. Their engineers by contrast are about third rate. Their fabricators are 4th or 5th rate, at third world levels at best.

We have in place a program to bring 100 Russian physicists over, it's going fine. The money is flowing through. Also we are collaborating with the Russian and international thermonuclear communities to develop the next phase of fusion energy. We have been working with one of their reactors for 15 years, have 100 of their people on our payroll right now. In fission our collaboration is much less extensive.

When you ask the basic question, What is it they have?, the answer is that what is of value are their commodities. Their weapons hardware is very impressive, that is what they are best at -- the problem is we don't want them to do what they do best. In effect we have to pay for them not to do it, if that is in fact the government policy.

To make a broad generalization, they have nothing that is internationally competitive in consumer markets, compared to what else is available in the free world. This is less true in technologies but somewhat.

What they have is resources, commodities, highly enriched uranium. They have oil, gas. As others have said, unless and until privatization occurs we can't expect them to be competitive. Our primary thrust will have to be to pay them for not doing what they do best.

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In technology, thermionics for example, they have it, it works, we feel there is potential collaboration but it's not terribly elegant. I expect their welding technology is an exception; some materials, metallurgy may be also.

Best we can do for them is form joint ventures to transfer our technology there. It's an exception that we'd want to bring theirs here -- except when we can work shoulder to shoulder with their physicists.

DYSON, EDVENTURE: In commercial software there is some very advanced development, for example in text processing, CAD/CAM, machine design. The ability to commercialize it is what they lack. The combination of American commercial skills and Russian S&T I think can be very fruitful.

GENE DANZIGER: Russians express frustration that we are not a constant presence, they express chagrin at being able to deal with Japanese and Germans but they can't get the U.S. to the table. The issues of the impediments our government brings along historically are keeping the U.S. from dealing with our counterparts there on a day to day basis. We are viewed as tourists or window shoppers, not business people.

Impediments on their side: If you want to go to Lithuania from Moscow you need a Moscow visa. Before a trip I have to take my passport sequentially through the various embassies -- it may put my trip off three months if I want to visit three CIS countries. The mechanics of travel is something governments can discuss.

JOHN S. ISBELL, DEPARTMENT OF COMMERCE: The Secretary of Commerce had a very large business summit in June with the Russian Minister of Foreign Economic Relations and agreed to establish a U.S.-Russian business committee. It will address some of the issues raised here. There are working groups on investment, industry cooperation, business-to-business cooperation, defense conversion. Right now we are trying to get our Russian counterparts to participate in the working groups. The Secretary is going to Russia again this fall for a second series of meetings.

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RONALD ROBINSON, TEXACO, INC.: On the issue of window shopping -- we met with their minister of geology, who mentioned that he had had lots of visits from Americans but so far no evidence of business. We need to find innovative ways of working together.

Regarding technology, our experience is that on a theoretical basis, Russian scientists are world-class. Nothing has been printed here that is not well known in Russia. In practice, however, they have not developed the ability to translate theory into application.

The best way to transfer technology is through people. We have to facilitate the movement of experts in different fields. Movement of people and movement of resources are our biggest impediments. Trading papers, going to conferences, is fine; but transfer doesn't happen until two people are actually working together. And as has been said, they need access to U.S. information technology. We have Russians working in our shop whom we have to exclude from use of our supercomputer, etc. It just frustrates progress.

Companies just starting to work with them should expect a lot of posturing for the first year until trust is developed. When you have people working together continuously over time, lots of opportunities emerge.

Challenges:

Communications: At first we carried our own satellite equipment in a suitcase -- otherwise we would have had no communication with Houston. We have since fabricated a facility, using a SOVAM satellite.

Customs problems: Taking highly sophisticated equipment in is risky at best. There is no recognition by them of expensive hardware; it's difficult to get through Customs. Some of ours sat on the airport tarmac in Moscow for 24 hours with just a tarp over it, $6 million worth of equipment. Finnish organizations know how to work with the Russian government to get it through.

Overall infrastructure: you should simply assume it's not there. Placing a phone call from our institute in southeast Moscow to central Moscow is a 50-50 proposition.

Income tax issue: it doubles the number of people we have to have there.

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U.S. computer speeds: The formula used by the U.S. government to calculate data transfer speeds is not used by any other computer manufacturers. There needs to be clearer information from the U.S. government on what the terms really mean, programmed into the applications themselves.

Multiple entry visas: The government needs to facilitate these. People are the best way to transfer technology.

Ownership of resources: It is not a straightforward process to get a government or company to recognize anything as a legal entity in Russia. You must be an accredited company to get a bank account, etc., but it's a difficult task.

Work ethic: On the basic side, they are good workers. On the applied side, people may or may not show up or stay around on a given day. We need education on both sides -- American companies should not expect an American work ethic, and they shouldn't expect the U.S. to understand theirs.

Commercialization of technologies developed in Russia: There are ways to do it under current laws, but it could be easier on both sides.

Our programs:

Computer center in Moscow: According to our hosts the computer center we have set up in Moscow is the largest and fastest non-military computer center there, with a VAX 780 with Sun workstations. Unfortunately, right now the Russians can't have direct access to it. The Navy insisted on this at the beginning, rightfully at the time. But now their access to modern systems is essential.

High-level nuclear reactor in western siberia: Production is falling 15-20% a year. This is their major source of hard currency so it's a real problem.

Research projects: there are things Russian scientists have advanced farther than we have. We try to bring them here, talk about what they've been doing. Funding is joint: each entity pays its own people.

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GERSON SHER, NSF: Some of our global competitors are ahead of the U.S. in terms of penetration. This is also true with regard to Eastern Europe. It's hard to understand, since we are part of the same export system, COCOM, dealing with the same Russian government. Why are they so much more successful?

DYSON: One, people in Europe are much more used to dealing with them. American companies don't know how to do business overseas. They are more used to the bureaucracy. Two, it's much easier to fly from Frankfurt than from New York -- they're there more.

But I don't think they're doing that much better. Russians would prefer to work with Americans, a big country like ours. Rather than comparing ourselves to others we should look at how we're doing at all.

Tied aid is one idea. I'm not sure I like it.

TAYLOR, PITMAN-MOORE, INC.: What's needed are vehicles to accelerate participation by our private sector. We need more concrete encouragement. We need to be able to offer competitive financial terms, more generous travel allowances, loan guarantees, and other ways to reduce commercial and political risk. We have such vehicles, but they are not being used. Under the USDA/FAS General Sales Manager (GSM) programs of the Commodity Credit Corporation (CCP), for example, Congress gave the authority to make facilities projects eligible for loan guarantees. Nine months later, no regulations have been published, no projects have been approved, USDA/FAS has yet to publish their regulations. We have the authority and the money, but no regulations. Europeans are much more flexible in defining the fine print of their assistance programs.

THOMAS SIMONEN, GENERAL ATOMICS CORP.: We have six contracts on the verge of signing, others in process.

Communications: We found a company there called TNT, which does overnight mail.

Challenges:

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Inexperience of Russians: in making proposals, in banking regulations, currency -- the general lack of ground rules. We've had to teach and lead them in certain ways.

Uncertainty of who to deal with: Our solution to that is to establish multiple linkages in our contracts. We require approval at the working group level, from an institute leader and from an external liaison. Then we put the responsibility on them to meet the terms. We have experienced brief work stoppages while they worked things out to meet the contract requirements.

General observations: I would emphasize that Russians are eager to work with U.S. industry. They've basically have a distrust of their government, therefore of any government. Government-to-government programs that come in at too high a level are viewed with skepticism. Working through industry is in my view the best way to establish the support for S&T that I think you are trying for.

We must recognize that it's a long-term commitment. But there could be enormous benefit in long haul. We need to figure out how to sustain the effort.

DANZIGER: My view is that other countries have surpassed us by having more liberal interpretations of COCOM regulations. They have fewer steps, which are becoming fewer faster.

RATCHFORD: Is there anyone who has not yet made a formal presentation?

LARSON: We recently did a survey of our membership regarding their interactions with the FSU on S&T. Half of the companies that responded planned to do something. We also asked what the barriers are. The main thing they mentioned was how to find out what's going on in R&D and what quality level it has. Other problems they mentioned: intellectual property rights, maintaining confidentiality of discussions, transfer payments, communications, and others mentioned here.

Let me tell you about a new international journal that is meant to be a forum of scientists and experts. It will be published by Sanford Durst

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in Long Island City, NY, starting in November. It's supposed to be devoted to promoting Russian-American cooperation.

I suggest creating an international research institute on the problems of security.

DYSON: I produce a newsletter about computer markets in Eastern Europe. Its target is entrepreneurs and value-added resalers who want to do business with their counterparts in Russia.

I have three suggestions for the government: reduce impediments, raise incentives, invest in infrastructure.

> Impediments: These people don't have much time to navigate through bureaucracy on either side.
>
> Incentives: They need government loan guarantees, an aid program -- better still, a tax policy so that the cost of administering the aid is borne by private companies who have a vested interest in its success.
>
> Infrastructure: If you invest directly, the most important sites are airports, communication systems and transportation systems, probably administered by some contractor.

The biggest thing our people need is a free channel to find their counterparts in Russia. We can't rely on the government to have a rating bureau. You've got to go over there and invest time and money in finding partners. The government can make it easier for us.

Regarding Relcom, it's a counterpoint to the government infrastructure, a fundamentally positive development. It's a monopoly only in the sense that there is currently nothing else in the country like it.

GERSON SHER, NATIONAL SCIENCE FOUNDATION: To access E-Mail, Bitnet and Internet have an up-front fee, then it is essentially free to users. The Relcom system is commercial, with no up-front fee but pay-per-use. SU-Ern is trying to set up Bitnet in the FSU, which would have the same protocol as the university system in the U.S. and no upfront money. There is also a new one, Relearn, a spinoff of Relcom; it's a no-fee system similar to Bitnet so there may be some real competition here. We are trying to encourage the government to

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develop a strategy to ensure effective and orderly use, a basic protocol.

ANWAR A. FANCY, FANCY ELECTRONICS LTD.: I've experienced few of the problems described here. We started in Russia two years ago. I ran into Mr. Velikov at a conference and he became chairman of my joint venture. Since the ministries lack money, however, I've partly switched to private enterprise. So we in effect have two tiers: a government channel and a direct market channel, which has 125 service setups throughout the country.

I have set up three joint ventures there. I work with an American joint venture bank, no problems. Our procedure is that it always takes the money in rubles, then every Tuesday and Thursday we convert it to dollars. We sell a price list every week to people in Russia, get their orders back by fax. I deliver within a week usually.

One major problem these private guys face is paying 120% interest on their rubles.

I have an international phone line in my office, faxing is no problem.

Can we somehow institutionalize our experience of the last two years? Give channels to small business people to find their counterparts there? That would be fantastic.

One ambitious project going on is someone who is trying to set up a mini Hong Kong. They are dying for American partners. There are 18-20,000 workers there. It needs a tax and legal structure as an umbrella, then we could bring 100s of Americans there.

And there should be a similar mechanism here to allow Russians to come here and contact Americans. Give them free space at COMDEX, find out what they want to sell or do.

I sell PCs, printers, scanners, etc. I buy in the U.S. and sell there. The market is 5-10,000 machines a month; it could be more if they didn't have to pay in advance by two weeks. They don't want equipment that is made or assembled there, they want it done here.

Customs: 5% duty as of a couple of months ago.

Travel: I have no problem getting visas, there is a company in Moscow that sells them for $2,000. Also, getting Russian visas to

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other republics is no problem from Moscow. But there are terrible problems traveling within Russia.

Regarding competitors from Germany or the Far East: The market is so fragmented, so enormous, information is so difficult to get that I still run into Russians who have never met another computer seller. There is plenty of opportunity for us.

DYSON: I agree -- if you show up with the goods there's someone there to buy them. There is a real PC market there now. To make money in Russia you must go there and invest, like Anwar has done. Nobody is making anything like a monopoly product.

PHILLIP PADGETT, MCDONNELL DOUGLAS: The people we've talked to are focused on R&D of space sciences, technology and materials. It's probable that we will have a R&D contract with one of these groups by the end of the year.

Challenges:

> Funding: Even though the scientists we're working with [at the weapons conversion center] are in the state system, and the project contributes to important national programs, we have been unable to identify any of these people as nuclear weapons specialists or weapons scientists. Because they don't fall into that classification we can't take advantage of their S&T so much. When we cross that threshold it will help with the nuts and bolts.
>
> But in terms of proprietary info, we will be working in a fishbowl since Japanese and German scientists also have access to the center. It would be helpful to have some sort of bilateral U.S.-Russian S&T center. Also to somehow expand the definition of the kinds of scientists who merit this kind of cooperation.

SLADE, WESTINGHOUSE: We have a lot of activity and attempted activity in the commercial arena there.

Challenges:

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Russians are extremely tough negotiators. Things seem to move very slowly. Right now we are attempting to look at putting our own money into a couple of institutes for materials work. You have to establish your own relationships with the scientists. We deal only with institutes we know and have some personal relationship with.

DoD funding: We try to send our technology into Russia, but we have a lot of difficulty seeing how we will get paid for doing that. We can help the Russians destroy some of their weapons, but it depends on getting access to DoD funding, which is very difficult.

In nuclear power, we are more successful. But again, it's difficult. We're hoping for contracts but have nothing solid currently.

We don't see it as insurmountable, it's a step by step process.

MORRISON: We are establishing a business framework to make information accessible to U.S. companies. We have identified a number of areas where we want to make information available through global networks: catalogs of technology, catalogs of individuals, business laws, services, bulletin board services to allow Russian and American companies to hook up.

There is a thrust toward informatization in the Russian government. We have a project to study software production within the CIS. We have a methodology for calibrating companies on how good they are in producing software. We plan to use it in Russia, Byelorussia, and the Ukraine. The point is to address the credibility issue, since American companies are not sure Russian companies will be able to deliver, or deliver on time.

Challenges:

Standardization: Russian needs to implement product codes and standards. We need agreement on product certification and standardization approaches. Their knowledge-intensive industries need access to venture capital from us.

Brainware problem: This is the Russian equivalent of our intellectual property problem. Russian programmers are scientists first, who use software to achieve practical results. But algorithms are not copyrightable, even though they may

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have great value. Another angle on this is to create jobs to stop the brain drain.

Communications: Russian communications systems were designed to monitor and control, not to communicate. They are both a business impediment and a security issue.

Countries that have information do well economically; countries that don't, don't.

Insurance: I would like to see insurance limits raised to $50 million.

Government presence: The Department of Commerce has only six field personnel in the CIS.

Banking: Banking relationships are needed between U.S. and Russian banks.

A suggestion: start a U.S.-Israel binational R&D foundation that matches up to 50% of funds for joint ventures. They would be paid back through venture profits.

JOHN A. SHANNON, SAIC: We don't make products, we mostly do studies and analyses. 60% of our business is with DoD, 35% is with the environmental community.

Over 15 years, we have become very familiar with the FSU's S&T infrastructure either via DoD or working with them directly.

Today we have a plan in action to respond to the Nunn-Lugar Amendment and the Freedom of Support Act by using our talents with Russian S&T talents to work towards defense conversion and environmental remediation. We have developed about eight projects jointly: nuclear reactor safety, data rescue, global climate change, space research, etc. We use a two-phased approach: we have developed a long list of persons we can work with on monthly basis, and a list of institutes we'd like to work with. We have worked with the Russian Academy of Sciences to jointly develop these proposals. Working directly, eye-to-eye, is the only way to do it. We will open our first office in Moscow in October.

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Another part of our program regards privatizing different parts of the S&T community and the Academy of Sciences. We will open our first office in Moscow in October.

Our approach is to send our scientists and engineers to offices in Russia to work with Russian scientists. They are hired as consultants or subcontract with Russian academies. Most are under U.S. government sponsorship.

In the future we plan to open a network of offices to liaise with Russian companies and help them privatize.

Challenges:

How much funding: To the questions of how to fund and who to fund, I would add how much? Salary scales, we gather, range from $100/month to $1,200/month. We were cautioned by the scientific community there that the U.S. view of what Russian scientists make, e.g., $100/month, might not be realistic. We suggest the U.S. government work out with the Russian government what their categories are and the levels within each.

Streamline contracting: Under the old methods of contracting, you could go from an RFP to a contract in a year. Time is of the essence now, these rules should be modified to facilitate more speed.

Joint hiring practices: We can hire directly or not; we need some uniformity in how to do that. Under some contracts we have right now we have available to us a large number of scientists we can hire as consultants. Our current contracting mechanism doesn't allow us to do that.

Advertise Russian opportunities: Within my customer base, at the level I deal with there is a lack of knowledge that we can do good research with Russia. This is unknown at many levels. You need to notify them there's a talent pool available.

MOSER: Only $165 million of the $400 million granted for weapons conversion has been earmarked. The question is, how will it be spent? This should be decided not by DoD but government-wide -- we need top-down leadership to do away with the slowness of bureaucracy.

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Also, Russians are very concerned about their own ecology. They are trying to figure out the technologies, without a plan in place to clean up. It will take time but we can work together to develop those technologies. It is a worthwhile endeavor. There should be tax incentives by the U.S. government to facilitate that.

GAGE: The issue is one of DoD's ability to keep control of the flow of information. DoD is going as fast as they can, trying to maintain control of the information that is passing through, the dangers of it's leaking. High-speed communications technologies will alter everything in 1995-96.

JOHN THOMAS, DOD: We are operating on a decreasing budget; people's own jobs are on the line. So we have an imperative now, of considering the effect of everything we do on our own people.

Another new dimension: The reason we are getting in the way of promoting technology transfer is that we have to consider Russia as a potential competitor in the long term, for example in their launch capabilities. This is an overriding consideration.

The $400 million has already been spent 10 times over. It includes academia. Under the best possible conditions, even if it is spent as efficiently as possible, it's just a drop in the bucket.

Russian blueprints are marvelous, but in the workshop they can't meet our standards. They are good in theory, poor in application. This is partly related to their work ethic. In fairness to U.S. companies who are criticized for going in too slowly -- the German government also is worried about its loans, worried about getting paid back. I'm not sure the Germans are doing so great compared to us.

Finally, whether you recognize it or not, we are streamlining. COCOM has cut the list by 40-50%. I agree that interpretation of the regulations can be everything. We choose to interpret more strictly than the Europeans do. Again, it's a problem of the potential for negative developments in Russia. Reform, privatization, and demilitarization are still an open question. Yeltsin is under tremendous pressure from the Russian military-industrial complex to do business the old way. Many of the persons running the institutes are the same ones as a couple years ago and are opposed to our ways. And Yeltsin has been forced to appoint some of the old defense managers to his cabinet, where they oppose his reforms. Of course we hope the

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process is not reversed, but market reforms are far from being a done deal. I look for a change of generation for a change in attitude.

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CISET Report on U.S. Government Science and Technology Interactions with Russia

INTRODUCTION

During the past year historic political and economic transformations have been initiated in the former Soviet Union. These have dramatically altered the world order and challenged assumptions which previously governed U.S.-Soviet relations. The stability of the new independent states (NIS) of the former Soviet Union will be greatly influenced by their ability to preserve and enhance scientific, industrial, and agricultural enterprises which foster free-market economic development. Cooperation with the United States in science and technology could significantly influence the transformation of these states into democratic, market-based societies. These transformations are critical to global economic, political and strategic stability. In addition, S&T cooperation with the NIS will provide to the United States access to unique scientific and technical expertise, research facilities and investigative opportunities.

Of course, scientific cooperation between U.S. and Soviet scientists has a long history. Formal cooperation has occurred for over twenty years through executive agreements that have facilitated scientific collaboration in key areas, including public health, environmental protection, space exploration, transportation, and energy. In response to the encompassing political changes underway in the NIS and the new scientific opportunities these changes have created, the policy framework for S&T cooperation should be examined to ensure that S&T interactions effectively advance mutual objectives. The present focus of attention is on Russia, recognizing that U.S.-Russian bilateral arrangements may provide a model for opportunities with the other NIS.

In November of 1992, Dr. D. Allan Bromley, Assistant to the President for Science and Technology, will meet with his Russian counterpart in Washington, D.C. to discuss the current scope of cooperation with the public and private sectors, and avenues for expanding bilateral S&T cooperation. In preparation for this meeting and at Dr. Bromley's request, the FCCSET Committee on International Science, Engineering and Technology (CISET), Subcommittee on S&T Cooperation with Industrialized Countries, has prepared this report, which characterizes the nature and scope of current activities involving U.S. Government agencies and identifies impediments which hinder S&T interaction. Background on the status of science and technology under the Yeltsin Government is provided first, followed by a summary of cooperative activities and major policy issues for consideration.

Science in Russia During Transition

In a presentation at Georgetown University last spring, Academician Yuri Osipov, President of the Russian Academy of Sciences, noted that the problems which confront Russian science mirror the present economic and social challenges of the former Soviet Union as a whole. The task of democratic and economic reform coincide with the reorientation of Russian research capabilities. One commentator has noted that in the broadest sense, the former Soviet Union is undergoing a transition to a civic society, with service and production functions previously undertaken by the state now devolving to the private sector, and subject to the laws and regulations of an accountable government.

The collapse of communism was driven by the desire for personal liberty, the centripetal tendencies of ethnic nationalism, and the deep and continuing stagnation and decline of the Soviet economy. Although personal freedoms and a renewed national identity are being realized, the success of present reforms may be determined by economic factors. The republics of the former Soviet Union are emerging from seven decades of oligarchic government and economic control. Their legacy includes the absence of market infrastructure in law, finance and administration, entrenched bureaucracy, and an industrial sector heavily oriented toward defense or protected, antiquated industries. Under Mikhail Gorbachev's piecemeal reforms, the Supreme Soviet introduced new economic freedoms while retaining administrative control of the national economy.

While Gorbachev's government attempted to ease economic difficulties through consumer subsidies, liberal bank credits to enterprises and welfare spending, the money supply and level of inflation expanded rapidly resulting in what one leading economist has termed the "vertiginous collapse of the Soviet economy." Gorbachev had failed to underpin legal and constitutional reform with corresponding economic policies.

As the regime's control declined, tax flows to the central government constricted, while public expenditures continued, leading to a consolidated deficit which exceeded 20% of GDP in 1990. Demand rapidly outstripped supply, as goods were diverted into the underground economy or exchanged on a barter market. In response, President Yeltsin and his team of economic advisers, led by Yegor Gaidar, have undertaken a comprehensive set of measures which follow the pattern of economic reforms in Eastern Europe. These include the creation of a stable, market-based monetary system, free trade, and rapid privatization.

Economic developments have had dramatic repercussions for the science base in Russia and on the capacity of Russian scientists to cooperate with U.S. counterparts. Russia and the other Soviet successor states are unable to support adequately the research

enterprise given competing national demands. The private sector remains underdeveloped and cannot provide proportional R&D investment as it does in other industrialized countries. The former Soviet Union's production plants, not yet privatized, may not be able to run as effective commercial enterprises for some years.

With the relaxation of travel and emigration restrictions, significant numbers of scientists now have emigrated to the United States, Europe and Israel. In 1990, 250 scientists of the Academy of Sciences, representing one-fifth of its scientists, went abroad on long-term contracts, whereas only 50 did so in 1989. In addition, many scientists have left their institutions to enter business or financial enterprises.

Western governments have made the broad appeal that preserving research capabilities of the former Soviet Union and converting military research into civilian technologies will be critical to the development of a vital economy and will prevent the migration of former Soviet weapons scientists to third world countries. Special attention is being given to high technology enterprises that were formerly part of the military-industrial complex. There are, for example, some 50 "closed cities," each with a population of approximately 40,000, dedicated to military technologies.

For those scientists who remain in Russia, economic retrenchments have resulted in a sense of isolation not dissimilar to that under former communist rule. The depletion of foreign currency reserves has severely limited the capacity of institutions to secure supplies and equipment manufactured in the West. Subscriptions to Western scientific and technical journals are virtually suspended. International mobility has been constrained by the inability of scientists to purchase airfares at market exchange rates. Further, the salary structure for most scientists, which has remained constant since the Stalinist era, is at a subsistence level due to inflation and has compelled many to take on supplemental or alternative employment.

Some of these privations may be eased with the stabilization of the ruble through stringent budget and credit policies enacted by the Yeltsin government, which may reduce inflation. However, a long-term need for capital investment, in both the public and private sector, suggests that a continuing retrenchment of the research enterprise in Russia is inevitable.

For doctrinal reasons, the Soviet Union invested substantially in science and technology as engines of social progress. Under the command economy of communist rule, support for the research enterprise was assured by fiat. In a market-based economy, the Russian government will be debating the affordable scope and extent of science which ought to be supported, given budget

deficits and the requirement of responsible monetary policies to secure Western structural aid from the International Monetary Fund and other sources.

Although Gorbachev's reforms consistently encouraged the economic self-sufficiency of scientific institutions, centralized funding of research persisted. The present Russian Science Minister, Boris Saltykov, now has introduced a new science policy framework based on competitiveness and diversity. The management and funding of science would dramatically alter under these proposed provisions. Block allocations for basic research would be replaced by a new emphasis on priority projects and merit-based grants. Support for individuals, rather than institutions, would be stressed. Criteria would be established to identify any institutions that should retain current subsidies, such as tax concessions and reduced rent.

In addition, the development of an industrial, civilian research sector would be promoted through the establishment of new legal frameworks to encourage investment. Institutions and economic links would be established between the Academies, Ministerial research institutions, and universities--branches of science that have historically been separated. Emphasis would be placed in areas of basic and applied science which might lead to innovative production techniques and products.

These measures have been introduced not only to rationally manage limited resources, but to reform the traditional organization of Soviet science under centralized authority. The organization and management of science in the Soviet Union was a collective oligarchy that mirrored the structure and priorities of the Communist Party. The system encouraged political patronage and created a fragmented research environment. Party officials assumed the right to appoint managers of research institutions and university rectors, who in turn had enormous authority to channel state support as they saw fit.

The doctrinaire functions of Soviet universities were judged to be incompatible with the pursuit of new knowledge through research. Therefore, institutions of higher education and the research institutions of the Academy of Sciences had little interaction. This separation has inhibited the ability of universities to train effectively new generations of scientists and cultivate research--since highly qualified graduates were culled for the Academies. There is a similar separation between academic and industrial research, and a corresponding inability to integrate research, development and production through academic and industrial alliances and to transfer basic research into useful and valued products.

New proposals to assist Russian science (such as the International Science and Technology Center established to

support defense related scientists, the House Committee on Science, Space and Technology's proposed bill to create a U.S.-Russian Science and Technology Foundation) are designed to circumvent the current top-down system of funding by supporting individual research activities based on merit. It seems clear that the scientific enterprise in the former Soviet Union will depend on external cooperation and assistance--both as a source of aid and conceptual guidance in developing new funding and management systems.

The most successful civilian research groups in Russia have traditionally been those with established ties to Western institutions. Linkages with U.S laboratories have enabled Soviet scientists to gain access to innovative concepts and methods and obtain needed equipment, supplies and training. However, equality of benefits has been the collegial philosophic and working principle of past cooperation. Soviet counterparts contributed unique resources or expertise and enhanced U.S. capabilities in such areas as high energy and plasma physics, spectroscopy and electronics research, and materials science--disciplines that have gained from an intellectual heritage in the physical and quantitative sciences and the broad Soviet investment in fields with prospective applications for the defense and aerospace enterprises. A critical challenge for U.S. Government agencies will be to ensure that principles of scientific reciprocity and mutual benefit are preserved in the long run while addressing immediate infrastructural needs.

NATURE OF THE RELATIONSHIP IN THE PAST

To examine the current U.S. S&T interaction with Russia and how it is evolving, it is useful to reflect on the nature of that relationship over the past 20 years. A number of general characteristics emerge. First, U.S.-Soviet cooperation was highly centralized. Virtually all activities were carried out under formal bilateral agreements. Informal linkages between institutions (and certainly between individual scientists) were discouraged and often impossible. Soviet counterparts in these agreements were generally ministries, academies, or other state-level organizations, not research institutes or universities.

Despite U.S. practice in its domestic S&T programs, cooperative activities under US-USSR agreements reflected the Soviet preference for hierarchical control and for central planning. Areas for cooperation generally were pre-selected by the parties to an agreement, leaving no room for investigator-initiated, competitively reviewed research proposals. Consequently, many of the cooperative activities reflected the priorities of the Soviet side (an example of this is NSF's experience under the old US-USSR S&T Agreement).

While these arrangements limited U.S. influence in bilateral activities, the centralized framework did have some positive aspects, particularly when compared with the current political and economic chaos in Russia. Commitments under bilateral agreements were generally honored. Channels of communication were clearly defined. Costs were generally shared equitably, on a receiving side pays basis and no funds were exchanged between the two countries.

Access to Soviet data varied, depending on the nature of the information. NRC and NIH report that Moscow was reluctant to share data on the health effects of the Chernobyl nuclear accident. USGS could obtain little information that the Soviets considered strategically important, such as data on oil and gas deposits, on critical and strategic minerals, satellite photos and topographic maps. Access to information began improving in the latter period of the Gorbachev regime, but the most dramatic change has been observed during the past year. The Russians are now willing to provide not only data on the Chernobyl accident, but also are offering information about earlier accidents in Chelyabinsk.

Throughout the seventies and most of the eighties, access to institutions and scientists was limited. Activities were overwhelmingly concentrated in the Russian republic and largely in Moscow and Leningrad. In the health area, for example, cooperation was focused largely on the major "showcase" centers, such as the All-Union Cardiology Research Center, the All-Union Cancer Research Center, and the Ivanovsky Institute of Virology, all in Moscow. Involvement of scientists in other cities and other republics was grudging and sparse. While this situation prevailed up to August 1991, the character of the current relationship between Russia and the U.S. is changing profoundly. Specific evidence of this change toward greater openness and less centralization is provided by the experience of U.S. technical agencies in the following section of this report.

MAGNITUDE AND CHARACTER OF THE CURRENT RELATIONSHIP

U.S. DEPARTMENT OF AGRICULTURE

Agricultural Research Service (ARS). The ARS has participated in short-term exchanges of scientists and joint symposia with USSR counterpart organizations since the mid-1970s. Recently, cooperative research in (1) biosystematics, (2) plant germplasm, and (3) biological control of rangeland weeds, Asian gypsy moth, codling moth, and Russian wheat aphid has been initiated through technical agreements with the Academy of Science, the Agricultural Academy of Science and the Ministry of Agriculture. This research, which is providing comparable benefits to each country, operates on a sending-side pays basis and the ARS investment will be about $100,000 in FY 1992. U.S. and Russian

scientists have conducted joint explorations for plant germplasm and biocontrol agents in Russia, the U.S. and Brazil. The ARS expects to double its funds for this collaborative research in FY 1993 and hopes to expand into areas of animal germplasm and value-added agriproduct development.

U.S. Forest Service (USFS). A protocol between USFS and the USSR State Forestry Committee initiated cooperation in 1974. Cooperative research has subsequently been conducted in (1) reforestation and genetics, (2) forest pathology and entomology, (3) grizzly bear and human ecology, (4) forest fire and atmospheric monitoring, (5) forest inventory and economics, (6) Siberian log imports, (7) Asian gypsy moth, and (8) Arctic forests research affiliated with the International Boreal Forest Research Association. The last three activities have received the largest level of USFS support. It is estimated that the USFS funding level will be $500,000 or more in FY 1992. In the past, costs have been shared, with the Soviet side paying for all in-country accommodations and travel of USFS personnel and the international airfare for their forestry professionals visiting the U.S. Currently, the Russians are unable to cover in-country expenses for hosting USFS visitors or airfare for their scientists. Until recently, the data received from Soviet forestry professionals were superficial, non-descriptive and scarce, at best. The quality of information provided in the last year has improved considerably.

A Letter of Record was signed in August 1992 between the Russian Forest Committee of the Russian Ministry of Ecology and Natural Resources and USFS. This document supports continued bilateral forestry research and exchange and also emphasizes cooperation in forest management and technical assistance to the Russian forestry sector. There are numerous proposals within USFS, state and private agencies for additional assistance to Russia in the fields of silviculture, fire prevention and suppression, timber harvesting and processing, environmental assessment and planning, forest economics, and marketing research to identify needs for forest products in the emerging Russian market economy.

National Agricultural Library (NAL). Under the Joint Working Group on Agricultural Cooperation in S&T, established under the umbrella S&T agreement, the Central Scientific Agricultural Library (CSAL) and the NAL have defined 14 areas of mutual interest which include improved exchange of USDA and Russian publications, sharing resources to produce translations, use of NAL full text digitizing capabilities, and improved coverage of American and Russian publications in the AGRIS database. NAL now receives nine Russian serials and the Soviet indexing services contributed to AGRIS reduces U.S. costs. The NAL Director and two Associate Directors will visit Russia next year to discuss the exchange of translation and training services. NAL plans to support the training in modern technologies of two librarians

from CSAL in exchange for the translation of selected materials from Russian into English.

Office of International Cooperation and Development (OICD). OICD administers the U.S.-USSR Agreement on Agriculture, which was signed in 1973, extended for successive five year periods, and will not technically expire or come up for renewal until 1993, although Joint Committee activities have been suspended. OICD has obligated about $80,000 in FY 1992 for exchange activities of USDA agencies, universities and non-profit research institutions. Under the 1990-91 protocol, 63 exchanges were completed in research and technological development, economic, research and information, and forestry. At the current time, there are 13 Russian scientists on long-term visits to U.S. laboratories arranged by OICD. The Russian Minister of Agriculture and Secretary Madigan signed a statement of shared principles during Minister Khylstun's visit in June, 1992. The USDA response is likely to cover business, commercial, economic and policy issues and may suggest a bilateral protocol on S&T cooperation.

U.S. DEPARTMENT OF COMMERCE

National Institute of Standards and Technology (NIST). The NIST agreement of many years with the USSR Academy of Sciences provided for exchange visits (on the basis of receiving side pays) in a broad range of physical, chemical, and engineering sciences; this agreement has now been renewed with the Russian Academy of Sciences. NIST has received Circular 175 clearance to begin negotiations with GOSSTANDART, the Russian State Committee for Standards and Metrology, the counterpart of NIST in many areas which operates several very high quality laboratories in the physical and optical sciences. NIST interests are in interchanging and validating ideas in the basic sciences, influencing the standard setting process in Russia, and assisting U.S. manufacturers to enter Russian markets.

Over 20 Russian scientists are now working in NIST laboratories or are approved to do so. NIST would like to assign a standards specialist to the commercial office of the U.S. Embassy in Moscow to influence development of the Russian standards systems and assist U.S. firms interested in business activities in Russia.

National Telecommunications and Information Administration (NTIA). NTIA has no formal S&T agreements or efforts with Russia but informal relations have been maintained on international telecommunications through the International Telecommunication Union and other multilateral conferences and coordination meetings. The Russian Minister of Communications has requested technical cooperation in the form of spectrum management training. NTIA proposes sending a joint team of USG and private sector experts to conduct a field assessment of the condition and

needs of the present telecommunications systems to develop policy planning and development options for Russia.

U.S. Bureau of the Census (CB). The Center for International Research of the CB has collected, analyzed and published statistics concerning the USSR for many years. In 1984 formal relationships were established with COSKOMSTAT, the Soviet statistical agency. An MOU encouraged the exchange of information between the two countries. Mutual exchange visits culminated in publication of a joint handbook, published in Russian and English, comparing and defining statistics related to comparable subjects. There are now 15 statistical offices throughout the former Soviet Union, replacing the central GOSKOMSTAT. All have asked CB for training of their staff. The Russian GOSKOMSTAT and the Center for Economic Analysis of the Ministry of Economics, as well as several of the most important economic research institutes in Russia, have expressed interest in conducting joint research projects with the CB.

CB has worked with the Institute for Socioeconomic Studies of Population in the Russian Academy of Sciences on a long-term study of the population in the city of Taganrog which was begun in 1968. This is the most comprehensive socioeconomic survey in Russia and represents an excellent potential source of information about the effects of the current economic transformation on the lives of typical urban Russians. CB has the capability (but no separate budget) to provide training for Russian participants in survey methodologies, foreign trade statistics, enumeration of small firms, income and poverty measurements needed to elevate their statistics collections to current Western standards.

National Oceanic and Atmospheric Administration (NOAA). NOAA has participated in S&T exchanges with the USSR (Hydromet and the Soviet Academy of Sciences) under a number of different agreements since 1972. Exchanges took place in the fields of marine and atmospheric sciences, fisheries science and management, environmental data and studies, and satellite remote sensing technology and applications. Recent activities in study of the science of climate change have overwhelmingly benefitted the U.S. Activities in the space sciences are just getting underway and show much promise. Costs have always been borne on a receiving side pays basis. In the last year, however, it has been necessary for NOAA to pay for costs of transportation and hosting on both sides in order to complete projects which could not go forward without hard currency support.

DEPARTMENT OF ENERGY (TO BE SUPPLIED BY DOE)

ENVIRONMENTAL PROTECTION AGENCY (TO BE SUPPLIED BY EPA)

DEPARTMENT OF HEALTH AND HUMAN SERVICES

The Department of Health and Human Services (HHS) has cooperated with the USSR through two agreements: (1) the US-USSR Agreement on Cooperation in the Field of Medical Science and Public Health, first signed in May 1972, and (2) the US-USSR Agreement on Cooperation in Artificial Heart Research and Development, first signed in June 1974. Both agreements expired this year but cooperation continues in 16 areas with participation of the National Institutes of Health (NIH); the Centers for Disease Control (CDC); the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA); and the Food and Drug Administration (FDA). A draft MOU for Cooperation in the Field of Health and Biomedical Research between HHS and the Russian Ministry of Health is currently being submitted for Circular 175 clearance.

The most active and extensive cooperation is in cardiopulmonary diseases, which includes nine areas of research that have resulted in over 70 publications in recent years. The program recently marked 20 years of uninterrupted cooperation. Other key areas of cooperation are cancer, environmental health, arthritis and musculoskeletal diseases, viral infections other than HIV, eye diseases, an individual health scientist exchange program, medical primatology, and biomedical problems of alcohol and drug abuse. Cooperation in several other areas is in various stages of development.

In the past, cooperation on the USSR side involved only institutes of the Academy of Medical Sciences and the Ministry of Health, and within those entities, was limited primarily to the major institutions (the All-Union Cardiology Research Center, the All-Union Cancer Center, the Ivanovsky Institute of Virology, among others). Areas of cooperation reflected largely Soviet priorities and investigator-initiated proposals were not considered. The cooperation produced some important benefits, including new insights into cardiovascular risk factors, techniques to limit infarct size following a heart attack, sharing of influenza strains to make appropriate U.S. vaccines, and access to an improved laser technology for the treatment of eye disease. From a political perspective, the program succeeded in maintaining solid working-level relationships and open channels of communication through 20 years of often stormy diplomatic relations.

In FY 1992, under the formal program of cooperation, 22 U.S. scientists visited the former USSR for 15 man-months and 117 scientists from the FSU visited the U.S. for 250 man-months. The preponderance of this activity involved Russia.

During the past two years, the climate for cooperation has changed substantially. There is now far greater openness, frank discussion of needs, and desire on the part of Russia for "cooperation" in a broad range of health-related issues. While cooperation in science and technology generally refers, within HHS' programs, to basic biomedical research, there are other areas of "health cooperation" that are more accurately interpreted as "technical assistance," such as pharmaceuticals and vaccine regulatory affairs, field epidemiology, and health care financing. From within existing resources, HHS is largely restricted to funding mutually beneficial S&T cooperation. Components of the Department, including the CDC, FDA, and the Health Care Financing Administration, are working with USAID to provide technical assistance on a range of urgently needed public health issues.

In addition to cooperation under the agreements, NIH implemented its Central and Eastern European Initiative, which supports collaborative projects between NIH intramural researchers and colleagues in the region through short-term exchange visits, fellowships, and laboratory materials for the foreign scientist. In FY 1991 and 1992 NIH supported 26 such projects for a total of $377,000. In FY 1992, NIH introduced a program of small grants to fund the same mechanisms involving NIH grantees. In FY 1992, 16 projects were funded for a total of $363,000.

NIH scientists are also collaborating with scientists belonging to Institutes of the Russian Academy of Sciences. Negotiations on an MOU under the Basic Science Agreement are pending completion.

Under the NIH Visiting Program, through which foreign scientists are invited to work at NIH intramural laboratories for extended periods
(one year or longer), the number of scientists from the former Soviet Union has increased from two, three years ago, to over 70 this year. This trend indicates that junior-level scientists are now able to travel overseas for long periods of time, an opportunity which previously had been denied them.

Total estimated HHS funding for cooperation with Russia in FY 1992 is $4 million.

DEPARTMENT OF THE INTERIOR

DOI currently has over 31 active projects with Russia under the Basic Science Agreement and the Environmental Agreement, for a total funding in FY 1992 of approximately $2.2 million. (Projects under the Environmental Agreement that are not S&T related are not discussed in this report.)

DOI has two MOUs under the **Basic Science Agreement**: The first is between the U.S. Geological Survey (USGS) and the Soviet Ministry of Geology. The new coordinators designated by the Russian Government are the Russian State Committee on Geology and Mineral Resources, and the Russian Academy of Sciences. FY 1992 funding is estimated at approximately $1.4 million. The second MOU is between USGS and the Main Administration of Geology and Cartography, with FY 1992 funding estimated at $0.5 million.

The main activities under this Agreement include: (1) Oil and Gas Studies, whose main objectives are to develop a unified system for describing, quantifying, and classifying petroleum resources, and to compile a digitalized map of petroleum occurrences throughout the world; (2) Mineral Resources Studies to better understand the identified mineral resources and mineral potential of the Russian landmass and to evaluate the impact of these resources on the world's mineral supplies; and (3) Mapping Science, which includes cooperation on geographic information systems applications, global change investigations, satellite product comparisons, and geodetic positioning studies.

Under the **Environmental Agreement**, there is one MOU between the Bureau of Land Management (BLM) and the Russian Ministry of Ecology and Natural Resources, with U.S. FY 1992 funding of $0.2 million. Three other programs under this Agreement include Animal Species Studies (Fish and Wildlife); Global Climate Change (USGS); and Earthquakes Hazards (USGS). Total funding for these activities is $0.6 million.

USGS' cooperative Water Resources Research involves studies of ground water contamination, particularly the transport of nitrates and herbicides. The primary objective of USGS' cooperation on Earthquake Studies is to improve earthquake prediction capability. BLM's cooperation on Paired Ecosystem Project/Global Climate Change studies the responses of sensitive ecological indicators to global climate change in different climatic zones in Eurasia and North America.

Following the signing of the MOU with the Ministry of Geology in 1989, access to information became easier, but it was still difficult to obtain satellite photos and topographic maps. Since the August 1991 coup attempt, restrictions were eased dramatically.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

US-Russian civil space cooperation is taking place under the Agreement between the United States and the Russian Federation Concerning Exploration and Use of Outer Space for Peaceful Purposes, signed by Presidents Bush and Yeltsin in June 1992. The agreement succeeded the 1987 US-USSR Civil Space Agreement

which expired in April 1992. The new agreement, which will be implemented by NASA and the Russian Space Agency, highlights cooperation in: (1) monitoring the global environment from space, (2) participation of astronauts and cosmonauts on Mir Space Station and U.S. Shuttle missions, (3) safety of space flight activities, and (4) space biology and medicine. Cooperation will also continue under the new agreement in life sciences, solar system exploration, space physics, astronomy and astrophysics, and earth sciences (disciplines carried over from the old agreement).

Cooperation was begun in the 1960s and continued under the Civil Space Agreement, culminating in the 1975 Apollo-Soyuz mission, the only instance of manned spaceflight cooperation between the two countries. Initially, NASA, the USSR Academy of Sciences, and Glavcosmos were the implementing agencies for the 1987 agreement. Additional organizations became involved as projects progressed and increasing openness led to the unveiling of previously secret organizations. Most notably, NASA began interactions with the Ministry of General Machine Building, which had created Glavcosmos to serve as a "cover" organization.

The two countries' space programs developed in isolation and complemented each other in many ways. For example, the U.S. developed excellent information on human response to launch and short-term exposure to microgravity, while the Russians gained significant experience in long-duration space flight. Broad U.S. experience in solar system exploration was balanced by in-depth Russian knowledge of Venus. Space physics programs were also complementary. The U.S. provided excellent instruments that might not otherwise be launched in return for the USSR's more frequent launch opportunities.

New initiatives include the flight of Russian cosmonauts on the U.S. Space Shuttle and of American astronauts on the Russian Mir Space Station; a rendezvous, docking and joint mission between Shuttle and Mir; and a new Joint Working Group on Mission to Planet Earth. All activities will proceed with the Russian Space Agency and continued involvement of the Russian Academy of Sciences.

Under the old agreement, cooperation was conducted on a no-exchange-of-funds basis. For meetings, the sending side paid travel and receiving side paid in-country expenses. NASA's interaction with Russia now involves the purchase of Russian space technology, goods and services. NASA has also signed contracts with Russian space industry on study of possible use of Russian Soyuz-TM spacecraft as an interim assured crew return vehicle; study of Russian-developed rendezvous and docking system; critical long lead-time research in life sciences; and general studies on Space Station Freedom applications for Russian launch vehicles and other space systems. NASA has signed a

contract to study possible Russian deep space network support for a U.S. Galileo Soband mission and is considering the acquisition of an engineering model lander from the Russian Mars '94 mission.

U.S. NUCLEAR REGULATORY COMMISSION

The NRC has played a leading role during the last five years in cooperative efforts under the Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCNRS). Cooperation has been aimed at improving safety in the former Soviet Union though bilateral information exchanges, joint technical working groups, exchanges of safety inspectors, and, recently, in specific coordinated research. JCCNRS working groups met in October and November, 1992 and the JCCCNRS has its annual meeting in December, 1992. NRC has been assisting Russia and Ukraine in developing a program of assistance in nuclear material safeguards, recommending employment projects (reactor safety, waste handling, materials, environmental restoration) for former nuclear weapons scientists through the International Science and Technology Centers (ISTCs), and developing international initiatives to help improve the safety of reactors in the former Soviet Union.

Multilateral negotiations conducted with the G-7 countries in Lisbon produced agreement in May to build on NRC and DOE cooperative activities, establish regional training centers in Russia and Ukraine, provide immediate operational safety enhancements for certain reactor types and risk reduction measures for others, and provide regulatory assistance in developing consistent and effective safety standards, as well as training in their use. Congress approved $25 million in FY 1992 funds to initiate work on these activities.

The heads of the U.S., Russian and Ukrainian regulatory agencies met in the U.S. in July to reach agreement on the actions needed to implement the Lisbon proposals. Implementation will begin in September and some JCCCNRS working groups will be subsumed under the assistance effort.

NRC has seen a dramatic upsurge in interest in mutual, scientifically rewarding cooperation with Russia on analysis of the effects of the Chernobyl accident and earlier nuclear accidents and events, especially those which occurred in the Chelyabinsk area. Working Group 12, concerned with issues involved in the aging of components and plant life extension, held its first substantive meetings in the U.S. in March; these are subjects of vital interest to the nuclear industries of both nations. Working Group 1, on regulation, held meetings in Moscow in May to discuss the draft atomic energy legislation being developed in Russia and Ukraine. Working Group 6 (Severe Accident Analysis) and Working Group 5 (Backfitting) met in Russia the last two weeks in June and members of the former group

travelled to several previously closed scientific centers to observe research being done cooperatively with NRC, convincing the U.S. side of the scientific merit of this work.

NATIONAL SCIENCE FOUNDATION

NSF cooperates with Russia primarily through its MOU with the Russian Academy of Sciences under the US-USSR Agreement for Cooperation in the Field of Basic Scientific Research, signed in 1989. This is the first agreement between the two countries to rely on the principle of investigator-initiated, competitively reviewed proposals and direct scientist-to-scientist interaction. This reversal of the former top-down principle represents a fundamental change in the approach of both countries to cooperation. One measure of its success is that the approval rate for proposals under the agreement is much higher than the norm for NSF proposals.

Since the agreement was signed, proposals have been received from every corner of the former Soviet Union, in contrast to the old US-USSR Science and Technology Agreement, for which NSF was the lead agency between 1972-1982. Under that agreement, activities were adopted primarily on the initiative of the Soviet side, which operated in a centralized and often manipulative manner. The U.S. did benefit from the cooperation in some areas, most notably in theoretical physics, materials science, microbiology, thermal engineering, and science policy.

Another unique feature of the agreement is that it no longer preselects topics for cooperation. By amendment in 1991, both sides agreed to extend the cooperation to virtually all fields of science, including social science. The main criterion for cooperation is now the quality of research. Participation under the agreement has also been extended to all basic science institutions, including universities.

Since its inception, the program has supported 34 scientific workshops and 67 cooperative research projects. In FY 1992, NSF supported 17 scientific workshops, 38 cooperative research projects, and 12 project development activities, totalling approximately $2 million.

In addition to its activities under the Basic Science Agreement, in FY 1992 NSF began awarding supplements to active grants for cooperative research projects with the former Soviet Union. These supplements provide infrastructural support to scientists in the NIS through the purchase and shipment of scientific supplies, office equipment, and subscriptions to scientific journals. NSF has awarded 93 grant supplements thus far, totaling over $1 million.

DEPARTMENT OF TRANSPORTATION

DOT cooperation in maritime and civil aviation with the USSR began in June 1973 with the US-USSR Agreement on Cooperation in the Field of Transportation; the most recent agreement will expire in May 1993. DOT is now drafting a new S&T agreement with Russia which may be signed in Washington early next year. An MOU with Russia on Air Navigation, Airspace Use and Air Traffic Control was signed in June 1992 and new activities are underway which could greatly benefit the U.S. aviation industry. The Federal Aviation Administration (FAA) and the Russian Aviation Register are working to determine the comparability of U.S. and Russian systems and standards for the certification of civil aircraft with the goal of a bilateral airworthiness agreement by 1995 which will permit reciprocal acceptance of certifications. Russia has approved GE engines for Airbus aircraft for Air Russia and other new airlines. FAA and the U.S. Air Transport Association (ATA) are working with the Russian Commission for Airspace Use and Air Traffic Control (ROSAERONAVIGATSIA) to open two air routes through the Russian Far East airspace to Tokyo by January 1993, saving airlines tens of millions of dollars annually in fuel costs.

Other activities involve cooperation in Russian use of the Global Positioning System for navigation and air traffic control; DOT support for the Westinghouse-led Global Air Transportation System and Services Consortium to begin a $10 billion air traffic control system modernization effort largely financed by overflight revenues; and continuing cooperation in accident investigation, aviation medicine, microwave landing systems and collision avoidance systems.

The U.S. Coast Guard (USCG) has maintained contacts with counterparts in the former USSR in the Marine Pollution Control and Salvage Administration (MPCSA) to keep the U.S.-USSR Environmental Agreement and its associated Joint Contingency Plan for the Bering and Chukchi Seas effective. Teams of pollution control experts are exchanged annually to improve information exchange and cooperation. A USCG team visited Moscow in June 1992 but the Russians now have difficulty attending meetings in the U.S. The Vice Commandant of the Coast Guard, Admiral Nelson, will visit Russia the first week in September 1992 to meet with officials responsible for Arctic activities to discuss reports of nuclear dumping in the Arctic Basin.

USCG is active in a number of areas related to icebreaking. Commercial transits of the North Sea Route (NSR) are of great interest because of the potential revenues to non-Russian shippers. A conference on the NSR will take place in Trondheim, Norway, September 2-4, 1992 to discuss the range of concerns which must be resolved before this ambitious and potentially environmentally destructive plan comes to fruition. There is also concern about ecological effects of possible drilling, pumping and maritime transport of oil in the Russian Arctic.

USCG has shared information on icebreaking techniques, hull and propulsion technology, and design and construction of icebreakers with Russian counterpart organizations.

The USCG and the USSR have shared information concerning radionavigation since 1980 and annual meetings since 1989 have been held to close the 500 mile gap between the Chayka eastern Russian chain and the North Pacific U.S. LORAN-C chain; this link should be completed by mid-1993. The Russians have been very cooperative in search and rescue efforts and law enforcement on illegal driftnetting since an agreement and MOU, respectively went into effect in 1989. There have been regular exchanges and a joint search and rescue exercise was held with the Russians this summer.

The Federal Railroad Administration (FRA) entered into a working agreement with the USSR in September 1989 within the framework of the Science and Technology Agreement on Transportation. Several areas for cooperation were identified, research papers were exchanged, but activities were not implemented due to political unrest in the former USSR. The railway systems in that country are critically important as intercity ground transportation, in the absence of a modern highway system, and are responsible for moving 50% of the railway freight of the world. The railways are the second largest employer in Russia, following the military. The Russian Rail Ministry was established in January 1992 and its Minister, G. Fadeev, has indicated interest in renewing S&T cooperation with FRA. The Ministry of Transport, however, views the new Ministry as a temporary institution. FRA has found that access to the new Ministry is difficult and restricted to lower levels (in contrast to the easy access to the Ministry of Transport).

IMPEDIMENTS

As Russia and the other Newly Independent States of the former Soviet Union begin to reorient their systems of science following Western models, many impediments still influence current and prospective cooperation between U.S. and Russian scientists. For the most part, these impediments will be reduced depending on the success of the political and economic transitions underway.

Impediments in Russia

- There is a high degree of organizational turnover and flux. Current leaders are not always in a position to make long term funding commitments or serve as signatories on contracts. There is broad uncertainty regarding the current or prospective status of institutions as public or private entities.

- There is an absence of effective intellectual property laws, which reflects a wider lack of appropriate legal frameworks

related to commerce. Prior to the failed coup in August of 1991, the Supreme Soviet had established governing codes that are in broad harmony with the West; however, no enforcement procedures had been put in place. This responsibility will now devolve to the respective republics.

- The lack of a legal framework concerning real property ownership creates a climate of uncertainty that affects cooperation with private institutions in the former Soviet Union.

- U.S. agencies are inhibited from transferring funds to Russia due to the inability of the present banking system to ensure the integrity of financial arrangements between foreign organizations and institutions of the former Soviet Union. Further, flows of foreign currency are heavily taxed and subject to conversion into rubles at unfavorable rates that do not reflect market value. There is no assurance that funds transferred to Russian financial institutions will be protected for their intended purpose.

- Due to economic difficulties in Russia, especially the lack of hard currencies to purchase airline tickets or hotel accommodations, standing principles of reciprocity under bilateral agreements have become very difficult to implement.

- There is a lack of comparability in systems and standards, ranging from telecommunications and computer systems, industrial standards related to health, safety and the environment. Reciprocal acceptance of technical and professional certifications has not been established.

- There is increased interest on the part of Russian scientists in attempting to sell their scientific information or expertise rather than share it, as was the practice in the past. Information that should be freely available in the West is now offered for purchase. For example, misperceptions exist that any information related to energy or minerals must have commercial value. It will be important to demonstrate that public release of such information will benefit Russian scientists by stimulating Western investment.

- Reliable communication by telephone or through facsimile messages is uncertain, as is safe receipt of packages and letters.

Impediments in the United States

- Existing procurement regulations and other administrative guidelines inhibit U.S. agencies from negotiating contracts with innovative Russian laboratories.

- Present export controls, particularly in the fields of computers and telecommunications, limit the capacity of U.S. agencies to exchange and jointly analyze data.

- Problems generic to U.S. executive agreements affect the capacity of the U.S. to cooperate with counterparts in Russia. Principally, many U.S. Government agencies do not have dedicated funding for international agreements and must draw on limited discretionary resources. Support becomes increasingly difficult in the present economic climate. Further, U.S agencies are unable to provide multi-year commitments due to the structure of the budget cycle.

Conclusions

Under the reforms of the Yeltsin government, Russia has embarked on an irreversible course of political and economic change. However, it is unclear whether current changes will bring about lasting reform, especially in a region with no historical precedent for democracy or a modern market-based economy. There is a compelling need to assist Russia and other Republics to realize their collective goals toward a functioning democracy and viable market economy.

Several broad international initiatives are either underway or being considered to achieve these goals by national governments and multilateral organizations. These include a stabilization fund to reduce inflation and secure the rouble as a convertible currency; balance of payment funds to assist Russia to import required goods and services; technical assistance to establish legal, banking, and investment sectors; and programs to convert military industries to civilian enterprises.

A critical indicator of the success of the former Soviet Union in realizing democracy and economic recovery will be the vitality of the scientific and technological enterprise, both within the public and evolving private sector. Over the past two decades S&T cooperation with the Soviet Union has assisted to bring about present changes by introducing Soviet scientists to the principles and values on which the U.S. scientific enterprise is built.

Russian science is now undergoing a transition from an era of top-down, highly controlled S&T activities and international cooperative arrangements to one in which each Russian scientist

and institution has become an independent actor. It is difficult to predict which institutions will survive, which officials will rise to positions of leadership, or which institutions will shift from the public to the evolving commercial sector. Significant retrenchments in the level of funding for the public research enterprise are likely until the Russian economy improves. In light of the changing environment of science in the former Soviet Union, a new set of policy considerations has emerged for U.S. policy makers.

Reciprocity in Scientific Cooperation

Past cooperation has been built on standing principles of reciprocity and mutual benefit. Although U.S. Government agencies continue to realize mutual scientific benefit in research collaborations with Russian counterparts, a true reciprocity has become difficult to maintain in the near-term (or even long-term) given economic constraints on Russian science.

U.S. Government agencies should consider reciprocity issues in a more prospective and long-term context. The encompassing need to support the scientific enterprise in the former Soviet Union is a higher priority than the even balance of costs or person-months. In the near-term, U.S. Government agencies should seek to benefit in other ways from collaboration with counterparts in the Soviet Union which compensate for present limitations. For example, the allocation of scientific labor might involve larger Russian contributions if the U.S. side provides the bulk of travel costs.

Assisting Russia to Reform Systems of Research Funding

To date, the United States has been compelled to accept the management and structure of Soviet science on the terms in which it was presented. During this formative era of change, U.S. Government agencies will be influential in facilitating the conversion in Russia from centralized funding to support for individual investigators, research teams or institutions based on scientific merit.

The introduction of a system of peer review will assist Russian science agencies, through independent evaluation, to identify those research groups which deserve priority funding in a period of severe resource limitations. Such a system will also instruct Russian scientists in the preparation of proposals for funding from their own Government or international sources. The National Science Foundation and the National Institutes of Health have demonstrated the potential for cooperation of this character through programs of grants supplements and competitive small grants which support research partnerships between institutions in the United States and the former Soviet Union.

It will be of mutual benefit if cooperative programs encourage a more pluralistic approach to publicly supported research in Russia by including, when appropriate, cooperation with university laboratories to strengthen the research capacity of the university system. Broader values of the Western scientific system should also be promoted as working principles of cooperation, such as the open sharing and exchange of data, innovative methods and technologies to accelerate scientific progress.

Technical Assistance

The primary role of technical agency cooperation with Russia should continue to stress scientific cooperation, rather than technical assistance. In many instances, however, provision of supplies and equipment to Russia has become a necessary condition of effective cooperation. Coordination with agencies or organizations which provide economic aid or technical assistance will assist to advance cooperative research programs with the Russia. For example, scientific solutions to common energy and environmental concerns (such as nuclear safety, solar power, biodegradation of pollutants, or efficient uses of urban transportation systems) require coordinated S&T cooperation and assistance.

Emigration of Scientists from Russian

The emigration of scientists from Russia is substantial and may increase. This is a source of concern, since Russia must retain its most productive scientists to create a technological, internationally competitive economy. During this period of economic retrenchment, U.S. policies should encourage efforts which provide hope to Russian scientists that they will be able to conduct world class research and gain international recognition in their home institutions. Efforts to establish international communication networks and provide essential supplies and equipment under cooperative programs lessen an increasing sense of isolation and scientific privation.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
Bethesda, Maryland 20892

September 2, 1992

TO: CISET Subcommittee on S&T Cooperation with Industrialized Countries

FROM: Assistant Director for International Relations, FIC

SUBJECT: Preparation of CISET Report on U.S. Government Science and Technology Interactions with Russia

The draft report which was sent to all agency representatives participating in the study for OSTP was sent to you September 1, as decided in the last subcommittee meeting to plan this report. The decision at that time was for each agency to provide responses within 24 hours (your response is due by C.O.B. today, September 2).

We would like to obtain a compilation of the present state of agencies involvement in S&T activities with Russia and we have prepared a table to collect this information (sent with this message). Please provide the information from your Agency for this table with your response to the draft report.

You will remember that our timetable for completing this initial study requires a report to OSTP by September 4. Thank you for your contributions to this CISET assignment.

F. Gray Handley

CURRENT ACTIVITIES
U.S. TECHNICAL AGENCIES
WITH RUSSIA

AGENCIES	AGREEMENTS PAST	AGREEMENTS CURRENT	SCIENTIFIC EXCHANGE	JOINT RESEARCH	FY 1992 FUNDING (EST) ($000)
USDA (ARS, USFS, NAL OICD)	X	X	X	X	680
DOC (NTST, NTIA, CB, NOAA)	X	X	X		?
EPA	?	?	?	?	?
DOE	?	?	?	?	?
DHHS (NIH, CDC, ADAMHA, FDA)	X		X	X	4,000
DOI (USGS, BLM)	X	X	X	X	2,200
NASA	X	X	X	X	?
NRC	X	X	X		25,000 (Includes Ukraine)
NSF	X	X	X	X	2,000
DOT (FAA, USCG)	X	X	X	X	?