National Aeronautics and
Space Administration

Office of Inspector General
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Reply to Attn of: W

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TO: I/Associate Administrator for External Relations
U/Acting Associate Administrator for Life & Microgravity Sciences & Applications

FROM: W/Assistant Inspector General for Inspections, Administrative Investigations, and Assessments

SUBJECT: NASA Oversight of Russian Biotechnology Research 1994-1997, G-00-007

A January 25, 2000, New York Times story alleged that NASA made grants to Russia in the mid-1990's that benefited Biopreparat, "a shadowy organization that once directed the Soviet Union's germ warfare program."[1] The story quoted sources saying that Biopreparat's director had shifted to his organization at least 10 percent of several NASA grants intended for Russian space biological researchers.

We reviewed NASA's support of Russian biotechnology research from 1994 to 1997.[2] We found that the contract between NASA and RSA was well designed in some aspects and efficient in transferring funding to Russian research institutes. We found that the State Department did not discourage NASA from working with Russian biotechnology institutes that had been part of the Soviet biological weapons program. However, when the State Department provided NASA with guidelines on working with potential dual-use biotechnology research, NASA did not follow these guidelines. Moreover, NASA exerted minimal oversight over the research program.

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[1] Judith Miller. *U.S. Aid is Diverted to Germ Warfare, Russian Scientists Say*. New York Times, January 25, 2000.

[2] This report focuses on NASA's support of Russian biotechnology research, and only peripherally addresses NASA's support of Russian research in other scientific disciplines. We did not specifically investigate whether NASA exerted sufficient oversight over research in other disciplines, or whether research in the other disciplines met NASA's goals. This report also builds upon the work of a NASA team (including an auditor from the NASA Office of Inspector General) which, in early 2000, reviewed whether NASA funding was diverted to Biopreparat. Based on an examination of NASA, Russian Space Agency, and Biopreparat records, the team found that from 1994 to 1997, Biopreparat was paid $161,000 to administer space biotechnology research. However, the team found no indication that any money was improperly diverted to Biopreparat. The team's findings are documented in *Verification of Payments to Biopreparat*, transmitted from the Director, Johnson Space Center to the NASA Associate Administrator for Space Flight, March 28, 2000.

I. BACKGROUND

A. The NASA-funded Russian Science Research Program[3]

In August 1993, NASA and Russia initiated a series of cooperative space activities, including docking the Space Shuttle to the Russian space station Mir and sending U.S. astronauts to Mir for extended visits. In June 1994, NASA agreed to procure from Russia $400 million of goods and services associated with these activities. One element of the $400 million contract was a $20 million program that funded Russian researchers to conduct ground-based space-related research. The major goals[4] of this research program were to:

- Sustain Russian space research and develop collaborative research relationships with Russian scientists in the years before the International Space Station (ISS) became operational[5]
- Educate Russian researchers and administrators about Western research processes (e.g., peer review and merit-based proposal selection)
- Learn about Russian scientific capabilities and gain new scientific knowledge

Appendix A is a timeline of key events in the Russian Science Research Program (RSRP).

In August 1994, the Russian Space Agency (RSA)[6] created the Scientific and Technical Advisory Committee (STAC) to manage the solicitation, peer-review and proposal selection, report preparation, and publication process for the RSRP. The STAC committee was chaired by Academician Vladimir Utkin, a former General Director of NPO Yuzhnoye, head of TsNIIMash, and chair of Russia's Advisory Expert Council.[7]

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[3] The $20 million program to fund Russian researchers is referred to in various documents as the "Research Program Implemented by the Scientific and Technical Advisory Council (STAC) of the Russian Space Agency," the "STAC Program," the "Scientific Research Program," and other names. For clarity, throughout this document we will refer to the program as the "Russian Science Research Program," or RSRP.

[4] This list of goals is based on NASA documents and interviews with NASA officials involved with initiating and implementing the RSRP. An additional benefit cited by some officials was that the funding might provide work for former weapons scientists (although the disciplines NASA was funding were not intended to be weapons-related).

[5] Some NASA officials have described this goal as "maintaining the momentum of Russian civil space research activity during Russia's economic transition."

[6] Now known as Russian Aviation and Space Agency (Rosaviakosmos).

[7] NPO Yuzhnoye is a large missile and launch vehicle factory in what is now the Ukraine. TsNIIMash (the Central Scientific Research Institute of Machine-Building) is a key Science and Research Center under the Russian Aviation and Space Agency. In addition to many research responsibilities, TsNIIMash operates the Russian Mission Control Center. The Advisory Expert Council coordinated with the NASA Task Force on Shuttle/Mir Rendezvous and Docking Missions (the Stafford Task Force).

The STAC divided the research program into disciplines, one of which was "space biotechnology."[8] The Russians chose a vice-chairman to manage the grant process for each discipline. Yuri T. Kalinin, Director of Biopreparat (See Section I.B), was named vice-chairman for the space biotechnology discipline.

In August 1994, the STAC distributed a solicitation for research proposals to 46 Russian organizations. Subsequently, NASA officials met with the STAC to explain the NASA science solicitation and selection process (including provisions to protect against conflict of interest) and NASA policy on protection of humans and animals in research. NASA personnel also provided comments on some of the proposals. The STAC eventually funded 166 proposals from approximately 60 Russian research institutes.

The principal outputs of the RSRP included three conferences and a set of final research papers.[9] The first conference was held in College Park, Maryland, in October 1995; the second in Korolyov, Russia, in November 1996; and the third in Huntsville, Alabama, in November 1997. At each conference, the results from some research projects were briefed and subjected to questions from an audience of U.S. and Russian researchers. The final research papers were placed on the web at www.stacresearch.org.[10] The RSRP ended in December 1997, when NASA made its final payment to the RSA.

B. Russia's Biological Warfare Program

The Soviet Union initiated a covert biological warfare program during the late 1920's.[11] Over the next few decades, Soviet biological warfare facilities developed infectious disease-causing agents as weapons.[12] In 1973, shortly after signing the Biological and Toxin Weapons Convention[13] (which banned the development, use, and stockpiling of biological weapons), the Soviet Union violated the terms of the Convention by greatly expanding its biological warfare program. Portions of the expanded—but still highly secret—program were managed directly by the military. Some research was conducted at facilities managed by the Ministry

[8] The other disciplines were space technology and materials science; geophysical studies; space biomedicine; Earth natural resources and environment monitoring; investigations of planets and small bodies in the Solar System; technical studies and experiments; space astronomy; and problems of space power and propulsion.

[9] Section V.C discusses the outputs of the RSRP.

[10] The stacresearch.org web site was taken down in 1998 following the conclusion of the RSRP.

[11] Statement by Dr. Kenneth Alibek to the Joint Economic Committee, United States Congress. Wednesday, May 20, 1998.

[12] According to a former Deputy Chief of Biopreparat, these biological weapons may have been used by the Soviet Union during the Second World War and in Afghanistan during the 1980's.

[13] Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction. The Convention was opened for signature on April 10, 1972, and entered into force on March 26, 1975.

of Health and the Soviet Academy of Sciences. However, most biological warfare research and development was conducted under the direction of an ostensibly civilian organization called Biopreparat.

At its peak in the 1980's, Biopreparat is believed to have employed approximately 30,000 people at over 40 research institutes and production facilities.[14] Biopreparat conducted some civilian drug and vaccine work, which enabled its researchers to interact with foreign scientists and procure disease strains from foreign microbe banks. However, most of Biopreparat's effort was focused on developing biological warfare agents, including smallpox, plague, Marburg virus,[15] and anthrax. Yuri T. Kalinin, a former general in the Chemical Troops of the Soviet Army, has been Director of Biopreparat since 1979.

Although the United States long suspected the existence of a Soviet biological warfare program, the defection of a high-ranking Biopreparat official in 1989 gave Western nations the first indications of the magnitude of the endeavor. In 1991, a team of visitors from the United States and the United Kingdom toured some Biopreparat facilities and found additional evidence of biological warfare research.[16] The full scale of Biopreparat's work became clear when the organization's Deputy Chief defected to the United States in 1992 and was debriefed by U.S. intelligence officials. (Biopreparat's role in biological warfare, however, was not discussed publicly in the United States until 1997, when interviews with the former Deputy Chief appeared in the media.)

Following the dissolution of the Soviet Union, Russian President Boris Yeltsin acknowledged that the Soviet Union, and then Russia, had conducted offensive biological warfare research, development, and production. In September 1992, the United States, the United Kingdom, and Russia agreed to work together to address concerns about compliance with the 1972 Biological and Toxin Weapons Convention. However, after initial site visits in 1993 and 1994, the three governments were unable to agree on procedures for further inspections. Since then, various U.S. and international initiatives to collaborate with Russian researchers formerly involved in biological weapons research have resulted in greater insight into most of the former Biopreparat laboratories. However, a few Biopreparat facilities, and all five former military biological warfare facilities, have never been visited by Western teams.

To date, the United States has been unable to confirm that Russia has ended its offensive biological warfare program. Determining whether a particular facility is conducting offensive biological warfare research can be difficult. One problem is that much of the equipment used for biological warfare research is identical to equipment used for peaceful biotechnology

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[14] According to published reports by Soviet defectors and other sources, Defense Ministry biological weapons facilities employed approximately 10,000 additional workers, and thousands of others were scattered throughout other agencies.

[15] The Marburg virus, which is similar to the Ebola virus, causes an acute, infectious, hemorrhagic viral fever that affects both human and nonhuman primates.

[16] The evidence included explosive test chambers, fermenters for growing large quantities of bacteria, and research on the smallpox and Marburg viruses.

research. In some cases, the only difference between offensive and defensive research is the intent of the researcher—identical research on a particular virus could either be used to develop a cure or to increase the lethality of the virus.

Biopreparat's continued role in biological warfare research is also unclear. Biopreparat no longer funds its component institutes, but continues to have ties to many of them.[17] Biopreparat officials deny that they are still involved with biological warfare and describe the organization as a joint-stock drug company, 51 percent owned by the Russian Government. However, Biopreparat is still led by its Cold War-era management and institutes affiliated with Biopreparat continue to conduct research on pathogens that were part of the Soviet biological warfare program.[18]

II. FUNDING

The RSRP was a $20 million element within the $400 million[19] firm fixed-price Joint U.S./Russian Human Space Flight Activities contract. The contract specified that the $20 million would be paid in 18 installments, each of which was linked to NASA's receipt of a Russian deliverable item (the 18 deliverables are listed in Appendix B). Upon acceptance and approval of a deliverable, NASA electronically transferred funds into bank accounts identified by RSA. By late 1997, RSA provided NASA all of the required deliverables and received the full $20 million.

Figure 1 shows the flow of funding for RSRP biotechnology research. NASA transferred funds to RSA, which subcontracted the administration of the $20 million contract to TsNIIMash. TsNIIMash received approximately $1.8 million for management and administrative functions (e.g. travel, publications, translation of proposals and/or reports as appropriate), including peer review and proposal selection. TsNIIMash distributed most of the remaining funding to institutions designated as responsible for each of the ten research disciplines.[20] Biopreparat, the responsible institution for the space biotechnology discipline, received $1.529 million from TsNIIMash.

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[17] In February 2000, a Wall Street Journal article reported that Biopreparat Director General Kalinin recently replaced the civilian director of the Institute for Immunological Engineering (one of the Biopreparat-affiliated research institutes funded in the RSRP) with a military scientist. This action suggests that Biopreparat still retains significant influence on at least some of its former institutes.

[18] Since 1996, institutes affiliated with Biopreparat have published papers detailing continued research on such pathogens as tularemia, encephalitis, plague, smallpox, and anthrax. For example, a 1997 paper by researchers at the Institute for Applied Microbiology described their development of a genetically altered anthrax strain that was resistant to anthrax vaccines.

[19] As of February 2000, additional tasks had raised the total contract value to about $537 million.

[20] Some funding was distributed directly to institutes where the research was to be performed. TsNIIMash paid $121,000 for space biotechnology research directly to the Shemyaking Ovchinnikov Institute of Bioorganic Chemistry.

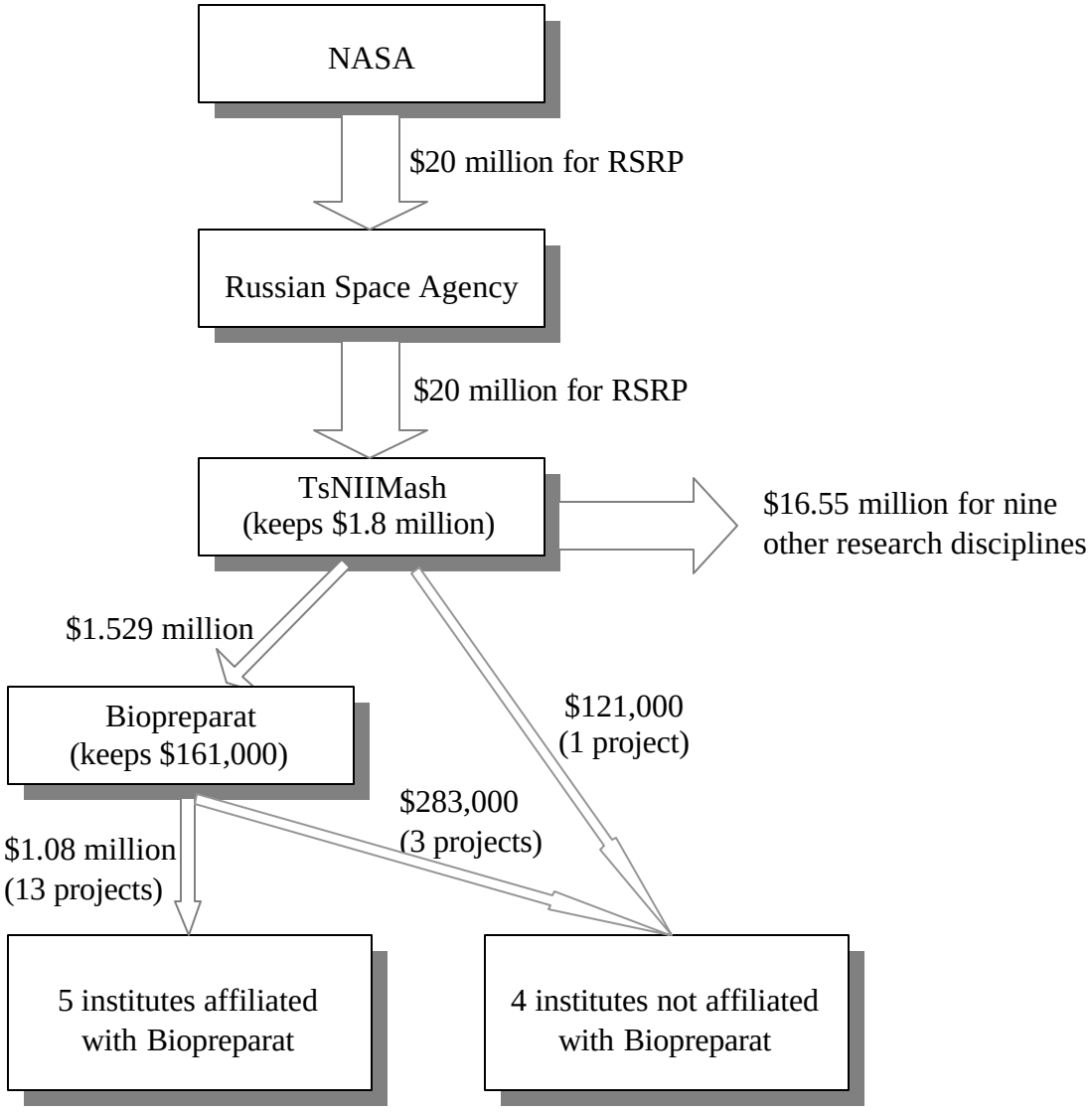

Figure 1. Flow of funding for RSRP biotechnology research

The NASA team that reviewed the possible diversion of funds to Biopreparat found that Biopreparat was paid $161,000 to administer the RSRP space biotechnology research. The team found no indication that Biopreparat used this money for other than the intended purpose and determined that the remaining $1.368 million transferred to Biopreparat was sent to the nine institutes conducting the research. Approximately $1.08 million of the $1.368 million was sent to five institutes affiliated with Biopreparat.[21]

Funding for Russian space biotechnology research appears to have been properly transferred from NASA to RSA to TsNIIMash to Biopreparat and thence to the institutions conducting the research. However, anecdotal evidence from several sources indicates that some institutes transferred little of the funds to the researchers with winning proposals. The veracity of this evidence is difficult to determine because the contract with the RSA did not give NASA the right to examine how the Russian institutes distributed the funds that they received.[22]

Some evidence suggests that RSRP funding did indeed reach many Russian researchers. At RSRP symposia and pre-symposia meetings, NASA requested that any researchers not receiving funding contact NASA's RSRP contracting officer. No RSRP researchers contacted the contracting officer and we are aware of no reports of researchers performing STAC-selected work who were not at least paid salaries by their institution. In addition, RSA provided NASA with all of the RSRP's contractually required deliverables, including five interim research reports (which included progress updates on all funded projects) and final reports for all investigations.[23]

A 1998 NASA draft document on RSRP financial issues[24] discussed the possibility that funding did not reach the RSRP researchers. The document states:

> If an investigator is funded for a project, this will not necessarily result in any augmentation of the researcher's operating budget, and would rarely be reflected in his or her salary. An investigator selected under the STAC program who expected to see additional funds available could easily draw the

[21] The five institutes were: the State Research Institute for Highly-Pure Biopreparations, the Institute for Immunological Engineering, the State Research Center of Virology and Biotechnology "Vector," Joint Stock Company Biochimmash, and the State Research Institute of Applied Microbiology.

[22] NASA research contracts (or grants) in the United States also typically distribute research funding to researchers' institutions rather than directly to the researchers. However, in the United States, several safeguards exist to prevent the diversion of funds by the institutions. For example, Public Law 104-156 requires that nonprofit institutions receiving federal funds undergo an annual audit of federal expenditures by the Defense Contract Audit Agency and independent public accountants.

[23] This evidence is, however, insufficient to prove that adequate funding actually reached the researchers. Papers could have been based on prior work, or work that was performed with only a fraction of the project's funding. Researchers may not have contacted the contract officer because they were concerned about possible repercussions.

[24] Scientific and Technical Advisory Council Financial Summary. Draft of November 13, 1998. (No further changes were made to the draft and no final report was issued.)

> conclusion that his or her institution had not been funded—or at very least assert that s/he 'did not receive the funds.' In fact, the funding was at the institution and its presence likely prevented a salary interruption or layoff of the research staff.

NASA's approach of funding institutions, and then relying on the institutions to distribute funding to the researchers, contrasts with the approach of another program that funded Russian biotechnology research. Since 1994, the International Science and Technology Center (a multinational organization that funds weapons scientists from the former Soviet Union) has attempted to prevent the diversion of research funding by depositing its grant payments to Russian researchers directly into researchers' personal bank accounts.

Finding 1: Contract funding allocated for Russian space biotechnology research appears to have been transferred properly from NASA to RSA to TsNIImash to Biopreparat and from Biopreparat to the institutions conducting the research. The funding was contingent on Russia providing deliverables, and all of the deliverables were provided.

Finding 2: Approximately 74 percent of the $1.68 million intended for RSRP space biotechnology research was directed to institutions that had been affiliated with Russia's biological warfare program. How much of this funding reached the researchers for which it was intended is unclear because the contract between NASA and RSA did not give NASA the right to examine how the Russian research institutes distributed the funds they received.

III. WARNINGS RECEIVED

In 1994, when the RSRP was initiated, most information concerning Russia's biological warfare program was classified. At least one official involved in the RSRP, however, was aware of Russia's biological warfare program and other NASA officials told us that they were conscious that many of the institutes receiving funding from the RSRP had connections to the Russian military-industrial complex.

In the spring of 1995, following the first round of proposal selection, NASA officials told us that they became concerned that the RSRP was funding institutes associated with biological weapons.[25] NASA then contacted the intelligence community to ask whether institutes receiving funding from the RSRP were associated with biological weapons research. NASA officials told us they received confirmation that institutes funded by the RSRP had been involved in biological weapons research but were not warned to stop working with the institutes.

[25] According to NASA's former Deputy Associate Administrator for Operations and Space Flight, Office of Life and Microgravity Sciences, NASA became concerned during a March 10, 1995 tour of Biochimmash. During the tour (which had been arranged by General Kalinin), Russian scientists said that they were involved in the production of biologically based medications, especially vaccines.

In the spring, summer, and fall of 1995, NASA attended a series of interagency meetings chaired by Ambassador Richard Morningstar, the Coordinator for Assistance to the Newly Independent States. The meetings were attended by U.S. Government agencies engaged in technical assistance, trade and investment, weapons dismantling, and other programs in the former Soviet Union. In August 1995, NASA presented a briefing on the RSRP to this group.[26] Following the presentation, an official in the Department of State's Bureau of Political-Military Affairs requested NASA provide them with a full set of briefing charts and a list of all funded projects. NASA provided the charts and list of projects to the official and to Ambassador Morningstar's office. At this time, NASA also offered to provide a briefing devoted entirely to the RSRP if there was sufficient interest.[27]

On September 12, 1995, an official at the Department of State's Bureau of Political-Military Affairs sent an unclassified memorandum to NASA to alert the Agency that institutes that had been part of the Soviet biological warfare program were being funded by NASA. The memorandum did not discourage NASA from working with the institutes, but provided the Agency with background guidance on the safe conduct of projects involving biological facilities in the former Soviet Union.[28] The memorandum also suggested a briefing be arranged "as soon as possible to go over the guidance and to discuss some concerns about projects that appear already funded."

The guidance provided to NASA included a "Priority List of Former Soviet Union Biological Weapons Institutes" (on which were listed five institutes NASA was funding through the RSRP). The guidance also included four pages of material describing steps being taken by the State Department's International Science and Technology Center[29] to minimize the risk of having funds diverted to covert biological or chemical weapons programs. These steps

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[26] This was not NASA's first briefing to the State Department that mentioned the RSRP. In April 1995, NASA briefed the State Department's Bureau of Oceans, International Environmental and Scientific Affairs about cooperative activities between Russia and NASA's Office of Life and Microgravity Sciences and Applications. One of the topics of the presentation was the RSRP. The presentation listed "space biotechnology" as one of the program's nine disciplines and U.T. Kalinin as the STAC Executive Council member from the space biotechnology discipline. However, the presentation did not list any of the proposed space biotechnology projects or the institutes at which the research would be conducted. The Bureau of Oceans, International Environmental and Scientific Affairs is responsible for the general oversight and guidance on all NASA science and technology cooperative activities, but is not the division of the State Department concerned with biological warfare.

[27] The State Department did not take up NASA's offer of a briefing devoted to the RSRP.

[28] The State Department did not oppose collaboration with former Soviet biological weapons facilities. In an article, *Redirecting Biological Weapons Expertise: Realities and Opportunities in the Former Soviet Union*, published later in September 1995 in the Chemical Weapons Convention Bulletin, the Coordinator for Nonproliferation/Science Cooperation Programs, U.S. Department of State discusses approaches to working constructively with the former Soviet biological weapons community and mentions how programs such as the RSRP "confirm both the grounds for optimism and causes for concern about working with the former Soviet BW community."

[29] The International Science and Technology Center is a multinational organization founded in 1992 to provide weapons scientists from the former Soviet Union with opportunities to redirect their talents to peaceful science. In 1999, the Center spent $42.6 million on 201 projects (including $11.1 million on 49 biotechnology projects).

included carefully vetting biotech proposals and establishing the principle of "invasive collaboration."

Regarding invasive collaboration, the guidance provided to NASA stated:

> The U.S. should insist that all projects involving NIS[30] institutes or facilities that are known to have been part of the Soviet/Russian BW [biological warfare]/CW [chemical warfare] program have an active western partner…. An active collaborator can be defined as one who takes part in making decisions on the project; is physically present for key experiments or milestones; takes responsibility for accurate reporting of technical process.

At the same time the State Department transmitted this guidance to NASA, they also notified the National Security Council about NASA's funding of possible Russian biological weapons facilities. This notification stated, "NASA was really unaware of what the Russian institutes' past activities were and are willing to work with us to correct their review/approval process." However, a State Department e-mail message attached to the notification also stated "…the appearance of y. pestis, tularemia, and encephalitis in the project titles should have given them [NASA] a hint that something was a little unusual."[31] The e-mail message continued, "We do not want to discourage NASA from working with these institutes, but there are some interagency guidelines that have been established for such cooperation and NASA is happy to have us brief them."

Two months after the alert from the State Department, NASA was invited to, and attended, a multi-agency-classified briefing concerning work with institutes connected to the Soviet/Russian biological warfare program. At this briefing, NASA and the other agencies were not directed to eschew cooperation with biological warfare institutes. Rather, they were warned of the dangers and given guidelines for safe collaboration.

Finding 3: In March 1995, NASA became concerned that, through the RSRP, the Agency might be funding institutes involved in biological weapons activity. NASA contacted the intelligence community and learned that some of the institutes being funded through the RSRP had been involved in biological weapons research.. At this time, the Agency did not receive any instructions regarding working with these institutes

Finding 4: In September 1995, the State Department's Bureau of Nonproliferation learned that NASA was funding institutes that had been part of the Soviet biological warfare program. The State Department provided guidance to NASA stating that the U.S. should "insist on having an *active* Western partner involved in *invasive collaboration* for each project"

[30] Newly Independent States (i.e., the countries that formerly were part of the Soviet Union)

[31] Yersinia pestis is the causative agent of plague. Tularemia is an infectious disease (found worldwide in wild animals, birds and insects) that produces an acute fever in humans. Encephalitis is an inflammation of the brain. The Soviet biological warfare program researched the use of all three as biological warfare agents.

involving such institutes. The guidance also noted the importance of "careful vetting of biotech proposals."

IV. NASA OVERSIGHT OF RUSSIAN BIOTECHNOLOGY RESEARCH

A. Project Selection

The guidance NASA received from the State Department listed "careful vetting of biotech proposals" as one of two key steps to minimize concern when working with former Soviet biological and chemical weapons facilities. The contract between NASA and RSA gave NASA the ability to approve and disapprove research projects. The STAC was responsible for developing an integrated research plan "containing investigations and associated priorities, milestones, goals, objectives, cost, etc." NASA was responsible for reviewing the research plan for prioritization and approval.[32] In practice, however, NASA exercised very little influence over which research projects in the space biotechnology discipline were selected.

Russian researchers submitted approximately 300 proposals in response to the STAC's announcement of the availability of research funding. NASA's records are incomplete, but the Agency apparently reviewed and provided comments only on some of the first round of approximately 120 proposal selections. During this round, which took place in early 1995, the STAC told NASA they received 19 proposals in the space biotechnology discipline. NASA reviewed eight of these proposals rating three "low priority" and two "high priority."[33] The STAC selected 14 biotechnology proposals for funding. Ten of the funded proposals were for research at institutes associated with Biopreparat.[34]

All eight biotechnology proposals reviewed by NASA were among those selected for funding. An April 13, 1995, letter from the NASA Deputy Associate Administrator for Operations and Space Flight, Office of Life and Microgravity Sciences to Academician Vladimir Utkin states:

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[32] The contract states that "the research plan will be reviewed for NASA by the Associate Administrator for the Office of Life and Microgravity Sciences and Applications, assisted by the NASA-Russian co-chairs of the existing research and mission science and technology Joint Working Groups for prioritization and approval. [New paragraph] After approval of specific projects, either ground or flight, RSA will provide funding under this contract to the organizations responsible for the implementation of the specific projects."

[33] In February 1995, the NASA Deputy Associate Administrator for Operations and Space Flight, Office of Life and Microgravity Sciences and Applications wrote to the STAC: "In reading the proposals, we did not review them for scientific merit; this is the prerogative of the STAC. We did consider their feasibility of performance (based on the information included) and whether the proposed work was research or some other kind of activity." The technical reviews of some of the projects, however, do appear to consider the projects' scientific justification.

[34] Two of the proposals, one on the "Separation and Identification of Biological Particles," and the other on "Isolation and Investigation of the Cell Surface Receptor of Tick-Borne Encephalitis Virus in Space and Earth" (both from the State Research Center of Virology and Biotechnology, also known as Vector) were reviewed after NASA had learned that Vector was associated with biological warfare research. One proposal was rated "high priority" and the other "medium priority."

> We are concerned that much but not all of our previously provided input has not been consistently applied in the respective discipline areas…. For example, when NASA evaluates a research proposal as having "low priority," we generally do not fund that proposal. Only "high priority" and "medium priority" proposals have any chance of receiving NASA funding. We note in this regard that a number of Russian proposals we recommended as having "low priority" have been selected for funding by your side.

In a second round of funding in 1996, the STAC funded three additional biotechnology proposals. All three proposals were from institutes associated with Biopreparat and on the State Department's Priority List of former Soviet Union Biological Weapons Institutes. NASA has no records of reviewing these proposals. All three proposals were funded. The 17 funded biotechnology projects (and the institutes at which they were performed) are listed in Appendix C.

Some NASA officials told us that the Agency intentionally did not exercise a strong influence over which projects were selected. They told us that NASA's limited influence in proposal selection was deliberate and intended to accomplish the objective of having the Russians develop a national capability to be competitive in Western peer review processes. NASA officials also told us that they did not want to increase Russian technical capabilities by providing direct "technical" oversight.

Finding 5: NASA exercised very little influence over which biotechnology investigations were selected for funding. The STAC funded 17 proposals received in the space biotechnology discipline. NASA reviewed only 8 proposals. Three proposals given a "low priority" rating by NASA were funded.

Finding 6: Three proposals for research at institutes on the State Department's Priority List of former Soviet Union Biological Weapons Institutes were funded without review by NASA, months after NASA received guidance from the State Department that listed "careful vetting of biotech proposals" as one of two key steps to minimize concern when working with such institutes.

B. Site Visits

The State Department guidance to NASA emphasized that invasive collaboration was key to minimizing the risk of funding being diverted to covert biological weapons programs. Invasive collaboration requires physical presence during key experiments or milestones. However, NASA only visited two of the five RSRP institutions listed on the State Department's Priority List of former Soviet Union Biological Weapons Institutes. These brief[35] visits occurred before the State Department provided NASA with the guidance emphasizing invasive collaboration.

[35] Based on the trip agendas, none of the visits appear to have taken more than three hours.

The contract between NASA and the RSA allowed for the possibility of U.S. site visits to Russian facilities.[36] During the RSRP, Russian institutes did not reject any requests for site visits. According to NASA officials, the Agency did not conduct additional biotechnology site visits primarily because U.S. scientists did not express an interest in visiting Russian biotechnology institutes.[37] NASA officials also told us that travel logistics were difficult to arrange and that, although travel funds were available, they viewed additional trips as "not cost-effective from a U.S. taxpayer perspective," given that NASA officials made semi-annual visits to Russia to review research/progress/reports and the RSRP held annual conferences involving U.S. and Russian researchers.[38]

NASA officials believe that they did not need to conduct site visits in the RSRP in consonance with State Department guidelines. The officials told us the RSRP was very different from the assistance programs for which the guidelines had been developed. They believe NASA's oversight of the RSRP met or exceeded the State Department guidelines and accomplished NASA's goals because the RSRP:

- Was based on a contract with set deliverables
- Involved regular meetings between NASA and Russian officials
- Involved the attendance of Russian scientists at research symposia
- Required interim research reports (which included progress updates on all funded projects)
- Resulted in final research papers that were available to the public

Finding 7: Despite guidance to the contrary from the State Department, NASA did not regularly visit and participate in research it was funding at Russian institutes that had been part of the Soviet biological warfare program. U.S. scientists were not physically present for any key experiments or milestones in any of the Russian biotechnology research. NASA only briefly visited two institutes and no site visits were scheduled following the receipt of guidance from the State Department.

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[36] Contract NAS15-10110, Section 3.4.1.2 states: "For each of the approved projects, the Russian side will consider inviting U.S. investigators with prior notification and approval of NASA who will fund the visits. RSA will provide access to the Russian investigators, to the appropriate research facilities, or flight hardware as appropriate."

[37] NASA officials told us that in RSRP disciplines with a history of bilateral cooperation (such as Earth Natural Resources and Environment Monitoring and Space Biomedicine) site visits and collaboration with U.S. scientists were common. However, since the biotechnology field did not have a history of collaboration between Russia and the United States, U.S. researchers were not sufficiently involved in the program to request site visits.

[38] The State Department guidance provided to NASA acknowledged that active collaboration "may necessitate providing additional funds to finance travel and per diem costs related to project activity."

V. RESULTS OF NASA FUNDING OF RUSSIAN BIOTECHNOLOGY RESEARCH

According to NASA officials we interviewed, the principal goals of the RSRP were to:

- Sustain Russian space research and develop collaborative research relationships with Russian scientists in the years before the ISS became operational
- Educate Russian researchers and administrators about Western research processes (e.g., peer review and merit-based proposal selection)
- Learn about Russian scientific capabilities and gain new scientific knowledge

In the space biotechnology discipline, NASA had mixed success in meeting these goals.

A. Sustaining Russian Biotechnology Research and Developing Collaborative Research Relationships with Russian Scientists in the Years before the ISS became Operational

When the RSRP was initiated in 1994, the Russian economy had been declining since 1992 and funding for research was scarce. One of NASA's goals for the 3-year RSRP was to help sustain the Russian space research community until research began on the ISS. (Assembly of the ISS was expected to start in November 1997 and to be complete by June 2002.) NASA officials hoped that by the end of the RSRP, the Russian economy would have recovered sufficiently for the Russian government to fund research on the ISS.

However, the Russian economy did not rapidly improve, but continued to decline until 1999. In addition, the ISS program experienced a series of delays and significant space station research has yet to begin. As a result, the 3 years of RSRP funding did not achieve the goal of supporting Russian space biotechnology researchers until new research funding for the ISS program was available.

The RSRP was, however, very efficient in delivering a large fraction of its funding to Russian research institutes. Overhead at NASA was low, consisting largely of salaries for a few civil servants and tasks performed under an approximately $700,000 per year contract with ANSER.[39] The RSRP transferred approximately $16 million (approximately $1.5 million in the space biotechnology discipline) to Russian research institutes during times when funding for research in Russia was extremely scarce. This money alone was not sufficient to sustain Russian biotechnology researchers until support for Russian research on the ISS became available. However, when combined with other sources of funding, RSRP funding probably helped to maintain at least some biotechnology research capabilities and personnel that may one day be involved in research on the ISS.

[39] In comparison, approximately 63 percent of the funding of Department of Energy's (DOE) Initiatives for Proliferation Program was spent in the United States, mostly by the DOE's national laboratories in implementing and providing oversight for the program. Source: General Accounting Office. Nuclear Nonproliferation: Concerns With DOE's Efforts to Reduce the Risks Posed by Russia's Unemployed Weapons Scientists. GAO/RCED-99-54. February 1999.

NASA also hoped to develop collaborative research relationships with Russian scientists in the years before the ISS became operational. However, with the possible exception of some communication between U.S. and Russian researchers at the three RSRP symposia, we saw no evidence of any collaborative relationships in the space biotechnology discipline.[40] None of the biotechnology research conducted in the RSRP involved U.S. or Western researchers, and we are unaware of any follow-on collaboration between RSRP and Western researchers that was sparked by the RSRP.

Finding 8: Although the RSRP alone was not sufficient to support Russian space biotechnology research until Russian government funding became available for ISS research, the program was very efficient in delivering funds to Russian research institutes. With the exception of meetings during the RSRP's three research symposia, the program was not successful in developing collaborative research relationships between Russian and U.S. biotechnology researchers.

B. Educating Russian Researchers and Administrators about Western Research Processes

The second major goal of the RSRP was to educate the Russian research community about Western research processes, such as adherence to international bioethical standards and merit-based project selection. In late 1994, NASA briefed the STAC on the NASA science solicitation and selection process and on NASA policies concerning protection of humans and animals in research. The contract between NASA and the RSA also contained provisions on project solicitation and selection and on protection of research subjects. However, we found that NASA was more adamant about protection of research subjects than about adherence to merit-based selection processes.[41]

NASA firmly explained the requirements for the protection of human and animal subjects to the STAC and took steps to ensure that projects followed these requirements. Researchers using human subjects were required to file a certificate with the RSA assuring that investigations would comply with the requirements of the Helsinki Agreement on the protection of human subjects.[42] An informed consent document was required for each human research subject. NASA told the STAC that projects selected by the STAC but not approved by the appropriate bioethics committees would not be funded or executed. Finally, RSA was

[40] We were told that the RSRP was more successful in fostering collaboration in other disciplines, particularly those disciplines with a history of bilateral cooperation.

[41] NASA officials told us that the Agency was "just as strident about conflict of interest" as it was about protection of human and animal subjects. However, our review of meeting minutes and correspondence between NASA and the STAC found that protection of human and animal subjects is mentioned repeatedly, but conflict of interest is never mentioned.

[42] Declaration of Helsinki. Recommendations Guiding Physicians in Biomedical Research Involving Human Subjects. Adopted by the 18th World Medical Assembly, Helsinki, Finland, June 1964, amended by the a World Medical Assembly in Tokyo in 1975, in Venice in 1983, and in Hong Kong in 1989.

required to develop an assurance of compliance with animal care and welfare in biological experimentation and to provide the assurance to NASA.

Requirements for the merit-based proposal selection process were less stringent. The contract stated that the content of the research program was subject to approval by NASA, but the Agency essentially exercised very little influence over which biotechnology projects were funded. (See Section IV.A.). NASA personnel were not present during the peer review process—NASA's role was limited to reviewing and commenting on some of the proposals that had already been selected. In addition, NASA did not provide a formal evaluation or critique of the STAC's peer review and proposal selection process.

Following the first round of proposal selections, NASA noted that "the review and selection process may not have been applied uniformly to all proposals in each discipline section" and "some proposals were selected by the STAC that did not have sufficient information in them to determine their purpose or merit."[43] In the space biotechnology discipline, 17 of 18 proposals were funded. Thirteen of the 17 funded proposals came from institutes that at one time reported to the individual in charge of proposal selection.[44] NASA only reviewed eight of the eighteen proposals, and of those were funded, even those that NASA considered a low priority.

Finding 9: NASA firmly explained the requirements for the protection of human and animal subjects to the STAC and took steps to ensure that projects followed these requirements. As a result, RSRP researchers that were involved in human and animal experimentation probably became familiar with Western standards for such research.

Finding 10: NASA explained Western peer review and proposal selection processes to the STAC, but did not take further steps (e.g., participating in the peer review process) to ensure that the peer review process was conducted properly. As a result, it is not clear whether RSRP biotechnology researchers were exposed to a full Western peer review process.

C. Learning about Russian Scientific Capabilities and Gaining New Scientific Knowledge

The third major goal of the RSRP was to learn about Russian scientific capabilities and gain new scientific knowledge. This type of knowledge transfer typically occurs through collaboration, participation in symposia, and the publication of research (preferably in peer-reviewed journals). In part because of the lack of collaboration in the space biotechnology discipline, symposia and published papers were the major routes for new knowledge and information about Russian scientific capabilities in this discipline to reach the United States.

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[43] Summary of NASA Meeting with Scientific and Technical Advisory Council of the Russian Space Agency. January 31-February 1, 1995, Satellite Beach, Florida.

[44] The STAC informed NASA that Russian section members representing institutions sponsoring a particular proposal were not part of the discussion and decision process on proposal(s) submitted by the institution.

The RSRP held three research symposia.[45] The first was held in College Park, Maryland, in October 1995; the second in Korolyov, Russia, in November 1996; and the third in Huntsville, Alabama, in November 1997. A compendium of abstracts for all RSRP research projects was provided to U.S. conference attendees prior to the second and third conferences. One RSRP biotechnology researcher attended the first conference and presented a summary overview of research conducted in the space biotechnology discipline. Most of the RSRP biotechnology researchers attended the second conference and presented their work. At the final conference, three RSRP biotechnology researchers (none from former Biopreparat institutes) gave presentations on their work.[46] At all three symposia, presenters were subjected to questions from the audience.

In early 2000, following the publication of the New York Times article on diversion of funding to Biopreparat, NASA's Office of Life and Microgravity Sciences and Applications contacted five U.S. researchers who attended the second or third symposium and asked for their assessment of the research presented at the symposium, particularly with regard to biotechnology projects. In general, these researchers voiced a low opinion of the program's scientific output. Summary comments from each reviewer follow:

> Reviewer 1: "The Russian scientists do competent basic research and they are familiar with the status of their field…My opinion of the merits of the research, originality, and productivity is less positive."
>
> Reviewer 2: "In terms of originality, I find what is in the reports is comparable to work I see coming from rather bright undergraduates or beginning graduate students. I do not think that I as a reviewer would recommend any of this work were it to be proposed by a research laboratory in this country."
>
> Reviewer 3: "To sum up, the progress shown in the biotechnology discipline in my view fall way short of reasonable expectations from the amount of money and the two years in time that the Russians were given. This was obvious there [at the symposium], and also is obvious from the written reports on the projects."

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[45] The objectives of the NASA-RSA STAC Symposia were:

- To enhance opportunities for exchange of technical data and research results between U.S. and Russian investigators
- To allow the Russian investigators funded by NASA to present their work to U.S. researchers and to interact with the U.S. peers
- To plan future collaborative scientist-to-scientist activities, including research on the ISS
- To allow international ISS partners to participate in the conferences and facilitate potential collaborations

[46] Three of the five principal investigators from institutes not affiliated with Biopreparat (or on the State Department's Priority List of Former Soviet Union Biological Weapons Institutes) gave presentations. None of the ten principal investigators from institutions connected to Biopreparat presented their work at the symposium.

> Reviewer 4: "In general the science presented in the biotechnology section was sound, but often not mature. Theoretical models were solid but experimental data was lacking both quantity and quality."
>
> Reviewer 5: "In general, the scientific quality of the work of the Russian partners seems reasonable…Having said that, I need to add that many of the projects are not compelling from the point of view of the scientific progress and achievements worldwide."

NASA received a final research paper for every RSRP investigation. The final research papers were made available on the Internet at www.stacresearch.org. However, the www.stacresearch.org web site was taken down in 1998 following the conclusion of the RSRP and the papers are no longer readily available. NASA officials told us that they still have the papers in an electronic form, but the papers were not posted on the Internet due to the cost.

NASA has not received or been notified about the publication in scientific journals of any papers stemming from biotechnology research funded by the RSRP.[47] However, our searches of scientific literature databases found that 10 of the 17 funded biotechnology research products have published at least one paper related to projects funded by the RSRP.[48] These research papers are found mostly in Russian journals, but a few were published in Western research journals.

Finding 11: During the RSRP, NASA took steps to encourage the transfer of knowledge gained in the RSRP. However, following the program's conclusion, NASA removed the final RSRP reports from the Internet.[49]

Finding 12: The five U.S. researchers polled by NASA generally voiced a low opinion on the scientific knowledge gained from RSRP biotechnology research. However, several RSRP biotechnology projects resulted in papers published in Western and Russian scientific journals.

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[47] The protocol from the second RSRP Symposium stated, "The RSA, STAC, and NASA expect that in the event that any Russian principal investigator prepares a paper [about their research] for publication in appropriate journals, the investigator will provide a copy of the submitted paper to NASA with the date of the paper submission and the title of the journal."

[48] Databases searched included Spaceline and PubMed at the National Library of Medicine, the Web of Science at the Institute of Scientific Information, and RECONplus.

[49] Since few RSRP papers are available elsewhere, NASA may want to consider again making them available on the Internet. The extremely minimal cost of doing so should not be a deterrent. As an alternative, NASA's Office of Life and Microgravity Sciences and Applications could post a list of RSRP research papers on the Office's web site and notify the public that the papers are available upon request.

VI. SUMMARY AND RECOMMENDATION

NASA's funding of biotechnology research through the RSRP was successful in some regards. Both NASA and Russian overhead costs were relatively low and the program was highly efficient in transferring funding to Russian research institutes. The contract between NASA and RSA was also well designed in some aspects—the linking of funding to deliverables ensured that milestones were met and deliverables were, in fact, received. NASA also did well in emphasizing to the STAC the importance of proper treatment of human and animal research subjects.

However, by not exercising its ability to influence project selection, and not providing oversight over the peer review process, NASA reduced its ability to determine whether the STAC was conducting a merit-based peer review process that would produce high-quality science. In hindsight, NASA could also have structured the contract between NASA and RSA to provide increased assurance that the funding would actually reach the researchers.

NASA made one extremely serious misstep. After being provided guidance by the State Department on how to collaborate safely with institutes that had been part of the Soviet biological warfare program, NASA did not follow that guidance. No site visits were scheduled to ensure that NASA funding was not supporting biological warfare research. No funded projects were reviewed for possible biological warfare connections. Indeed, months after receiving guidance from the State Department, that listed "careful vetting of biotech proposals" as one of two key steps to minimize concern when working with such institutes, NASA funded, *without reviewing the proposals,* three additional projects at institutes that had been part of the Soviet biological warfare program.

Recommendation 1: Any future NASA program that funds foreign researchers, particularly in nations not traditionally allied with the United States, should be carefully coordinated with the State Department (including the State Department's Bureau of Nonproliferation) to ensure that proper safeguards are in place. If the program funds biotechnology research in countries with known or suspected biological weapons programs, NASA should practice "invasive collaboration."

VII. EVALUATION OF NASA MANAGEMENT RESPONSE

We received NASA Management's response to the draft report on October 13, 2000 (See Appendix D). NASA concurred with our recommendation and all 12 findings. We consider the recommendation closed pending verification of Agency compliance.

[Original signed by Dana Mellerio for]

David M. Cushing

5 Enclosures:
Appendix A: Russian Science Research Program Timeline
Appendix B: Contract Deliverables
Appendix C: RSRP Biotechnology Projects
Appendix D: NASA Management Response
Appendix E: Report Distribution

MAJOR CONTRIBUTORS TO THIS REPORT

Yolande Harden, Procurement Analyst
Dana Mellerio, Director, Inspections and Assessments
Andrea Pawley, Presidential Management Intern
Paul Shawcross, Aerospace Technologist (team leader)

Appendix A

Russian Science Research Program Timeline

RUSSIAN SCIENCE RESEARCH PROGRAM TIMELINE

August 1993	United States and Russia initiate series of cooperative space activities, including visits to Russian Space Station Mir.
June 1994	$400 million contract between NASA and RSA finalized. One element is $20 million Russian Science Research Program (RSRP).
August 1994	Russian Space Agency creates the Scientific and Technical Advisory Committee (STAC) to manage the RSRP peer-review and proposal selection system. STAC distributes initial solicitation for research proposals to 46 Russian organizations.
September 1994	NASA officials meet with the STAC in Russia to explain NASA science solicitation and selection process and NASA policy on protection of humans and animals in research.
January 1995	STAC and NASA officials meet in Florida and review approximately 120 proposals tentatively selected for funding by the STAC.
March 1995	STAC formally selects 120 experiments for funding. First major installment ($3.2 million) of funding is paid to RSA.
	NASA team visits Joint Stock Company Biochimmash. Following the visit, NASA contacts the intelligence community and learns that RSRP institutes had been involved in biological weapons research.
April 1995	NASA briefs State Department Bureau of Oceans, International Environmental and Scientific Affairs on cooperative life and microgravity science activities with Russia, including RSRP.
August 25, 1995	NASA briefs the State Department Newly Independent States interagency coordination (Morningstar) group about the RSRP.
September 1, 1995	State Department Bureau of Political-Military Affairs requests, and is provided, list of RSRP research projects. NASA offers to provide additional briefings on RSRP if desired.
September 11, 1995	During STAC Quarterly Review Meeting, NASA officials visit two institutes at which the RSRP is funding biotechnology research.
September 12, 1995	State Department tells NASA that the RSRP is funding institutes that had been part of the Soviet biological warfare program. State

	Department provides guidance and suggests briefing to review guidance and discuss concerns
October 1995	Second major installment ($3 million) of funding is paid to RSA.
	First RSRP symposium held in Maryland. STAC vice chairs present summary overviews of research in their discipline.
November 1995	NASA attends classified interagency briefing at State Department on “project coordination in biotechnology and biomedical areas of cooperation."
March 1996	NASA is informed of results of second round of proposal selection. Approximately 47 additional research projects are selected for funding.
April 1996	Third major installment ($3 million) of funding is paid to RSA.
October 1996	Fourth major installment ($3 million) of funding is paid to RSA.
November 1996	Second RSRP symposium is held in Russia. NASA and Russian audience receive briefings on RSRP and other research, including brief presentations on eight RSRP biotechnology projects.
June 1997	Fifth major installment ($3 million) of funding is paid to RSA.
September 1997	Abstracts for 161 RSRP investigations published and posted on the web at www.stacresearch.org
November 1997	Third RSRP symposium held in Huntsville, Alabama draws 375 attendees, including 60 from Russia. Three Russian investigators (none from Biopreparat-affiliated institutions) present papers on their biotechnology research.
December 1997	Final installment ($3 million) of funding is paid to RSA.
1998	Stacresearch.org web site is taken down.

Appendix B

Contract Deliverables

CONTRACT DELIVERABLES

Deliverable	Accepted by NASA	Funding $M	Funds to Biopreparat*
Solicited Requests for Proposal Report	1/12/95	0.2	
Integrated Plan for Science Research (initial)	3/13/95	0.2	
Report on Implementation of Integrated Plan for Science Research (installment 1 of 6)	3/13/95	3.2	$232,500
Administrative Expenses Report	2/15/95	0.2	
Integrated Plan for Science Research (final)	10/27/95	0.1	
Interim Research Report	10/26/95	0.1	
Report on Implementation of Integrated Plan for Science Research (installment 2 of 6)	9/25/95	3.0	$232,500
Administrative Expenses Report	10/13/95	0.2	
Interim Research Report	4/1/96	0.1	
Report on Implementation of Integrated Plan for Science Research (installment 3 of 6)	4/1/96	3.0	$270,000
Administrative Expenses Report	4/1/96	0.2	
Interim Research Report	10/17/96	0.1	
Report on Implementation of Integrated Plan for Science Research (installment 4 of 6)	10/17/96	3.0	$270,000
Interim Research Report	5/7/97	0.1	
Report on Implementation of Integrated Plan for Science Research (installment 5 of 6)	5/7/97	3.0	$261,900
Administrative Expenses Report	5/7/97	0.2	
Interim Research Report	12/12/97	0.1	
Report on Implementation of Integrated Plan for Science Research (final)	12/12/97	3.0	$261,900
	Total	**20.0**	**$1,529,000**

*Source: Revised Schedule of Works and Financing of Contract <<Scientific Research Program Elaboration>> Science-NASA. Document provided to NASA by RSA, December 15, 1997

Appendix C

RSRP Biotechnology Projects

RUSSIAN SCIENCE RESEARCH PROGRAM BIOTECHNOLOGY PROJECTS

Project Title	P.I.	Institution	Funding*	Biopreparat Institute?
Study of effects of microgravity and other factors of orbital space flight on transfer and exchange of genetic material in processes of bacterial conjugation and fusion of protoplasts	Zerov, Y.P.	State Research Institute of Highly Pure Biopreparations	$110,000	Yes
The Optimization of Heterological Expression Yeasts - Saccharomycetesin Microgravitation Conditions with Examples of Hbs-Antigen of Hepatitis B	Zazimko, L.A.	Saint Petersburg Vaccine and Sera Research Institute	$102,000	
The study of the influence of space flight conditions on properties of plant cell cultures-producers of biologically active substances	Ukraintsev, A.D.	Joint Stock Company Biochimmash	$105,000	Yes
Hybridoma producing monoclonal antibodies specific to tularemia microbe	Khlebnikov, V.S.; Shcherbakov, G. Ya.	JSC The Institute of Engineering Immunology	$109,000	Yes
Encapsulated hybridomas- source of ultrapure antibodies	Nesmeyanov, V.A.	Shemyaking Ovchinnikov Institute of Bioorganic Chemistry RAS	$105,000	
Proteins Caf1 of Y.pestis in crystals and solution	Zav'yalov, V.P.; Abramov, V.M.	JSC The Institute of Engineering Immunology	$107,000	Yes
The study of structural-functional organization of protein molecules under conditions of Earth and space	Timofeyev, I.V.	State Research Center of Virology and Biotechnology "Vector"	$117,000	Yes
New fields of bioobjects research under microgravity conditions	Gavryushkin, A.V.	State Research Institute of Applied Microbiology	$107,000	Yes
Electrophoretic separation of biologically active substances in space	Gavryushkin, A.V.	State Research Institute of Applied Microbiology	$105,000	Yes
Isolation and investigation of the cell surface receptor of tick-borne encephalitis virus in space and Earth	Loktev, V.B.	State Research Center of Virology and Biotechnology "Vector"	$98,000	Yes
Researching of protein crystallization in zero gravity	Levtov V. L.	Institute "Nemetally" JSC "Kompozit	$110,000	

Production of polymeric materials with desired properties under microgravity condition	Nechitailo, G.S.; Vladimir, A. B	Scientific Technical Center “Ecology and Space”; Institute of Continuous Media Mechanics, UB RAS (Perm)	$110,000	
Separation and identification of biological particles	Toporkov, V.S.	State Research Center of Virology and Biotechnology Research Institute of Aerobiology	$98,000	Yes
Separation of biological particles in suspension by magnetic field	Bakirov, T.S.	State Research Center of Virology and Biotechnology "Vector" Research Institute of Aerobiology	$117,000	Yes
Biologically active de novo protein in crystals and solution**	Zav'yalov, V.P.; Kirpichnikov, M.P.	Institute of Immunological Engineering, Institute of Bioorganic Chemistry, Russian Academy of Sciences	$50,000	Yes
Optimization of expression of recombinant polypeptides**	Shemyakin, I.G.	State Research Centre for Applied Microbiology	$50,000	Yes
Principles of lyophilization of biomaterials in space**	Pokhilenko, V. D.	State Research Centre for Applied Microbiology	$50,000	Yes

* TsNIImash and Biopreparat each absorbed approximately 10 percent of the funding for each project (see Section II)

** Project selected for funding in 1996, during the second round of proposal selection

Appendix D

NASA Management Response

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of: IH

OCT 13 2000

W/Assistant Inspector General for Inspections, Administrative Investigations, and Assessments

FROM: I/Associate Administrator for External Relations
U/Acting Associate Administrator for Life and Microgravity Sciences and Applications

SUBJECT: Draft Report on *NASA Support of Russian Biotechnology Research 1994-1997, G-00-007*

This memorandum is in response to your memorandum of September 13, 2000, concerning the subject report. The comments provided below reflect NASA's response to the one recommendation for corrective action and the twelve findings.

RECOMMENDATION FOR CORRECTIVE ACTION

Recommendation 1: **Concur.** Concur with the recommendation that any future NASA program that funds foreign researchers should be coordinated with the State Department to ensure that proper safeguards are in place. NASA practices due diligence with respect to the proper execution of international activities and works closely with the Department of State and other Executive Branch agencies to ensure appropriate consultation/compliance.

FINDINGS

Findings 1-4: Concur.

Findings 5 & 6: Concur. Concur with these findings as they pertain to project selection. Based on the NASA-RSA contract, project selection was the responsibility of the STAC which conducted a peer review process of all RSRP proposals. The contract also provided NASA with the right to deny funding to any project selected by the STAC. Seventeen projects were funded in the space biotechnology discipline. All 17 projects were reviewed by NASA at the 1996 STAC Symposium held in Moscow in November 1996, and all projects submitted final reports to NASA in 1997.

Finding 7: Concur. NASA executed the RSRP in consonance with State Department guidelines that had been developed for the International Science and Technology Center (ISTC). Specifically, NASA's execution of the RSRP was in consonance with the State Department guidelines for ISTC because the RSRP:

- Was based on a contract with set deliverables;
- Involved regular meetings between NASA and Russian officials;
- Was regularly briefed to the NASA Life & Microgravity Sciences & Applications Advisory Committee (LMSAAC) of the NASA Advisory Council;
- Had LMSAAC members serve as proctors and participate in the STAC meetings held between NASA and Russia;
- Required interim research reports (which included progress updates on all funded projects);
- Resulted in final research papers that were available to the public.

Findings 8 -12: Concur.

If you have any questions, please call the Code I point of contact for this response, Ms. Angela Phillips Diaz, Director, Human Space Flight and Research Division. She may be reached at 202-358-4550.

John D. Schumacher

Kathie L. Olsen

cc:
AI/Dr. Mulville
AM/Dr. Nicogossian
G/Mr. Frankle
H/Mr. Luedtke
IH/Ms. Diaz
J/Mr. Sutton
JM/Mr. Robbins
M/Mr. Rothenberg
UP/Ms. Havens
UP/Ms. Lyons
JSC/AA/Mr. Abbey
JSC/BU/Ms. Ritterhouse

Appendix E

Report Distribution

Distribution

National Aeronautics and Space Administration (NASA) Officials:

A/Administrator
AI/Associate Deputy Administrator
AM/Chief Health & Medical Officer
AS/Chief Scientist
B/Chief Financial Officer
G/General Counsel
H/Associate Administrator for Procurement
J/Associate Administrator for Management Systems
JM/Management Assessment Division
L/Associate Administrator for Legislative Affairs
M/Associate Administrator for Space Flight
P/Associate Administrator for Public Affairs
R/Associate Administrator for Aerospace Technology
S/ Associate Administrator for Space Science
Y/Associate Administrator for Earth Science
Director/Lyndon B. Johnson Space Center

NASA Advisory Officials:

Chair, NASA Advisory Council
Chair, Advisory Committee on the International Space Station
Chair, ISS Operational Readiness Task Force
Chair, Life & Microgravity Sciences & Applications Advisory Committee

Non-NASA Federal Organizations and Individuals:

Assistant to the President for Science and Technology Policy
Deputy Associate Director, Energy and Science Division, Office of Management and Budget
Budget Examiner, Energy Science Division, Office of Management and Budget
Associate Director, National Security and International Affairs Division, General Accounting Office
Professional Assistant, Senate Subcommittee on Science, Technology, and Space
Deputy Director, Office of Proliferation and Threat Reduction, Department of State
Coordinator of Assistance for the New Independent States, Department of State
Inspector General, Department of State
Senior Director for Nonproliferation and Export Controls, National Security Council

Chairman and Ranking Minority Member of each of the following Congressional Committees and Subcommittees:

Senate Committee on Appropriations
Senate Subcommittee on VA-HUD-Independent Agencies
Senate Committee on Commerce, Science and Transportation
Senate Subcommittee on Science, Technology and Space
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on VA-HUD-Independent Agencies
House Committee on Government Reform and Oversight
House Subcommittee on National Security, International Affairs, and Criminal Justice
House Committee on Science
House Subcommittee on Space and Aeronautics

Congressional Member:

Honorable Pete Sessions, U.S. House of Representatives

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