

**Appendix B:
Public Sector
U. S.-Russian
Cooperative
Projects** | **B**

Public Sector U.S.-Russian Cooperative Projects

Field and mission/title	Description	Russian entity	Status
Astrophysics			
Exchange of Compton and Granat Data	Mission timelines being exchanged. U.S. proposal to perform correlative studies of neutron stars and stellar-mass black hole candidates using BATSE, SIGMA, and ART-P.	Institute of Space Research (IKI)	Granat expected to operate in three-axis stabilized mode through 10/94. Russian and French partners considering operating in a scanning mode through about 10/95. Scientific data exchange discussed at 4/94 JWG.
Experiment for gamma-ray and optical transients (EGOTS)/Konus-A	Russian proposal for U.S. participation in proposed flight in 1995.	Ioffe Institute, St. Petersburg	Approved by RSA as Konus-A. To be flown on a low-Earth orbit spacecraft scheduled for launch in early 1995. Could be reflown in 1-2 years as Konus-A2.
Gamma-ray burst data exchange	Exchange of data among BATSE, Granat, and Ulysses.	IKI	Burst timing/location now or will be available from PVO, SMM, Ginga, Phobos-2, Compton, WIND, Ulysses, Granat, Coronas-1 and Mars '94 (now '96). Good exchange of data currently among BATSE, Granat and Ulysses.
HETE	International gamma-ray-burst survey using a small satellite to be built by the United States, in collaboration with France and Japan; NASA to loan ground-station equipment to Russia to receive signals from HETE and to alert visible-light observatories to look at burst sources.	Pulkovo Observatory, St. Petersburg	Satellite launch planned for 7/95 at the earliest. Loan agreement to be written.
Long-duration balloon studies for Relict-3 mission	Russian Relict-3 mission funded for Phase A. NASA participation under consideration.	IKI	Sides agreed that long-duration balloon-based observations might be a good preliminary step. Russians noted that LDBF near Moscow had been closed due to funding problems. NASA to discuss with its science community the usefulness of such flights in northern hemisphere.
Operations and archiving for Spectrum-X-Gamma (SXG)	Cooperation in archiving and operations for Spectrum-X, using NASA-supplied hardware for the SXG archiving system.	IKI	Smithsonian Astrophysical Observatory selected as the U.S. SXG Coordinating Facility, to support U.S. guest observers and work with IKI to define and procure archiving hardware.

Precision Gamma-ray spectrometer (PGS)	U.S. germanium gamma-ray detectors to fly as part of Russian experiment on Mars '94 (now '96) orbiter; U.S. contribution sponsored by NASA and DOE; being handled in Solar System Exploration JWG.	IKI	Launch date slipped to 1996. U.S. components, built by DOE/LANL, shipped to IKI in 1993.
Radioastron	Russian mission; NASA to provide DSN support, loan of VLBA recording terminals, and VLBA observing time and to cooperate in correlation of selected data sets.	IKI, Russian Academy of Sciences (RAS)	Launch date TBD, no earlier than 1997 (following Spectrum-X-Gamma); engineering model of 10-m deployable antenna being fabricated, scheduled to be completed by the end of 1994; ground test early 1995 at Puschino Radio Observatory.
Relict-2	Russian mission similar to COBE. NASA participation in development and fabrication of receivers.	IKI	Development of flight model spacecraft, utilizing Prognosz engineering model, pending availability of funds; launch scheduled for 12/95. Computer workstation and software for processing COBE data by Relict science team procured at GSFC; to be loaned to IKI by NASA.
Spectrum-UV	170-cm telescope for imaging and spectroscopy, with possible co-aligned smaller telescopes, in a 7-day, highly elliptical orbit.	Institute of Astronomy, RAS, IKI	Currently not scheduled for flight, Ukraine, Canada, Germany and Italy also reportedly involved.
Spectrum-X-Gamma	NASA to provide Stellar X-ray Polarimeter (SXP), Monitoring X-ray Experiment (MOXE—All Sky X-ray Monitor), and filters for Russian EUVITA instrument.	IKI	Scheduled launch date is late 1996. Engineering models of SXP and MOXE instruments accepted by IKI; flight units in production, MOU being developed.
Wind/Konus	Gamma-ray burst detectors for Wind spacecraft, as part of ISTP; co-investigator from the Ioffe Institute,	Ioffe Institute	Instrument delivered and integrated on spacecraft. Launched 11/1/94.
Earth Science and Environmental Monitoring JWGs			
BOREAS Field Experiment	Joint U.S.-Canada experiment on interactions between the boreal forest and the atmosphere.	Institute of Forest and Timber (IFT), Siberian Branch, RAS	Russian investigator selected through peer-reviewed process, resident at the University of New Hampshire.
Correlative measurements of ozone	Cooperation involving ground-, balloon-, and aircraft-based measurements correlative with space-based measurements,	Institute of Atmospheric Optics (IAO)	Joint Implementation Team formed 4/94; more than 30 Russian proposals currently under study.

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Crustal Deformation in Pamir-Tien Shari	Determining the mechanisms of mountain building using the Tien Shari mountains as a natural laboratory.	Institute of High Temperature Physics, RAS	Major field program during summers 1993 and 1994; included scientists from Russia, Kyrgyzstan, Kazakhstan, and the United States; further field experiments planned for summer 1995.
Earthquake Precursors Study	Data exchanges in the area of atmospheric precursors to earthquakes.	Institute of Astronomy, RAS	Some exchanges completed; further exchanges, including retrospective analysis of satellite data for selected California earthquakes, to continue.
FEDMAC-Sayani Field Experiments	Study of forest health using in situ and satellite data.	IFT	Field work complete; final publications being prepared.
FIFE-Kursk Field Experiments	Study of climatologically significant land-surface parameters using satellite data.	Institute of Computational Mathematics, RAS	Field work complete; final publications being prepared.
Gravity and Magnetics in Tibet and China	Analysis of gravity data from Russia and western China by bilateral investigator groups.	Institute of Mathematical Geophysics, RAS	Modeling continuing.
Internet Connectivity	Extending electronic communications via the existing NASA Science Internet (NSI) connection with IKI to reach Russian Earth science facilities.	IKI, RAS	List of priority sites to be jointly developed and provided to NSI for implementation.
Kamchatka Volcanological Studies	Exchange of U.S. and Russian aircraft data and joint ground measurements; joint analysis of data.	Institute of Geology, Petrology, Mineralogy, and Geochemistry (IGPMG), RAS	Learjet overflights completed 8-9/94; additional aircraft flights under consideration; data exchanges under way.
LITE Shuttle mission	To coordinate Russian ground-based LIDAR measurements with Shuttle-based measurements; Russian principal investigator on science team.	IAO, Siberian Branch, RAS	9/94 Shuttle flight.
Meteor-3/TOMS	Flight of NASA Total Ozone Mapping Spectrometer (TOMS) instrument on Meteor-3 polar orbiter.	Russian Federal Service for Hydrometeorology and Environmental Monitoring (ROSHYDROMET)	8/91 launch; TOMS instrument failed in early 1995.

Moz-Obzor (Priroda)	Use of the Moz-Obzor ocean-color instrument on Priroda in conjunction with SeaWiFS.	Institute of Radioengineering and Electronics (IRE)	U.S. proposal accepted by the Priroda Science Team.
Operational Data Transmissions	Processing of limited amount of NOAA satellite products by ROSHYDROMET for use in local and regional forecasting; provided by NOAA through GTS.	ROSHYDROMET	Under way
Priroda	NASA invited to participate in the science associated with the Mir-Priroda module.	IRE	Seven NASA investigations using Russian-provided instruments; launch December 1995.
Regional Tectonics in Eurasia	Through WEGENER program	Institute of Geology, RAS	GPS survey of Caucasus completed 1993; workshop 6/94 in St. Petersburg.
SAGE Flight	Flight of SAGE instrument on a Russian Meteor-3M as part of NASA EOS Program.	RSA, Scientific Research Institute of Electromechanics (NIIEM)	Agreed at 12/94 GCC meeting.
SeaWiFS	Variety of activities involving Russian participation in U.S. SeaWiFS project.	Shirshov Institute, RAS	Russian scientist selected as a principal investigator in the SeaWiFS program; Russian bio-optical data delivered to SeaWiFS database; NASA to facilitate further Russian scientist participation.
Siberian AVHRR Stations	Installation of two NASA-provided HRPT stations at Yakutsk and Khabarovsk to support IGBP 1 -km data set project.	ROSHYDROMET	Installed 1 -2/95.
Space Geodetic Measurements	Long-term loan of Mark 3 VLBI data-acquisition systems; satellite laser tracking and exchanges of data; potential project in atmospheric precursors for earthquakes.	Institute of Astronomy, RAS	Loan agreement in place; first VLBI experiments summer 1994; satellite laser ranging (SLR) data exchanges well-established.
TAIGA Study of the Boreal Forest	Exchange of Russian ground truth and data from NASA-provided satellite HRPT receiving station in Krasnoyarsk, to study forest productivity, forest health, fire risk, and fire history in the context of the global carbon cycle.	International Forestry Institute (IFI), RAS	Letter agreement concluded 3/94; equipment installed 11/94.
TOMS Flight	Flight of another TOMS on a Russian Meteor-3M.	RSA, NIIEM	Agreed at 12/94 GCC meeting.
Watershed Hydrology Project (Priroda)	Study of microwave remote sensing for large-watershed hydrology.	IRE, RAS	Formalized at 6/94 Priroda Scientific Council meeting.

Public Sector U.S.-Russian Cooperative Projects (Cont'd)

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Solar System Exploration			
Antarctic instrument cross-calibration balloon flight	To cross-calibrate remote-sensing gamma-ray and neutron spectrometers for geochemical observation of planetary surfaces.	IKI	At the 10/94 JWG, discussed successful Antarctic balloon flight; recommended expansion of goals to encompass intercalibration of geochemical systems for U.S. and Russian planetary missions; detailed plan to be submitted at next JWG meeting.
Coordination and exchange of data for science exploration of Venus	Data exchange from the Magellan, Galileo, and Venera/Vega missions; data documentation and archiving; review of Russian scientists' experience in the Magellan Guest Investigator Program; specific joint investigations and studies; documentation of future exploration goals, including consideration of concepts for future techniques and experiments to achieve these goals; selection of future landing sites and/or balloon traverses; and identification of future joint/complementary experiments and missions.	IKI	Discussed at 10/94 JWG; progress satisfactory; meetings 1/95 and 3/95 in Arizona and Houston, TX.
Coordination of future missions	Technical study of future cooperative solar system exploration missions.	IKI	10/94 JWG meeting received reports from joint technical study teams for Mars Together, and Fire and Ice. JWG endorsed reports in principle and forwarded them to the 12/94, GCC meeting, at which the principals asked the JWG to continue the study activity and produce a specific recommendation at the next GCC meeting (6/95).
Coordination of missions	U.S. VLBI tracking of Mars '96 during cruise to Mars; U.S. Mars Surveyor relay of Mars '96 lander data to verify lander operability; joint tracking campaigns during Mars orbit phase; and joint U.S.-Russian VLBI tracking experiments.	IKI, RAS	Discussed at 10/94 JWG meeting; progress satisfactory.

Coordination of science observations and exchanges of data	Development of common data formats; systematic exchange of data sets in the agreed formats; and exchange of participating scientists.	IKI	Activities involving the Phobos, Mars '96-' 98, Mars Surveyor, and Pathfinder missions reviewed at 10/94 JWG meeting; substantial progress made. Detailed status of each Participating Scientist to be reviewed at the next JWG meeting.
Exobiology	Characterization of Mars sites of interest to exobiology, Mars mission strategies, instrumentation for various missions, and planetary protection.	IKI	At the 10/94 JWG meeting, implementation team recommended continuation of joint Mars site studies and a joint workshop on planetary protection measures for Mars sample return missions.
Ground-based observations in support of planetary missions	To coordinate Mars Watch and Near-Earth Objects Watch,	IKI	At the 10/94 JWG, agreed to continue and strengthen joint ground-based observing programs through an exchange of observing plans and results.
Mars '96	Fly two copies of U.S. Mars Oxidant (MOX) experiment on Mars '96 landers.	IKI, RAS	Flight postponed to 1996; progress satisfactory,
Mars engineering models	To develop realistic models of the Martian near-surface wind environment to support future lander missions.	IKI	United States to continue modeling work; both sides to seek better understanding and verification of the results by comparison with available observations and other models,
Mars landing-site selection	To develop models of the Martian surface for the design of future missions and selection of landing sites.	IKI	Agreement at the 10/94 JWG meeting on several specific steps to develop additional information for refinement of the engineering model; met in 3/95 in Houston to review potential landing sites for Mars '96 small landers and penetrators.
Mercuric iodide room temperature x-ray detecting system	Part of German alpha backscatter Instrument for Mars '96.	Max Planck Institute, Germany; IKI	Hardware delivered; awaiting 1996 launch.
Space Biomedicine, Life Support Systems and Microgravity Sciences			
Biological investigations aboard Mir	Investigations to include "Seed to Seed" experiment with dwarf wheat and investigations of avian egg development.	Institute of Biomedical Problems (IBMP)	At 3-4/94 JWG meeting, two sides agreed to proceed with implementation.

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Bion 11 and 12	U.S. reimbursable participation in primate scientific programs on the Russian Bion 11 and 12 biosatellite missions, scheduled for 1996 and 1998.	RSA, IBMP, Central Specialized Design Bureau, Samara (TsKB)	Contract signed 12/94; series of working meetings under way at NASA Ames Research Center (ARC) and IBMP.
Bion 10 flight experiments	Flight of U.S. primate experiments on Russian biosatellite mission.	IBMP, Institute of Evolutionary Physiology and Biochemistry (IEPB), RAS	Experiments completed; analysis of results presented and published.
Cooperation regarding space-radiation-environment databases	Beginning with 9/94 meeting, pursue a systematic exchange of databases.	IEPB	At 9/94 meeting, two sides agreed to begin identifying sources of data from the respective countries, types of data, and database formats. Specific range of data types sought agreed to at 3-4/94 JWG meeting.
Flight of TEPC (Tissue Equivalent Proportional Counter) on the Mars '94 mission	U.S.-provided TEPC to be flown on the Mars '94 mission (now slipped to 1996).	IEPB	Agreement in principle; implementing agreement under negotiation.
IBMP life-support testbed upgrade	Russia invited the United States to take part in upgrading the IBMP life-support testbed in order to set up an international center on the development and testing of complex physical-chemical and environmental life-support systems.	IBMP	At 3-4/94 JWG meeting, U.S. side agreed to study the proposal.
Joint experimental dosimetric measurements		IEPB	Measurements on STS-60 mission completed; to continue on subsequent flights.
Joint rodent developmental experiment	Joint experiment on board the Space Shuttle in 10/94.	IBMP	Agreed during 3-4/94 JWG meeting; preparations under way.
Medical systems in support of the International Space Station	Testing and evaluation of medical programs during Phase One.	IBMP, Cosmonaut Training Center (TsPK), RSA	Ongoing.
Publication of "Foundations of Space Biology and Medicine"	Multivolume compendium of U.S. and Russian articles on research in the field.	IBMP, Ministry of Health	Exchange of chapters for Volume III completed; for Volume IV, to be completed by 9/30/95.

Radiation-exposure standards	Exchange of information on current U.S. and Russian standards and exploration of possibility of convergence on one process and one set of standards.	IEPB	Forum to be established; first meeting in 9/94,
Shuttle/Mir program	Fundamental and applied medical and physiological experiments aboard Mir and Shuttle.	IBMP, others	Being implemented.
SLS-2 flight experiments	Joint U.S.-Russian experiments in biology.	IBMP	Final report released 9/94. Russian specialists invited to a symposium in the United States on SLS-2, held fall 1994.
Space-crew safety, operational efficiency and unified U.S.-Russian medical support in piloted missions	Updating and advancing medical issues of space crew safety and operational efficiency; establishing a unified U.S.-Russian system for medical support in piloted missions.	IBMP, TsPK, Ministry of Defense, RSA	Ongoing.
Standardizing techniques for physical, chemical, and biological analyses of recovered water and air	Coordination of Russian and U.S. sampling operations and data sharing.	IBMP	At 2/95 meeting held between IBMP toxicologist and NASA, sampling methods agreed to for first Phase One flight.
Support of Russian scientific community under the NASA/RSA contract	Funding of Russian space scientists and technologists in eight discipline areas (\$20 million set-aside).	RSA's Scientific and Technical Advisory Council, 50 scientific organizations	Joint meeting held in Moscow and the United States to review process.
Unified approach to environmental standards	Setting appropriate standards for Phase One program.	IBMP	At 2/95 meeting held between IBMP toxicologist and NASA, sampling methods agreed to for first Phase One flight.
Space Physics			
Anomalous cosmic rays	Three-point approved program involving investigation of trapped anomalous cosmic rays, coordinated measurements with SAMPEX, and investigation of the mean ionic charge state of solar energetic particles. German investigators also participating.	Scientific Research Institute of Nuclear Physics, Moscow State University (NIIJAF MGU)	Comparison of modeling and observations discussed during 4-5/94 JWG. Agreement on reduction and comparison of data from 7-8/93 Cosmos flight and SAMPEX to derive the mirror point distribution of trapped anomalous cosmic rays. United States to prepare joint publication on new data. Russia to provide additional data from three COSMOS flights during the last solar cycle.

Public Sector U.S.-Russian Cooperative Projects (Cont'd)			
Field and mission/title	Description	Russian entity	Status
Coronas	U.S. scientists invited to participate in mission operations planning and subsequent data analysis of Coronas-1, as well as the planned Coronas-F and Foton missions, to study solar activity.	Institute for Earth Magnetism, Ionosphere and Radio Propagation of the Russian Academy of Sciences (IZMIRAN)	Coronas-1 operational. Letter agreement finalized 1 /23/95.
Flight dynamics	Update <i>IACG Handbook on Trajectories, Mission Design and Operations</i> ; conduct mission design for Relict-2.	IKI	Updated handbook expected to ready for distribution 9/94; small joint team formed to develop an electronic version.
Geospace	Interball-Tail and Interball-Aurora spacecraft planned for launch in 10/94 and spring 1995, respectively.	IKI	In 4-5/94 JWG, agreement reached on U.S. scientist participation in data analyses. NASA to fund investigators (subject to Interball principal investigator agreement and Interball science team member involvement).
IACG-coordinated campaigns	Coordinated observing campaigns using existing spacecraft regarding flow of energy in the magnetotail, collisionless boundaries in space plasmas, and solar events and their manifestations in geospace.	IKI	First campaign, led by GSFC, in fall 1993. Second campaign to be led by ESA. Second and third campaigns not before 1996.
Long-duration balloons	To fly long-duration balloons carrying U.S. payloads between North America and Russia; NASA to provide balloons, launch, and tracking.	NIIJAF MGU	First flight planned for 6/95.
Magnetospheric modeling	Development of a mathematical framework for describing the different components of the Earth's distant magnetic field; assembling data from space, mainly observations of the magnetic field, used for calibrating the mathematical representations.	IKI	Most of the work is being done by the Goddard group (Stern, Tsyganenko, et al.); significant new developments and publications have resulted. JWG (4-5/94) concluded that the implementation team had achieved its intended purpose and decided to terminate its activity.

Solar Probe	Provide science input to Elachi/Galeev technical team.	IKI, RAS, IZMIRAN	Technical team to prepare preliminary report by 8/94, final report by 11/94. Joint Science Steering Group formed at 4-5/94 JWG meeting. U.S. side hosted workshop on 'Near-Sun Science with a Small Solar Probe' in summer 1994.
TREK	U.S. ultra-heavy cosmic-ray detectors flown on Mir; NASA supplied detectors and leading data-analysis efforts, while RSA providing launch, recovery, and collaboration in data analysis.	IKI	Three small stacks and one-third of the large stack have been returned to Earth from Mir. Plans are under way to retrieve the remaining two-thirds of the external collector in 1995 by a joint U.S./Russian EVA. Afanasiev is currently at University of California at Berkeley to participate in TREK data analysis for one year.

ARC = Ames Research Center
 ART-P = Advanced Roentgen Telescope-Positioning
 AVHRR = Advanced Very High Resolution Radiometer
 BATSE = Burst and Transient Source Experiment
 BOREAS = Boreal Ecosystem-Atmosphere Study
 COBE = Cosmic Background Explorer
 DOE = Department of Energy
 DSN = Deep Space Network
 EOS = Earth Observing System
 EUVITA = Extreme Ultraviolet Imaging Telescope Array
 EVA = Extra Vehicular Activity
 FEDMAC = Forest Ecosystem Dynamics Multispectral Airborne Campaign
 FIFE = First International Field Experiment

SOURCE: Office of Technology Assessment, 1995

GCC = Gore-Chernomyrdin Commission
 GPS = Global Positioning System
 GSFC = Goddard Space Flight Center
 GTS = Global Telecommunications System
 HETE = High Energy Transient Experiment
 HRPT = High Resolution Picture Transmission
 IGBP = International Geosphere-Biosphere Program
 ISTP = International Solar Terrestrial Physics
 JWG = Joint Working Group
 LANL = Los Alamos National Laboratory
 LDBF = Long Duration Balloon Facility
 LIDAR = Light Detection and Ranging
 LITE = LIDAR In-space Technology Experiment
 MOU = Memorandum of Understanding

NASA = National Aeronautics and Space Administration
 NOAA = National Oceanographic and Atmospheric Administration
 PVO = Pioneer Venus Orbiter
 RSA = Russian Space Agency
 SAMPEX = Solar, Anomalous, Magnetospheric Explorer
 SeaWiFS = Sea-Viewing Wide Field Sensor
 SIGMA = French gamma ray instrument
 SMM = Solar Maximum Mission
 VLBA = Very Long Baseline Array
 VLBI = Very Long Baseline Interferometer
 WEGENER = Working Group of European Geophysicists for the Establishment of Networks for Earthquake Research