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SUMMARIES OF TWO U.S.-SOVIET MEETINGS ISSUED

NASA and the U.S.S.R. Academy of Sciences have confirmed the summaries of results of meetings held between the two agencies in November.

One meeting, held in Moscow, Nov. 14 through 17, concerned possible cooperative scientific experiments using the U.S. Shuttle and the Soviet Salyut spacecraft. At the other meetings, held at Wallops Island, Va., Nov. 19 through 25 and in Bethesda, Md., Nov. 16 through 18, experiments flown on a recent Soviet biosatellite as well as proposals for future biosatellite missions and medical results of manned space flight were discussed.

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In Moscow the two agencies discussed preliminary scientific proposals and scientific experimental areas that might benefit from a long duration station of the Salyut type and a reusable Shuttle spacecraft. The joint working groups agreed to meet in the United States in late March or early April, in Moscow in July and again in the U.S. in October 1978.

The Bethesda and Wallops Island meetings discussed information on experience gained in manned space flight programs, in particular, the Salyut 5/Soyuz 21 and 24 missions. Also discussed were preliminary results from U.S. and Soviet experiments flown on Cosmos 936 in August 1977. The U.S.S.R. also invited the U.S. to participate in Soviet biosatellite flights in 1980 and 1981.

A ninth meeting of the space biology and medicine working group will be held in the U.S.S.R. in the second half of 1978.

The talks are being held as part of ongoing activities under the U.S.-Soviet Space Cooperation Agreement.

Copies of the Summaries of Results are attached.

SUMMARY OF RESULTS

TALKS BETWEEN REPRESENTATIVES OF THE US NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AND THE USSR ACADEMY OF SCIENCES ON THE OBJECTIVES, FEASIBILITY AND MEANS OF ACCOMPLISHING JOINT EXPERIMENTAL FLIGHTS OF A LONG DURATION STATION OF THE SALYUT TYPE AND A REUSABLE SHUTTLE SPACECRAFT.

Moscow, November 14-17, 1977

In accordance with the agreement of May 24, 1977 between the United States and the USSR concerning cooperation in the exploration and use of outer space for peaceful purposes and the agreement of May 11, 1977 between the US National Aeronautics and Space Administration and the USSR Academy of Sciences on cooperation in the area of manned space flight talks were held in Moscow, November 14-17, 1977, between Soviet and American specialists on the proposed Shuttle/Salyut project.

1. Discussions of scientific and technical questions relating to the proposed project were carried out in two Working Groups: a Joint Working Group for Basic and Applied Scientific Experiments (Experimental Group) and a Joint Working Group for Operations (Operations Group).
2. During the meeting the working groups, as foreseen in the Agreement of May 11, 1977, considered the feasibility and means of carrying out a joint experimental program using a long-duration station of the Salyut type and a reusable Shuttle spacecraft.

3. The Joint Working Group for Basic and Applied Scientific Experiments preliminarily considered the following scientific proposals which could be carried out within the framework of a Shuttle/Salyut program.

- (1) Radio astronomy experiments using an aperture synthesis system.
- (2) Infrared interferometry.
- (3) X-ray astronomy.
- (4) Gamma-ray astronomy.
- (5) Cosmic ray research.
- (6) Research on physical conditions in active regions of the sun.
- (7) Space biology and medicine.
- (8) Laser absorption spectroscopy for studying pollution of the upper atmosphere.
- (9) Radio sounding for radiophysical investigation of the Earth's atmosphere.
- (10) Space processing.
- (11) Active (controlled) experiments in the Earth's magnetosphere and ionosphere.
- (12) Space meteorology and study of earth resources.

Of these proposals a common interest was expressed at this time in the following research areas:

- High energy astrophysics (gamma-ray astronomy, x-ray astronomy and cosmic rays);
- Atmospheric research;

- Active experiments in the magnetosphere and ionosphere;
- Medical and biological experiments;
- Radio astronomy.

All the proposals discussed at this meeting (including space processing, solar physics and infrared interferometry) are subject to further study. The inclusion of a possible research or experimental area in the list of areas considered at this meeting does not commit the sides to include or not to include it in any program of joint experiments. The list of areas subject to further study may be supplemented by agreement of the sides. Each Joint Working Group Co-Chairman will designate for his side the specialists responsible for developing recommendations in each appropriate research area and will submit a list of such specialists to the other side by March 1, 1978. The work of the specialists in each area will be carried out by correspondence and--if necessary--through special meetings by the agreement in each case of the respective Joint Working Group Co-Chairman.

The proposals transmitted by the Soviet scientists to the American specialists are listed in Attachment 1. The list of proposals presented orally by the American side in the course of the meeting is in Attachment 2. The proposals of the American scientists, including consideration of the discussion which took place during the Working Group meeting, will be sent to the Soviet side by March 1, 1978.

4. The Joint Working Group for Operations identified the following basic ^{proposed} assumptions for planning of the joint scientific Salyut/Shuttle program.

- a. During the joint separate flights, experiments may be conducted which require interaction and mutual orientation of the two spacecraft.
- b. Large size scientific equipment to be installed inside or outside the Salyut may be delivered by the Shuttle.
- c. Some small size experiments may be delivered to orbit inside the Salyut.

The Working Group also identified three possible operating modes, or combinations thereof, in which the scientific experiments utilizing the Salyut/Shuttle may be conducted:

Mode A - The Salyut and the Shuttle are two mutually oriented spacecraft.

Mode B - The Salyut and the Shuttle are docked to each other.

Mode C - The Salyut operates the scientific experiments delivered by the Shuttle.

Basic specifications and preliminary information on the capabilities of the Salyut and the Shuttle were exchanged as set forth in Attachment 3. Each side agreed to prepare a handbook with technical specifications and operations parameters for their spacecraft including sketches and block diagrams. These handbooks will be exchanged by January 1, 1978.

Additionally, the Operations Working Group discussed and basically agreed to the USSR proposed list of requirements to the spacecraft systems imposed by possible scientific experiments and equipment. This list is set forth in Attachment 4.

The USSR proposed outline of a document, "Preliminary Technical Proposal for Program Accomplishment" (Attachment 5) was accepted in principle and it was agreed that at the next meeting the required contents of the document would be discussed. It was also agreed that the main areas of onboard systems compatibility such as mission phases, docking systems, joint flight dynamics, equipment installation (including use of manipulator), onboard electrical compatibility, radio communications, life support, etc. will be discussed at the next meeting.

5. The sides agree that the further work of the Joint Working Groups should proceed as follows:

- The Joint Working Groups will meet in the United States in late March or early April 1978. At that time the Joint Working Group for Basic and Applied Scientific Experiments will discuss the proposals of the two sides and prepare preliminary versions of possible scientific programs. The Experimental Group will also discuss the requirements placed on Shuttle and Salyut with respect to scientific experiments. At the March/April 1977 meeting the Joint Working Group on Operations will exchange materials and discuss the technical requirements for compatible spacecraft systems, as well as conducting a preliminary discussion and evaluation of the feasibility of the preliminary versions of possible scientific programs proposed by the Experimental Group.
- The two Joint Working Groups will then meet in July 1978 in the USSR. At that time the Groups will agree on

a preliminary selection of a possible experimental program and a preliminary division of work between the sides on scientific materials and equipment, sufficient to permit each side to estimate its own costs. The Operations Group will prepare a preliminary evaluation of the feasibility of the proposed versions of scientific programs and continue its work on compatible spacecraft systems.

- The two Joint Working Groups will meet in October 1978 in the United States to decide on recommendations for a program of scientific experiments and to reach conclusions on the technical feasibility of such a program. At that time the Joint Working Groups will also prepare the documents foreseen for the first phase of joint work in accordance with the agreement between the US National Aeronautics and Space Administration and the USSR Academy of Sciences of May 11, 1977. At the October meeting the groups will also consider a joint management plan for carrying out the recommended program and will discuss the technical documentation such a program would require.

6. The sides informed each other of the following designations:

- a. Dr. Noel W. Hinners as the Chairman of the Joint Working Group for Basic and Applied Scientific Experiments from the US side.

Mr. R. Z. Sagdeyev as the Scientific Research Program Leader and Mr. I.A. Zhulin as the Chairman of the Joint Working Group for Basic and Applied Scientific Experiment from the USSR side.

b. Mr. Glynn Lunney as the Chairman of the Joint Working Group for Operations from the US side.

Mr. Yu. P. Semenov as the Chairman of the Joint Working Group for Operations from the USSR side.

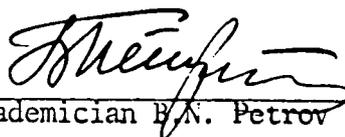
7. This Summary of Results shall enter into force after its confirmation by the Administrator of the US National Aeronautics and Space Administration and the President of the USSR Academy of Sciences, and the parties shall communicate with each other with respect to such confirmation by correspondence within 30 days of this date.

Done in Moscow, November 17, 1977 in duplicate in the English and Russian languages.

For the US National
Aeronautics and Space
Administration


Dr. Noel W. Hinners

For the Academy of
Sciences of the USSR


Academician B.N. Petrov

ATTACHMENT I

USSR SPECIALISTS PROPOSALS FOR THE JOINT
EXPERIMENT PROGRAM OF THE SALYUT/SHUTTLE MISSION

1. USSR WDI-002 Radioastronomy space system of aperture synthesis (RAKSAS)
2. USSR WDI-003 Space infrared interferometer
3. USSR WDI-004 Proposals to scientific program on X-ray astronomy for the Salyut/Shuttle mission
4. USSR WDI-005 "SAGA" experiment (USSR/US experiment on gamma-astronomy)
5. USSR WD1-006 Exploration of physical conditions in active solar areas
6. USSR WD1-007 Active (controlled experiments for the Salyut/Shuttle mission)
7. USSR WD1-008 Absorption laser spectroscopy of upper atmosphere pollution
8. USSR WD1-009 Experimental study of Atmospheric Radio-physics by atmosphere radioscunding using the Salyut and Shuttle spacecraft
9. USSR WD1-010 Cosmic Rays experiments
10. USSR WD1-011 Proposals for the USSR/US joint experiments in the area of "matter and space technology"
11. USSR WD1-012 Space meteorology and natural resources studies.

Attachment 2

ORAL PRESENTATIONS BY AMERICAN SIDE

1. General Objectives in High-Energy Astrophysics McDonald
2. Possible Directions of Research in Space Medicine and Biology Winter
3. Prospects for Satellite Experiments in Global Study of Upper Atmosphere Composition Jaffe
4. Active Experiment Possibilities in the Study of the Magnetosphere and Ionosphere Kennel

SALYUT STATION/SHUTTLE SPACECRAFT
BASIC TECHNICAL PARAMETERS AND
SCIENTIFIC EQUIPMENT REQUIREMENTS
(preliminary)

I.0. Fundamental characteristics of Space Shuttle and the Salyut space station

1.1. Orbit parameters	<u>Salyut</u>	<u>Space Shuttle</u>
- altitude	350/400 km	350-400 km
- inclination	51.6°	51.6°
1.2. Total flight duration	1.5-2 years	7 days
1.3. Dimensions		
length	21 m	37.1 m
maximum size including solar batteries (Salyut) and wingspan (Space Shuttle)	30-33 m	23.8 m
maximum diameter	4.2 m	
1.4. Mass characteristics (before docking with space Shuttle)		
mass	26 tons	88.4 tons
		with total load
I_x	$1.2 \times 10^5 \text{ kgm}^2$	(TBD)*
I_y	$1.2 \times 10^6 \text{ kgm}^2$	(TBD)*
I_z	$1.0 \times 10^6 \text{ kgm}^2$	(TBD)*
1.5. Coordinates of the mass center (the origin of Salyut coordinates along the longitudinal axis in the plane of the Soyuz docking ring 4100 mm)		
X_c	- 2.7 m	65%
Y_c	0	0
Z_c	0	0

*) -----
 To be determined after scientific equipment is defined

1.6. Distance between the mass center and Salyut/Shuttle docking interface	9.3 m	(TBD)*
1.7. The number of crew members	2	2 crew plus up to 5 scientists
1.8. Orientation accuracy		
- inertial	10 min	0.5°
- orbital	50 min	0.5°
1.9. Instrument pointing, accuracy, inertial	20 min	2°
orbital	1°	2°
1.10. Docking system hatch dimensions	920 mm (limited by 2 chords to the distance of 700 mm)	920 mm
2.0. Basic requirements of Salyut and Space Shuttle for the Scientific Equipment		
2.1. Mass of scientific equipment		
- to be installed outside the Salyut spacestation (Delivered by the Shuttle)	5 to 10 t	
- to be installed inside the Salyut space station (Delivered by the Shuttle)	0.5 t	

- to be installed inside Space Shuttle (total mass of the launched equipment) 20 t
 - Possible to be returned to earth by Space Shuttle up to 12 t
- 2.2. Dimensions of scientific equipment delivered by Space Shuttle
- to be installed outside the Salyut (it may consist of multiple units) diameter 4 m
length 16 m (overall)
 - delivered by Space Shuttle to be installed inside the Salyut space station diameter 0.6 m
length 0.6 m
- 2.3. Power available for consumption of the scientific equipment: -
- onboard the Salyut space station up to 2 kw
 - onboard Space Shuttle up to 7 kw (steady)
(during independent flight) up to 12 kw (peak)
- 3.0. Basic parameters of the flight program
- 3.1. Experiment duration
- Space Shuttle and the Salyut space station are two mutually oriented objects (mode A) TBD
 - the Salyut space station and Space Shuttle are docked (mode B) up to 5 days
 - Salyut uses the scientific equipment delivered by Space Shuttle (mode C) 0.5 years

3.2. Distribution of functions for motion control:

- in mode A the relative orientation is provided by Salyut and Space Shuttle independently; relative position of the mass center is provided by Space Shuttle
- in mode B the orientation is provided by TBD
- in mode C the assembly orientation is provided by Salyut

3.3. Exposure time for scientific observations

- in mode C - one month or more (with interruptions)

3.4. Distance from which the investigations can be started in mode A

3000-4000 km

4.0. Coordinate systems for the joint flight

- in mode A
 - Salyut coordinate system
 - Space Shuttle coordinate system
- in mode B
 - Active spacecraft coordinate system
- in mode C
 - Salyut coordinate system

Basic parameters of scientific equipment needed for the feasibility analysis.

1. Experiment initiator
2. Goals
3. Measurement range
4. Field of vision
5. Exposure time for one observation, needed number of observations
6. Relative position of objects
 - base
 - accuracy of maintaining it
 - accuracy of base data
7. Acceptability of orientation engine plumes
(in general/for exposure)
8. Time for preparation for exposure
9. The number of dockings for conducting one set of experiments
10. The number of days for the program implementation
11. Crew participation
12. Telemetry requirements:
 - number of parameters
 - Recording Rate
 - general flow (bit/sec)
 - volume per data session
 - volume per day

13. Power consumption (Salyut/Space Shuttle)
(average, peak)
14. Accuracy of onboard time reference
15. Equipment content (Salyut/Space Shuttle)
16. Equipment dimensions (Salyut/Space Shuttle)
17. Equipment Mass (Salyut/Space Shuttle)
18. Distribution of duties between sides (proposed)
19. Status of the equipment readiness
20. Requirements for necessary ground-based testing
21. Requirements for necessity and location of control
panels and testing
22. Required accuracy of object orientation
23. Requirement for Power source
(direct-alternate)
24. Command requirements (Ground-onboard)

"THE PRELIMINARY TECHNICAL PROPOSALS FOR
PROPOSED
IMPLEMENTATION OF THE/SALYUT-SHUTTLE MISSION"

PURPOSE.

This document defines joint preliminary technical proposals for implementation of the Salyut-Shuttle Mission, project milestones, calling for both sides interaction, including mission objectives, joint scientific program, flight model and program, description of the Salyut-Shuttle orbital complex, system compatibility concept, mission control guidelines, crew and mission controllers training, joint activities organisation and schedule.

C O N T E N T S

1. Purpose.
2. Reference Documents.
3. Definitions and Terminology.
4. Joint Mission Objectives.
5. Joint Investigations and Experiment Program.
6. Flight model and Program.
 - 6.1. Mission Groundrules.
 - 6.2. Mission Versions Analysis and Rationale.
 - 6.3. Main Ballistic Characteristics.
 - 6.4. List of and Requirements to Joint Operations.
 - 6.5. Groundrules for Contingencies.
7. Salyut-Shuttle Space Complex Description and Characteristics.
 - 7.1. Concept Rationale for the Salyut-Shuttle Space Complex.
 - 7.2. Salyut-Shuttle Orbital Complex.
 - 7.3. Space Shuttle and its Systems.
 - 7.4. Salyut Station and its Systems.
 - 7.5. Scientific Equipment installation.
8. Crew Safety Assurance.
9. Compatibility Assurance.
 - 9.1. Basic Elements to be Compatible.
 - 9.2. Requirements for Compatible Systems.

- 9.3. Experimental Development of Compatible Systems
- 10. Groundrules for Mission Control, Mission Controllers/
Crew Training.
- 11. Organization of Activities.
- 12. Schedule.

SUMMARY OF RESULTS

EIGHTH MEETING OF THE US-USSR WORKING GROUP

ON SPACE BIOLOGY AND MEDICINE

Wallops Island, Virginia, USA

November 19-25, 1977

and

THE ASSOCIATED WORKSHOP ON HYPOKINESIA

Bethesda, Maryland, USA

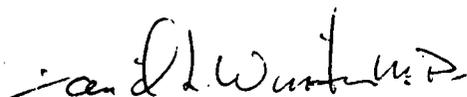
November 16-18, 1977

1. The Joint Working Group on Space Biology and Medicine held its eighth meeting at Wallops Island, Virginia, USA, November 19-25, 1977. This meeting was held pursuant to US NASA/USSR Academy of Sciences Summary of Results of January 21, 1971, which was endorsed by the US-USSR Space Cooperation Agreements of May 24, 1972 and May 18, 1977. The participants are listed in Attachment 1.
2. The Working Group continued to discuss information on experience gained in manned space flight programs, in particular, the Salyut 5/ Soyuz 21 and 24 missions.
3. The Working Group discussed the Joint Space Biology Flight Experiment Program.
 - 3.1 Preliminary results of the analyses of data from US and Soviet experiments flown on Cosmos 936 in August 1977 were discussed. The Working Group noted the successful completion of the scientific and technical objectives of the joint experiments flown on Cosmos 936.
 - 3.2 Supplemental reporting requirements for Cosmos 936 experiments are contained in Attachment 2. The Soviet side invited the US side to participate in a Cosmos 936 final results symposium to be held in Moscow in the second half of 1978. Additional details on the symposium and US participation in it will be agreed in correspondence between the Co-Chairmen by March 31, 1978.

- 3.3 The Soviet side informed the Working Group of its plans for scientific investigations to be performed on a biological satellite in 1980. The Soviet side invited the US side to participate in this flight. Both sides exchanged ideas about the types of experiments which could be performed on the 1980 biosatellite. The US side agreed to respond with proposals by May 15, 1978.
- 3.4 The Soviet side informed the US side of a biological satellite expected to be flown in 1981 and invited the US side to participate in this flight. Both sides exchanged ideas on the types of experiments which could be conducted and the US side agreed to respond to the Soviet invitation by December 31, 1977.
4. The US side informed the Soviet side about the general characteristics of the Shuttle/Spacelab system, including the Life Sciences module, Common Operations Research Equipment, Spacelab Payload Accommodations, and the possibility of conducting medical and biological experiments in this system. The US Co-Chairman invited the Soviet side to participate in these experiments and informed the Soviet side of the procedures to be followed in the future in order to submit proposals for consideration for flight.
5. The Working Group also gave special attention to ground-based work, in particular:
 - 5.1 The US side presented the research approach and anticipated investigations for understanding, predicting and preventing space motion sickness. The Soviet side presented a paper on the mechanisms of vestibular-vegetative disturbances which are observed during the initial phase of weightlessness and the means of counteracting these disturbances.
 - 5.2 The US side presented the results of the Spacelab Mission Demonstration Test (III) emphasizing the operations and mission management.
 - 5.3 The Working Group considered the problems of laboratory simulation of weightlessness (Hypokinesia) discussed at the associated Workshop in Bethesda, Maryland, November 16-18, 1977. The agenda of the Workshop is contained in Attachment 3.
 - 5.4 The Working Group noted the importance of conducting hypokinesia experiments and discussed the problems of standardization of research methods. It concluded that it is necessary to coordinate in the future such studies, methods, and procedures, and to exchange data and results obtained by both sides. Jointly prepared proposals to achieve these objectives are listed in Attachment 4.

- 5.5 The sides exchanged information on the forecasting of man's health in weightlessness. The sides agreed that it would be desirable to associate their respective specialists involved in forecasting man's health in weightlessness with the joint Hypokinesia studies proposed in Attachment 4.
6. The materials listed in Attachment 5 were exchanged prior to or at the meeting.
7. The Joint Working Group agreed to consider at its next meeting the following topics:
 - 7.1 Results of flight studies performed during the preceding year.
 - 7.2 Results of major ground-based studies performed during the preceding year.
 - 7.3 Joint flight experiment programs in Space Biology and Medicine.
 - 7.4 Forecasting of man's health state in Hypokinesia (Simulated Weightlessness).
 - 7.5 Results of vestibular research conducted during the preceding year.
8. The parties agreed to hold the ninth meeting of the Joint US-USSR Working Group in the USSR in the second half of 1978. The exact date and place of the meeting as well as the final agenda will be determined through correspondence between the Co-Chairmen. Available materials relating to the agenda items will be exchanged so that the other side will have them 30 days in advance of the next meeting.
9. The Joint Working Group suggests that the principals of the January 1971 Summary of Results approve these recommendations, in whole or in part, within 30 days from this date, after which those recommendations which have been approved shall enter into force.
10. The text of this protocol has been prepared in the English and Russian languages, both versions of which have equal status.

Co-Chairmen



Dr. David L. Winter



Dr. N. N. Gurovsky

Wallops Island, Virginia, USA
November 25, 1977

LIST OF PARTICIPANTS

Eighth Meeting of the US-USSR Working Group
on Space Biology and Medicine
Wallops Island, Virginia, USA
November 19-25, 1977
and
The Associated Workshop on Hypokinesia
Bethesda, Maryland, USA
November 16-18, 1977

US Members and Experts of the Working Group

- | | | |
|-----|-------------------|----------------------|
| 1. | D. L. Winter | NASA Headquarters |
| 2. | R. R. Hessberg | NASA Headquarters |
| 3. | R. M. Farrell | NASA Headquarters |
| 4. | A. E. Nicogossian | NASA Headquarters |
| 5. | S. Deutsch | NASA Headquarters |
| 6. | R. S. Johnston | Johnson Space Center |
| 7. | L. F. Dietlein | Johnson Space Center |
| 8. | J. A. Rummel | Johnson Space Center |
| 9. | J. L. Homick | Johnson Space Center |
| 10. | C. H. Leach | Johnson Space Center |
| 11. | P. C. Rambaut | Johnson Space Center |
| 12. | J. C. Sharp | Ames Research Center |
| 13. | H. Sandler | Ames Research Center |
| 14. | K. A. Souza | Ames Research Center |
| 15. | E. M. Holton | Ames Research Center |
| 16. | P. A. Thibideau | NASA Headquarters |
| 17. | L. F. Hanold | NASA Headquarters |
| 18. | R. Lavroff | Interpreter |

LIST OF PARTICIPANTS CONTINUED

USSR Members and Experts of the Working Group

1. N. N. Gurovsky Ministry of Health USSR
2. L. I. Kakurin Institute for Medico-Biological Problems
of the USSR Ministry of Health
3. N. M. Rudnyi Aviation and Space Medicine Service of
the USSR Air Force
4. A. V. Yeremin Y. A. Gagarin Center for Cosmonaut
Training
5. N. S. Novikov Academy of Sciences (USSR)
6. I. I. Bryanov Institute for Medico-Biological Problems
of the USSR Ministry of Health
7. V. V. Voronin USSR Ministry of Health
8. V. V. Verigo Institute for Medico-Biological Problems
of the USSR Ministry of Health
9. A. M. Genin Institute for Medico-Biological Problems
of the USSR Ministry of Health
10. E. A. Ilyin Institute for Medico-Biological Problems
of the USSR Ministry of Health
11. A. N. Liubimov USSR Ministry of Health
12. Y. V. Natochin I. M. Setchenov Institute of Evolutionary
Physiology and Biochemistry
13. V. S. Oganov Institute for Medico-Biological Problems
of the USSR Ministry of Health
14. Y. P. Simonov Government Institute for International
Relations of Moscow

Provisions For Data Exchange,
Final Report Preparation and Publication of Results of
Joint Experiments Flown on Cosmos 936

(Supplement to Attachment 3F of the Protocol of the Seventh Meeting of the
Joint US-USSR Working Group on Space Biology and Medicine, Yerevan, USSR
September 20-29, 1976)

1. The US side presented preliminary results on experiments K202, K203, K204, K205 (ectopic osteogenesis), K206, K207 and K208. The US side will transmit preliminary reports by January 15, 1978. The Soviet side transmitted its report, "Preliminary Results of Scientific Experiments on the Cosmos-936 Biosatellite," including material on experiments K202, K205 (ectopic osteogenesis), and K206. As previously agreed, both sides exchanged published periodical and newspaper articles on Cosmos 936.
2. In order to complete the analysis of K204 data, the Soviet side will provide the US side with approximately 20 kg of the Soviet rat diet and 2 kg of the sunflower seed oil used in the Soviet diet by January 31, 1978. The results of this additional analysis will be included in the final report.
3. The US final report on experiments K202, K203, K204, K205, K205 (ectopic osteogenesis), K206, K207, and K208 will be transmitted to the Soviet side by June 30, 1978. The Soviet side will transmit its final report on joint experiments K202, K205 (ectopic osteogenesis), and K206 to the US side by the same date.
4. The right to first scientific publication of the preliminary and final results obtained by US scientists in experiments K202, K204, K205, K207 and K208 belongs to the US side; the preliminary and final results may be published after the Soviet side receives the US preliminary and final reports, respectively. Subsequent scientific publication may be both unilateral and bilateral with the Soviet side. The first scientific publication of preliminary and final results of experiments K203, K205 (ectopic osteogenesis), and K206 will be prepared jointly by US and Soviet specialists.

US/USSR
BEDREST (HYPOKINESIA) WORKSHOP

Wed., Nov. 16

0900 - Welcome and Introductions

Dr. D. Winter

Dr. N. Gurovsky

SESSION I - Comparison of Horizontal and Headdown Bedrest Results

0930 - USSR - Comparative Model of Weightlessness

Genin

1045 - USSR - The C-V System under Artificial Hypokinesia

Kakurin

1145 - US - The Cardiovascular System Response to Bedrest

Sandler

1245 - Lunch

1400 - Discussion

SESSION II - Bone and Muscle Changes Observed During Bedrest

1430 - US - Bone and Muscle

Rambaut

1530 - USSR - Bone and Muscle

Oganov

1630 - Discussion

1730 - Recess

Thurs., Nov. 17

SESSION III - Fluid, Electrolyte and Endocrine Changes Observed During
Bedrest

0900 - US - Fluid and Electrolyte

Leach

0945 - US - Endocrine

Danellis

1045 - USSR - Water and Electrolyte Metabolism

Natochin

1145 - Discussion

1230 - Lunch

SESSION IV - Use and Value of Countermeasures

1345 - USSR - Methods of Prophylaxis

Kakurin

1445 - US - Cardiovascular Countermeasures

Johnson

1600 - US - Musculoskeletal Countermeasures

Schneider

1700 - Discussion

1800 - Recess

Fri., Nov. 18

SESSION V - The Usefulness of Animal Models in Simulated Weightlessness

0900 - USSR - The Value of Animal Models

Ilyin

1015 - US - Primates as Animal Models

Bourne

1115 - Discussion

1200 - Closing Remarks

1230 - Adjourn

PROPOSED PROGRAM PLAN FOR US/USSR STUDIES IN HYPOKINESIA
AND OTHER TECHNIQUES FOR THE SIMULATION OF WEIGHTLESSNESS

1.0 Introduction: As a result of previous studies of human responses to hypokinetic conditions it has become apparent that absolute bed rest can be utilized to evoke many of the physiological processes which result from exposure to the weightless environment.

2.0 Program Definition: A US/USSR program in hypokinesia should consist of the following elements:

2.1 Standardization of methodology

2.1.1 Prior to initiation of joint studies, documentation will be prepared that describes physical, chemical and biological methods to be utilized. All previous agreements on methodology and all improvements that have subsequently occurred will be consolidated.

2.2 Specific Study Projects

2.2.1 The program envisages a series of specific studies utilizing hypokinesia to develop information in the following areas:

- Cardiovascular and musculoskeletal responses
- Mechanisms underlying physiological changes
- Countermeasures
- Standardization of procedures
- Maintenance of crew health and facilitation of readaptation to terrestrial conditions

2.2.2 An initial study will assess the adequacy of the developed standardized procedures during simultaneous hypokinesia experiments conducted in the US and the USSR. It will consist of a one week period of hypokinesia preceded by a two week ambulatory period and followed by a two week ambulatory period.

3.0 Implementation

3.1 Types of Possible Cooperation:

- 3.1.1 Standardization of experimental conditions and methodologies
- 3.1.2 Joint development of experiment protocols

Attachment 4

- 3.1.3 Consolidation of experiments
 - 3.1.4 Exchange of investigators
 - 3.1.5 Identification and testing of promising countermeasures
 - 3.1.6 Interpretation and publication of results
- 3.2 Schedule for Initial Study:
- 3.2.1 First drafts of experiment proposals and standardization documents will be exchanged by May 1, 1978.
 - 3.2.2 Second draft of documents will be exchanged by July 1, 1978.
 - 3.2.3 Final agreement on proposals will be reached at the next Working Group Meeting.
 - 3.2.4 The study will be initiated in second half of 1978.
 - 3.2.5 Preliminary results will be exchanged 60 days following completion of test protocol.
 - 3.2.6 Agreement on the exchange of scientists to support cooperative studies will be reached at next Working Group Meeting.

LIST OF MATERIALS EXCHANGED AT OR PRIOR TO THE
EIGHTH MEETING OF THE US-USSR WORKING GROUP
ON SPACE BIOLOGY AND MEDICINE
Wallops Island, Virginia, USA
November 19-25, 1977

and

THE ASSOCIATED WORKSHOP ON HYPOKINESIA
Bethesda, Maryland, USA
November 16-18, 1977

Submitted by the Soviet side

1. Laboratory Modeling of the Effects of Weightlessness on the Human Organism. (Genin)
2. Some Characteristics of the Cardiovascular Function under Horizontal and Head Down Tilt Bed Rest Conditions. (Kakurin)
3. The Dynamics and Mechanisms of Changes in the Musculo-Skeletal Systems Under Bed Rest Conditions. (Oganov)
4. Water and Electrolyte Metabolism During Bed Rest of Different Duration. (Natochin)
5. Use and Effectiveness of Countermeasures During Experimental Modeling. (Kakurin)
6. The Study of Biological Effects of Extended Weightlessness Under Laboratory Experimental Modeling on Animals. (Ilyin)
7. Some Aspects of Vestibular Problems in Space Medicine. (Bryanov)
8. Biomedical Results from Two Visits to the Salyut 5 Orbital Station. (Yeremen)
9. Preliminary Results of Scientific Experiments Conducted on Board the Biosatellite "Kosmos 936." (Ilyin)

10. Prediction of Health Status in Space Flight. (Verigo)
11. Mathematical Modeling of Human Respiration. (Verigo)

Submitted by the US side

1. The Cardiovascular System Response to Bedrest. (Sandler)
2. Calcium and Nitrogen Balance in Crewmembers of One 84-Day Skylab IV Orbital Mission. (Rambaut)
3. Fluid and Electrolyte Changes Observed During Bedrest. (Leach)
4. Endocrine Changes Observed During Bedrest. (Danellis)
5. Fluid Volume Changes Induced by Spaceflight and Fluid Replacement as a Countermeasure. (Johnson)
6. Attempts to Prevent Bone Mineral Loss During Prolonged Bedrest. (Sandler)
7. Monkeys as Bedrest Models. (Bourne)
8. Space Motion Sickness: Current Research on Issues of Importance for Future Manned Space Flight. (Homick)
9. Postural Equilibrium Following Exposure to Weightlessness Spaceflight. (Homick)
10. Life Sciences Spacelab Mission Development Test III, R+30 Day Report.
11. Life Sciences Spacelab Mission Development Test III, Quick Look Summary.
12. The Apollo Soyuz Test Project Medical Report.
13. Cardiovascular Effects of Weightlessness. (Sandler)
14. A Baseline for Predicting the Human Physiological Response to Weightlessness. (Rummel)
15. Spacelab Payload Accommodation Handbook.