International Council of Scientific Unions

SPECIAL COMMITTEE
ON
SOLAR-TERRESTRIAL PHYSICS

76-6

President: Dr. Francis S. Johnson *Vice-President:* Dr. J. W. King *Secretary:* Dr. E. R. Dyer

INTERNATIONAL MAGNETOSPHERIC STUDY
J. G. Roederer, Chairman IMS Steering Committee
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IMS NEWSLETTER

CONTENTS

This issue of the monthly IMS Newsletter will reach many symposia attendants and others who are not active IMS participants. This is one reason we reprint (page 3) a short general article on IMS objectives and plans. These NLs give in abbreviated form much detailed planning information and what actually has happened so far as the start-up of the IMS continues with satellites of opportunity and the growing GBR program (ground-based, balloon, rocket, also aircraft and ship). This issue has been compiled in the absence of Mr. Allen, head of the TIMSCIE Office, by his less experienced colleagues. ---A.H.S. et al, May 27

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PROGRAM PLANS FOR JUNE 1976

Special IMS Periods

Jun 23 1400 UT to Jun 26 1700 UT — IMP-H, Vela 5B, Vela 6A - Neutral Sheet (see also p8)

GBR Campaigns: (numbers refer to program details in IMS Bulletin No. 2 or in references in these NLs)

--------Phenomena-related Campaigns--------

--- to Jun 10; A-22; Jefferies (formerly Peek); Kauai; Rocket - Ba injection and other exper, notes
--- to Jun 30; #0090; Horton; Woomera; Rockets (2) - 1, neutral atm species; 2, airglow, ozone, notes
Jun 1 to Jun 30; #0311; Ungstrup; Andoya; Balloons (4) - E-fields, X-rays, riometers, see note below
Jun 1 to Jun 30; #0263,0311; Olesen, Ungstrup; Sdr Stromfjord; Rockets (2) - Complex exper, see note

------Quasi-synoptic Observations involving Balloons, Rockets, Aircraft, Selected Surface Campaigns------

Jun 1 to Aug 15; A-20; Koons, et al; New Zealand area and N. conjugate; Surface- VLF exper, satel, note
Jun 1...30; #0458; Charakchyan; Mirny, Murmansk, Moscow, Alma Ata; Balloons - daily launch, cosmic rays
Jun 2, 9, 16, 23, 30; #0162; Y. Corcuff; Gen Belgrano, Halley Bay; Surface; weekly VLF obser see NL-5,p2
Jun 22 to Jun 24; #0004; Bauer; IISN; Surface - General thermospheric meas by incoher scat radar network

--------Observing Plans for Temporary Surface Stations--------

--- to Sep 30; #0115; R.W. Smith; Jordanstown; Surface - airglow interferom, intermittant operation
(we have not received full information on Surface campaigns)

Notes on Program Plans for June 1976

Addendum on Special IMS Period for June. The start and end times and the satellite conjunctions listed above are those given in the December Special Announcement by SCOSTEP (see NL 76-1 p4). Later computations by Vette in IMS Satellite Situation Center Report No. 6 (page14) give the start time as 1600UT rather than 1400UT on June 23. Still later computations on significant locations of satellites during this interval are given in the note on page 8 of this NL, including the newly launched SOLRAD 11 A & B.

#0311; Ungstrup, 4 balloons to launch from Andoya and drift N. of Iceland and across Greenland. Will carry exper to meas E-fields, X-rays and riometers. Telemetry to Andoya, Iceland and W. coast of Greenland.

#0263, 0311; Olesen and Ungstrup, 2 rocket exper to launch from Sdr Stromfjord to meas: E-field; ELF, VLF waves; ionospheric currents; particle precipitation; plasma density and temperature; daughter payload will meas part precip & plasma density. Launch criteria: (1) cleft (cusp) near and N. of Sdr Stromfjord, (2) Strong ionospheric currents above Sdr Stromfjord and Godhavn with backscatter echoes on 12 MHz & slant sporadic E traces indicating ionosphere with 2-stream instability of Farley and Buneman.

A-20; Koons, Morgan, Dowden (0167), Unwin (0313), Keys (0323) multi-national VLF program. VLF signals from portable transmitter to broadcast from New Zealand. Receivers to operate at Dunedin NZ, and in N conjugate region near Cold Bay, Al. Photometers and riometers at Lauder, NZ. VLF & particle data to be obtained from satel ISIS II and SSS when over transmitter & conjugate region.

PROGRAM PLANS FOR JULY 1976

SPECIAL IMS PERIODS

Jul 7 0700 UT to Jul 8 1900 UT — IMP-J,IMP-H - Neutral Sheet; IMP-J,VELA 5B,VELA 6A - Magnetopause (see also pg8)

Jul 9 2000 UT to Jul 10 0800 UT — IMP-H, HAWKEYE 1 - Magnetopause (see also page 8)

Jul 22 0600 UT to Jul 22 1800 UT — IMP-H, VELA 6A, VELA 5B - Magnetopause

Jul 31 2000 UT to Aug 3 0400 UT — IMP-J, VELA 5B, VELA 6A - Neutral Sheet

GBR Campaigns: (numbers refer to program details in IMS Bulletin No. 2 or in references in these NLs)

--------Phenomena-related Campaigns--------

Jul 1 to Jul 31; #0005; Bland; Fort Churchill; Balloon - cosmic rays and particles, cosmic ray telescope
Jul 1 to Jul 31; A-18; Woolliscroft; South Uist; Rocket - +ion mass spectrometer
Jul 1 to Jul 31; A-19; Williams; South Uist; Rocket - Lyman , e-density
Jul 1 to Jul 31; #0085; Dickinson; South Uist; Rocket - neutral oxygen & e-concentrations
Jul 1 to Dec 31; #0019; Jakimiec; USSR; Rocket - solar X-ray exper, cooperative with Interkosmos program

------Quasi-synoptic Observations involving Balloons, Rockets, Aircraft, Selected Surface Campaigns------

--- to Aug 15; A-20; Koons, et al; New Zealand area and N. conjugate; Surface- VLF exper, satel, note
Jul 1...31; #0458; Charakchyan; Mirny, Murmansk, Moscow, Alma Ata; Balloons - daily launch, cosmic rays
Jul 7, 14, 21, 28; #0162; Y. Corcuff; Gen Belgrano, Halley Bay; Surface; weekly VLF obser see May note
Jul 13 to Jul 15; #0004; Bauer; IISN; Surface - thermal tides in 100-130 km altitude region, see NL 76-3

--------Observing Plans for Temporary Surface Stations--------

--- to Sep 30; #0115; R.W. Smith; Jordanstown; Surface - airglow interferom, intermittant operation
(we have not received full information on Surface campaigns)

Notes on Program Plans for July 1976

Addendum on Special IMS periods for July. The start and end times and the satellite conjunctions listed above are those given in the December Special Announcement by SCOSTEP (see NL 76-1 p4). Later computations by Vette in IMS Satellite Situation Center Report No. 6 (pg 14) give the refined times as (changes underlined): July 7 0800 to Jul 8 2000; Jul 9 2100 to Jul 10 1000; Jul 22 0600 to Jul 22 2000; Jul 31 2300 to Aug 3 0400. For the July 7-8 and 9-10 periods, additional information is given on pg 8 of this NL on details of significant locations of satellites, including SOLRAD 11A & 11B.

PROGRAM PLANS FOR AUGUST 1976

ECIAL IMS PERIODS

- - - - - - -- to Aug 3 0400 UT IMP-J, VELA 5B, VELA 6A - Neutral Sheet

GBR Campaigns: (numbers refer to program details in IMS Bulletin No. 2 or in references in these NLs)

---------------------------------------Phenomena-related Campaigns---------------------------------------

Jul 1 to Dec 31; #0019; Jakimiec; USSR; Rocket - solar X-ray exper, cooperative with Interkosmos program

------Quasi-synoptic Observations involving Balloons, Rockets, Aircraft, Selected Surface Campaigns------

--- to Aug 15; A-20; Koons; et al; New Zealand area & N. conjugate; Surface- VLF exp, satel; NL-4 p3
Jul 7, 14, 21, 28, #0162; Y. Corcuff; Gen Belgrano, Halley Bay; Surface; weekly VLF obser, see NL-5 p2

------------------------------Observing Plans for Temporary Surface Stations------------------------------

--- to Sep 30; #0115; R.W. Smith; Jordanstown; Surface - airglow interferom, intermittant operation
(we have not received full information on Surface campaigns)

This review article is reprinted from the ESA Bulletin, February 1976. It was written by Dr. K. Knott, Space Science Dept. ESTEC, Noordwijk, Neterlands.

THE INTERNATIONAL MAGNETOSPHERIC STUDY

What Do We Know Already?

Long before the scientific exploration of space with the aid of satellites began, astronomy had established many facts about the solar system. It consists of the Sun, as an ordinary star, and nine revolving planets. The Earth, the third but nearest of these planets, revolves at a distance of $1.5x10^8$ km from the Sun. Our central star is generating power by nuclear fusion at a rate of $3.7x10^{26}$ W and, despite this immense production rate, still has an expected lifetime of 10^7 years. It emits most of its power in a radiative manner, but it also releases ionised gas which expands radially into the solar system.

It is at this point that measurements conducted from satellites have taken over and such parameters as flow speed, temperature, density and composition of the expanding solar plasma, or "solar wind", have been recorded directly. The planet Earth, with its dipolar magnetic field, represents a tiny obstacle in the stream of the solar wind. The planet's magnetic field acts as a screen, preventing the solar wind from coming nearer than 10 Earth radii (average) to the Earth's surface. The plasma stream is deflected, causing deformation of the dipolar cpmfiguration and creating the famous teardrop-shaped "bottle" which we call the magnetosphere. In as far as the approaching solar wind cannot a priori enter the magnetosphere, by the same token plasma cannot escape from within this cavity.

The Sun is not burning steadily at its surface, and strong variations occur in the intensity of the solar wind, leading in turn to variations in the magnetosphere's shape. Under "quiet" solar-wind conditions, the magnetosphere expands; when the solar wind bolws harder, it is compressed.

The magnetosphere contains three distinctly different types of particle population: the near-Earth environment is dominated by cool dense plasma of the ionospheric type; further out (but only to regions where the dipolar configuration of the magnetic field is roughly preserved), we find very energetic particles, trapped magnetically in the well-known Van Allen belts; further out still, and particularly within the tail of the magnetosphere, a large reservoir of medium to low-energy particles is stored. By and large, magnetospheric particles have a much higher energy than solar-wind particles.

The overall particle content of the magnetosphere is remarkably constant for long periods of time, although high and medium energy particles are lost continuously by precipitation into the high-latitude atmosphere.

Precipitation and the degree of general disturbance in the magneotsphere increase during substorms and become exceedingly high during geomagnetic storms. Substorms seem to be generated as a result of small discontinuities in the solar wind, while geomagnetic storms appear to be caused by strong solar eruptions which not only cause the solar wind to increase, but also release high-energy particles toward the Earth. Nevertheless, steady-state conditions are always quickly restored in the magnetosphere, in a matter of hours following a substorm and within a matter of days after a magnetic storm.

Many other small-scale phenomena, such as waves and plasma instabilities, have been discovered and studied, but in spite of several hundred satellite missions the relationship between the various observations has not been established and therefore the dynamics, in terms of cause and effect, of our immediate space environment are not yet wholly understood.

Shortcomings of Previous Observations

Before going on to describe what remains to be done and is in fact planned for the IMS, the limitations of a single-satellite experiment may be demonstrated with a simple example. Let us assume that a satellite's magnetometer shows a reduction in magnetic field strength at a certain moment in time, then at least two different conclusions are possible: (i) the magnetic field has undergone a temporal change or (ii) the spacecraft has moved from a region of higher to a region of lower magnetic field strength. Using a single-satellite experiment as a basis, the choice between (i) and (ii) can only be decided statistically. The discovery of the magnetopause, the boundary between magnetosphere and solar wind, has come about in this way and a great number of individual satellite crossings of the magnetopause were needed before its characteristics and approximate location could be established.

If we now want to go on to study the behaviour of the magnetopause, we need to know the speed of motion of that boundary when subjected to an increasing solar-wind strength. It should be clear immediately that this parameter, although of fundamental importance for the understanding of magnetospheric dynamics, cannot be derived from a single-satellite pass. Only two satellites orbiting together with a suitable distance between will be able to determine the magnetopause's motion. This simple example should serve to demonstrate that multisatellite missions will give us access to entirely new magnetospheric parameters. Many other more complicated examples can be cited: Each requires simultaneous observations at two or more points inside (mainly) or outside the magnetosphere.

It is intended during the IMS to make optimum use of all available tools, not only satellites but also rocket-borne or ground-based observational platforms in a single co-ordinated and concerted attack on the outstanding problems. Only a combined effort of this nature will help us to obtain answers to such questions as: How does the solar-wind plasma gain

(Continued on page 4)

entry to the magnetosphere? How is it accelerated to the energies observed in the Van Allen belts? What are the necessary conditions for a quiet magnetosphere and under what circumstances do instabilities develop?

Measurements During and Planning for the IMS

The International Magnetospheric Study is built around two major satellite missions, GEOS and ISEE. GEOS, a purely ESA mission, will be the world's first scientific geostationary satellite and has been adopted as the reference spacecraft for the IMS. The ISEE mission is a combined NASA/ESA venture comprising three satellites: ISEE-A and B will be launched by one vehicle and will acquire identical orbits (perigee 400 km; apogee 20 Re), with a variable spacing between the A and B craft; ISEE-C will be positioned far outside the magnetosphere, 235 Earth radii upstream in the solar wind, at a point where the gravitational forces of Sun and Earth cancel one another. Further satellites, such as the HELIOS solar flyby mission, EXOS, a Japanese magnetospheric satellite, and a Russian near-Earth satellite, will complement the in situ measuring network. All of these satellites will be equipped with sophisticated instrumentation for the measurement of particles, fields and waves.

It is planned to complement the satellite programme with extensive rocket and balloon launching programmes. Such launches will be carried out primarily at higher latitudes, within the auroral zones where the particle precipitation from the magnetosphere takes place. Rocket-borne particle detectors will measure this precipitation just before it strikes the Earth's atmosphere. Balloon payloads will mainly measure X-rays generated by the interaction of the energetic particles with the atmosphere.

Last, but by no means least, there will be the contribution of geophysical observations from the ground. These will consist, for example, of magnetometer recordings and auroral recordings by scanning photometers tuned to different characteristic emmission frequencies. Magnetospheric disturbances are reflected by strong currents in the lower ionosphere and these in turn cause a magnetic field which can be recorded on the ground. Scanning photometers will reconstitute the patterns of auroral displays, and both magnetometers and photometers will be used in extended networks to derive the morphology of precipitation patterns.

In summarising the tools available to us for the IMS we note that plasma disturbances transmitted from the Sun can be detected by interplanetary probes such as HELIOS and ISEE-C. The interaction of such disturbances with the magnetosphere will be studied by the ISEE-A and B satellite pair. In its equatorial orbit, at a distance of 6.6 Earth radii, GEOS will study a region of the magnetosphere which is of particular interest because it is linked by magnetic field lines to both the northern and southern auroral zones. The ultimate effect of solar-originated disturbances on our atmosphere will be recorded by rocket- and balloon-borne instrumentation and will be monitored continuously from the ground.

To make the IMS a success and to repay the effort that is being invested, planning and co-ordination on a worldwide scale is mandatory. Spacecraft orbits and payloads must be carefully matched and the most suitable operating modes for complementary experiments must be worked out in order to seek the expected phenomena at the correct time and at the correct location. Satellite and ground-based experimenters must be fully aware of the possibilities and limitations of their respective measuring capabilities. Nor can the data handling and distribution aspects be neglected. A satellite like GEOS generates data at a rate of 100 000 bps, which is equivalent to an output of one full computer tape every 30 minutes. Needless to say, such a wealth of data can only be analysed efficiently if high-quality summaries are produced from which periods of geophysical significance can be identified for further study.

IMS Objectives and Expected Scientific Return

In summarising the objectives and possible benefits of an extensive undertaking like the IMS, it must be postulated that the exploration and understanding of the near-Earth part of the Universe is a fully justified venture in itself. Wider knowledge of regions outside the solar system will only be achieved by combining collective information from these regions, such as their radiation at various wavelengths, with detailed information on fundamental processes observed in situ in the solar system. Another stimulus stems from the possibility of using the magnetosphere as a "laboratory" for studying fundamental plasma physics, an approach that may promote discoveries related to high-density plasma physics and controlled nuclear fusion. Study of instabilities and wave-particle interactions would seem to be of major importance in this context.

It has been discovered that magnetospheric processes have direct influence on our immediate environment. Short-wave radio communication and electrical power distribution networks can be seriously affected by strong geomagnetic storms. The amount of energy injected into our atmosphere by precipitating magnetospheric particles is such that they may play a role in establishing its heat balance and hence may well influence its dynamics. Striking relationships between solar processes and climatic conditions such as temperature and rainfall, and thence food production, famines and even economic wealth, still await an explanation, an explanation that could well prove to be of untold benefit to all the inhabitants of our "magnetically bottled" planet Earth.

National IMS Documents

We have recently received three detailed reports on IMS plans and activities of individual countries.

Japanese IMS News No. 2 (in Japanese), has program updates and news for Japanese IMS participants (presumably.....the Japanese visiting scientist at WDC-A is not available for translation as we compile this NL). The sections and authors are International (T. Obayashi), Plasmasphere (S. Kato), Auroral Flare (T. Oguti), Geocorona (H. Kamiyama), Heliosphere (K. Nagashima), Solar Activity (H. Tanaka), Analysis (H. Maeda), Hateruma Is. Expedition (H. Kamiyama), ULF VLF Expedition at Canada (T. Oguti), Sounding Rockets (ISAS, U of Tokyo), Ionospheric Sounding Satellite ISS.

The United Kingdom Programme for the IMS, 1976-79 is a 34-page booklet issued by the Royal Society, 6 Carlton House Terrace, London, SW1Y 5AG. Compiled by J.W. King and P.A. Smith for the British National Committee for STP, it includes very complete details of the United Kingdom Programme with sub categories for each of the following: a)Interplanetary and magnetospheric studies, b) Energetic particles in the magnetosphere and ionosphere, c) wave-particle interactions, d) Ground-based experiments in geomagnetism, e) VLF experiments, f) Airglow experiments, g) Ionospheric soundings, h) Riometer studies and i) other research programmes. In addition the booklet contains the United Kingdom rocket programme summary for 1976-77; chronological lists of the United Kingdom studies planned for the IMS; geographical coordinates of observing sites and an alphabetical list of experimenters' names and addresses.

The Swedish Sounding Rocket Programme 1976-1980 is decribed in a February 1976 document compiled by Per Zetterquist of the Swedish Space Corporation. One-page project summaries are given in standard format. There are 5 approved projects (about 11 payloads, 4 already launched), 3 projects in the study phase and 7 in the preliminary planning stage. The participating groups are the Kiruna Geophysical Institute, the Department of Plasma Physics of the Royal Institute of Technology, the Department of Meteorology of the University of Stockholm and the Uppsala Ionosphere Observatory.

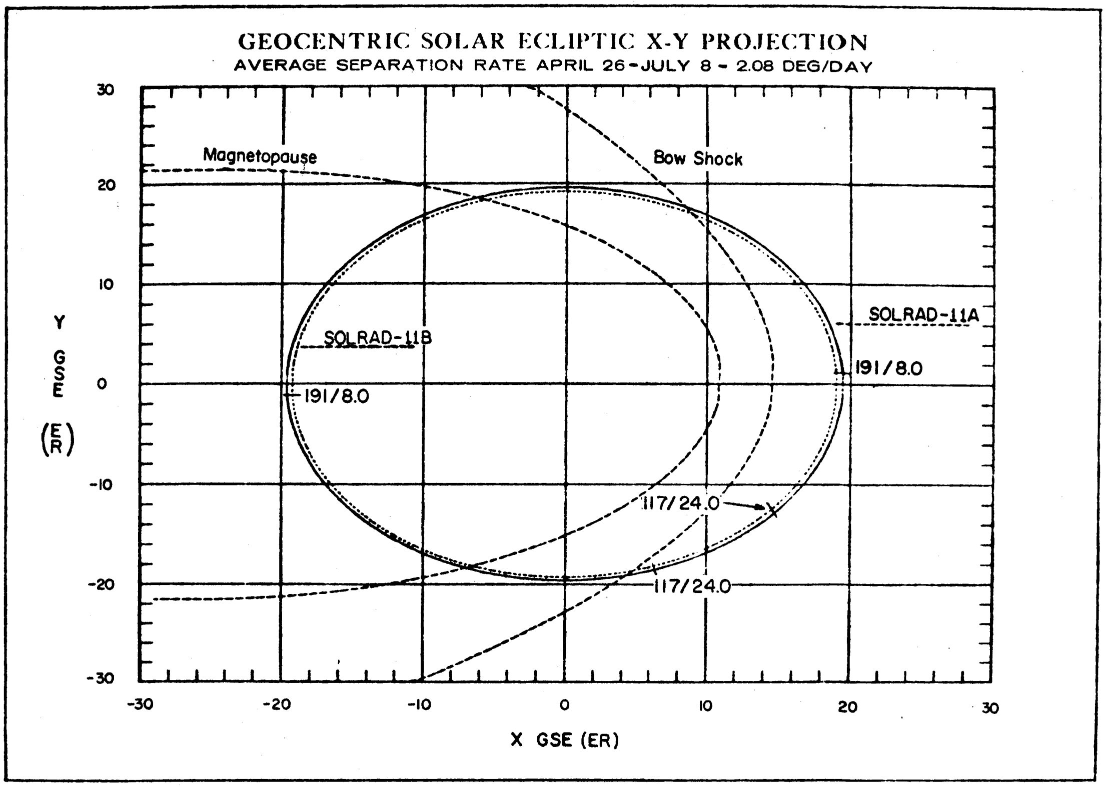
ORBITAL INFORMATION FOR SOLRAD 11 A & B During Transiton Phase

from IMS Satellite Situation Center (SSC))

Following the successful separation maneuver of SOLRAD-11 A & B in mid-April, in which 11 A was raised to a higher altitude, tracking data for the next two weeks provided orbital elements of sufficient accuracy to permit the SSC to issue the following information. It appears the satellite will reach their planned separation of 180 degrees around July 8, 1976 and are drifting apart at an average rate of 2.08 degrees per day. Since 11 B must be raised in altitude and possibly both orbits fine tuned to preserve this separtion the elements of both satellites will change in early July. Consequently, predicted positions of these spacecraft are only given up to July 8.

The projection of the orbits into the ecliptic plane by means of a rotation of the radius vector about the x-axis are given in the figure below. Since these spacecraft are inclined to the ecliptic by about 6 degrees, this projection does not distort the view in the orbital plane except to flatten the arc around x=0 as can be seen by the projected shape of the magnetopause and bow shock. The position of the spacecraft on day 117 (April 26) at 2400UT and on day 191 (July 9) at 0800 UT are shown. The sidereal period of 11 A is 5 days 4 hours and of 11 B is 5 days 0.4 hours. The region of near Earth space defined as inside the magnetosphere lying within 2 Re of the neutral sheet is termed the Neutral Sheet Region by the SSC. The table gives all of the entry and exit times of SOLRAD-11 A & B through day 192 (July 10).

Additional information on the SOLRAD orbits are available on inquiry to the SSC.



Neutral Sheet Region Passes for SOLRAD -11 A & 11 B -- 1976 April 30(day 121) to July 7(day 189)

SOLRAD -11 A

Entry Time (day/hr)	Exit time (day/hr)	Duration (hr)
121/7.2	121/12.8	5.6
126/7.6	126/13.6	6.0
131/7.6	131/15.6	8.0
136/7.4	137/7.0	23.6
141/9.9	142/8.2	22.3
146/14.6	147/8.6	18.0
151/17.9	151/20.2	2.3
152/2.4	152/8.5	6.1
157/3.0	157/8.0	5.0
162/3.1	162/7.5	4.4
167/6.0	167/6.9	0.9
177/21.0	178/3.6	6.6
182/20.6	182/3.6	7.0
184/6.0	184/10.0	4.0
187/22.0	188/3.3	5.3
189/5.7	189/13.0	7.3

SOLRAD -11 B

Entry Time (day/hr)	Exit Time (day/hr)	Duration (hr)
120/9.5	121/8.7	23.2
125/8.8	126/8.3	23.5
130/8.2	131/7.9	23.7
135/7.9	136/7.5	23.6
140/8.0	140/12.8	4.8
140/14.2	141/7.1	16.9
145/8.9	145/10.8	1.9
145/16.2	146/6.6	14.4
150/17.4	151/6.1	12.7
155/18.4	156/5.5	11.1
160/19.5	161/4.7	9.2
165/20.6	166/3.9	7.3
170/22.0	171/2.6	4.6

SPECIAL IMS MEETING, Moscow, USSR, 10-16 March 1976

The resolutions, recommendations, and statements given below were adopted by the special meeting on the IMS in Moscow, 10-16 March 1976, in which the Soviet IMS Commission, representatives of research institutions from the entire Soviet Union and several members of the IMS Steering Committee participated.

Resolution of Thanks

The foreign participants in the Special Meeting on the IMS in Moscow, 10-16 March 1976 record their deep gratitude to their Soviet hosts for their warm hospitality, the excellent arrangements provided for the meeting, and their spirit of cooperation, all of which made the meeting a most fruitfull one.

Request for Advice from National IMS Committees, Coorinators, etc.

The IMS Steering Committee went on record at its meeting in Grossenzersdorf (June 1975) and Grenoble (September 1975) as expecting the help of national committees, correspondents and coordinators for Solar-Terrestrial Physics or for the IMS project in the work that the committee is implementing.

The IMS Steering Committee would especially welcome suggestions from the Soviet IMS community on the form, contents, and other aspects of the IMS Newsletter, which now supplies the current information needed to secure the coordination of studies according to IMS program.

Taking into account that Soviet scientists have found the IMS Newsletter very useful, the IMS Steering Committee invites the Soviet IMS Community to use this publication as a vehicle for informing the world IMS Community of new projects and changes in already planned projects.

The IMS Steering Committee has solicited suggestions about how to improve the kind of detailed coordination required during the implementation of the IMS, and has encouraged national STP and IMS offices to work directly with the Steering Committee and with each other to solve practical problems as they arise. The IMS Steering Committee hopes that national representatives, in particlar those from the Soviet Union will bring concrete proposals on these questions, to the General Meeting of SCOSTEP in Boulder, Colorado, USA, on 2-5 June 1976.

Coordination between Siberia and Canada

Participants in the Special Meeting on the IMS in Moscow recommend to SibIZMIR (Irkutsk) and to the Institute of Cosmophysical Research and Aeronomy (Yakutsk) and to organizations conducting similar observational programs in Canada to schedule the carrying out of observations along the profiles using chains of stations during one and the same intervals of time.

Proposed Operations Coordination Center

The IMS Steering Committee takes into account that the Soviet IMS Commission, noting the considerable value of the IMS Newsletter produced by the Temporary IMS Central Information Exchange (TIMSCIE) Office and expressing the need for an integrated coordination effort with international participation for the whole IMS period, acknowledges in principal the importance of the long-term tasks to be dealt with by the proposed Operations Coordination Center (OCC) at Vienna, and agreed to investigate the possible forms of Soviet participation in the OCC. Consequently, it is recommended that the IMS Steering Committee renew its study of the detailed functions that this OCC should provide, and of the staffing, logistics, and financial support needed to bring this activity into existence in the very near future.

Booklet on IMS Services

During the discussions at the Special Meeting on the IMS in Moscow it became apparent that it would be necessary to prepare and distribute to national IMS contacts a booklet describing in concise and simple terms the services offered by the IMS organizaions such as the Satellite Situation Center (SSC), TIMSCIE, SELDADS, and WDC-A and -B, their principal functions and interrelations, and the appropriate means of requesting their services. A brief decription of the IMS program should introduce this information. In regard to the availability of data from the Soviet Union at the WDC-B's, the Soviet participants informed the meeting that ground-based data would be handled as usual through WDC-B, and that satellite data would be handled by WDC-B2 or other organizations to be designated in the future.

Procedures for Obtaining Information on the IMS Investigations in the USSR

The IMS Steering Committee is asked to inform the world IMS community that requests for information about, or data from, individual Soviet programs will be most expeditiously handled if these requests are sent to the Soviet IMS Commission. This does not exclude the possibility of direct contacts between individual scientists or institutions. When such direct contacts are made, it is recommended that copies of the correspondence be sent to the address of the Soviet IMS Commission so that they can help if necessary.

Antarctic Campaign in April-June 1978

Noting that, if the ISEE-A/B spacecraft (Mother-Daughter) are launched in October 1977, they will intersect the neutral sheet in the magnetosphere tail many times during the interval April-June 1978, it should be recommended in this connection that the IMS Steering Committee communicate with SCAR and with Presidents of National Academies of Sciences, National Research Councils, and other appropriate organizations with the objectives of intensifying IMS-related observational programs in the Antarctic during this time interval.

Visit to SELDADS Center in Boulder, June 1976

Dr. D.J. Williams, Director of the Space Environment Laboratory, NOAA, Boulder, Colorado, USA, has extended an invitation for a meeting to be held at the Laboratory's center for the Data Acquisition and Display System (SELDADS) to demonstrate the operation of the system. This meeting will be scheduled during the International STP Symposium in Boulder, 6-18 June 1976. The Soviet delegates attending the Symposium are especially welcomed to avail themselves of this opportunity to see SELDADS in operation. (Secretary's note: all other IMS participants are also welcome, of course).

Spacecraft Orbital Elements

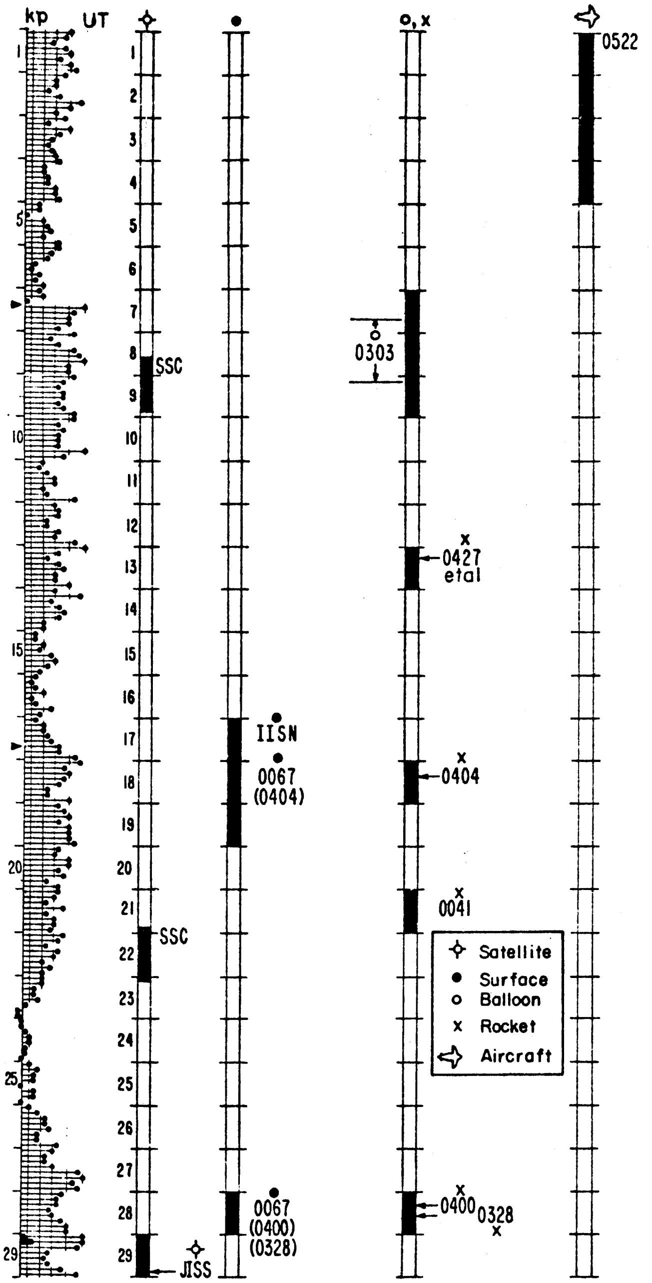
The IMS Steering Committee notes that the Soviet IMS Commission will take appropriate steps to provide orbital elements for IMS spacecraft, such as Prognoz-4 and Interkosmos-14. The Satellite Situation Center has agreed to calculate the positons of these satellites and to publish them in graphical form as it has done for other spacecraft. The IMS Steering Committee will take these predictions into account to define or redefine Special IMS Spacecraft Periods.

Information about Soviet and Interkosmos Spacecraft

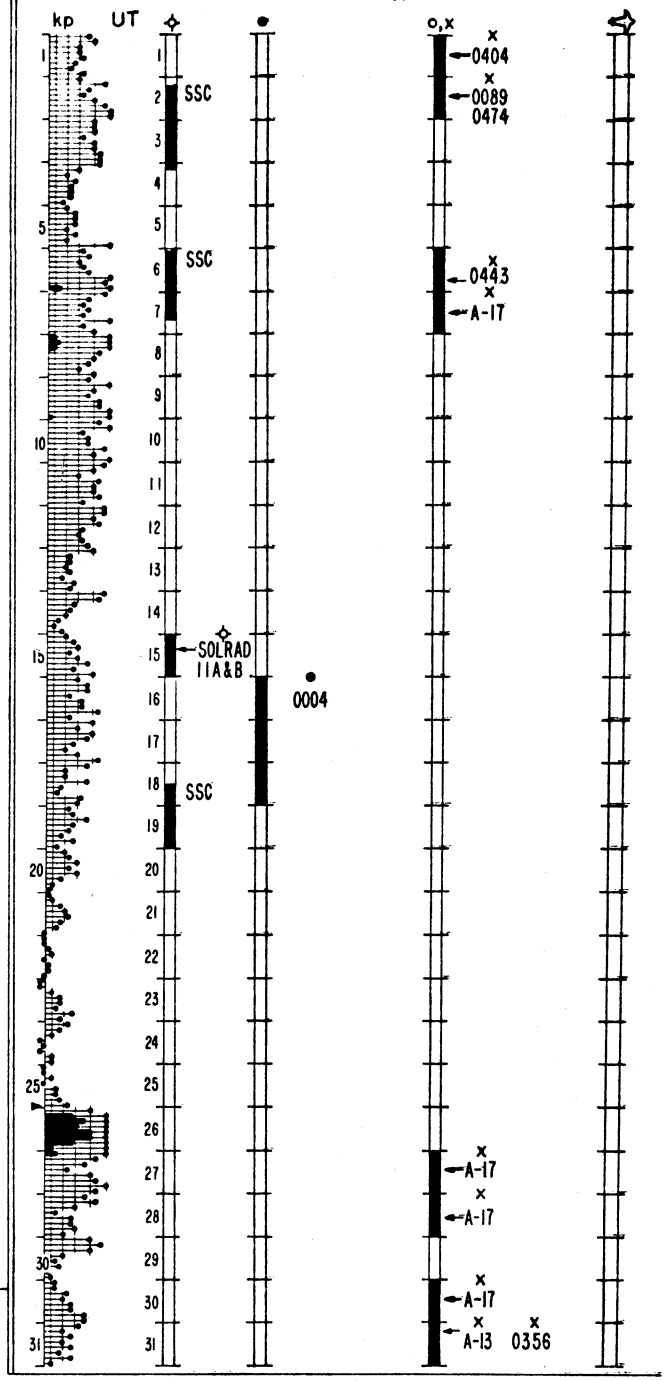
The Soviet participants have provided detailed information on the experiments on IMS satellites Prognoz-4, launched on 27 December 1975, Interkosmos-14, launched on 11 December 1975, and MAGIK and IK-Ionosonde, to be launched in the future. (This information is contained in IMS Newsletter #4 and #5.)

Next Formal Meeting of IMS Steering Committee will take place in Boulder, June 2-5 during the General Meeting of SCOSTEP. Also meeting will be the other main SCOSTEP projects - Middle Atmosphere Program (MAP), Solar and Interplanetary Programs (SIP) and Monitoring the Sun-Earth Environment (MONSEE); many subprograms of these are related to IMS.

FEBRUARY 1976 CAMPAIGN ACTUALITIES
(Preliminary)



MARCH 1976 CAMPAIGN ACTUALITIES
(Preliminary)



NOTES ON ACTUALITIES

Confirmed IMS campaign actualities for Feb-Mar 1976 shown above are listed here. Experimenters please relay actualities details to TIMSCIE Office for future Newsletters. We are especially interested in April and May campaign results for those programs shown on the Simon-style GBR campaign Calendar on page 9.

A-1; Offermann, combined rocket and balloon program at Arenosillo in southern Spain. During Jan/Feb a total of 49 rockets and 20 balloons launched carrying 23 experiments to measure electron dens and temp, ion dens, composition and mobility, neutral atmosphere dens, composition, temp, and selected trace constituents. Altitudes covered were 60-140 km. Supporting wind and temperature measurements in troposphere and stratosphere were made by met rockets and balloons. Objective was to study D-region winter anomaly and its dependence on atmospheric dynamics and neutral and ion chemistry. Coordinated measurements of mesosphere and lower thermosphere winds and temperatures, and D-region radiowave absorption were made by 12 ground based stations in W. Europe. For details contact D. Offermann, Univ Bonn, Nussallee 12, 53 Bonn 1, FRG; Telex 8 869 693.

#0004; Bauer, incoherent scatter radar at St Santin was operating to support Offermann project (A-1) as well as participating in IISN interval observations. A-1 support times: Jan 5 0730-1730 UT, Jan 6 0730-1730 UT and Jan 23 0630-1730 UT. Data quality best for last period. IISN observations Jan 20 0300 to 22 1900 UT and also Feb 17 0300 to Feb 19 1900 UT. Good quality data.

#0041; Thrane, successful launch from Esrange on February 21, study of lower ionosphere during aurora with 5 experiments.

#0400; Berning (now Fitz), Blank, Ulwick, Stair at

(continued on page 8)

(continued from page 7)

Poker Flat launched EXCEDE/SWIR 0546 UT Feb 28. Chatanika supported with observations.

#0328; Christensen, FERRET launched at Poker Flat 1212 UT Feb 28, carried instruments to measure EUV, ion mass spectrometer, ion and e-probes, photometers and magnetometer. Chatanika support.

JISS; Ogata (same address as #0185) project manager for Japanese IMS satellite launched 2130 UT, 29 Feb. To observe ionosphere, radio noise, ion/e-density/temperature and ion composition. Telemetry lost about April 4.

#0427, et al; Kamada, et al, rocket S-310JA1 launch at 0945 LT Feb 13 from Syowa to 216 km altitude observed plasma waves, e-dens and e-energy spect

#0404; Cloutier, 2 launches at Poker Flat: 0705 UT Feb 18 and 1045 UT Mar 1; E&B-fields, particles. Supported by Chatanika incoherent scatter radar.

#0443; Hultqvist, launches from Esrange at 1858UT Jan 22 and 2100UT March 6. E-field, particles, e-and ion density in mother/daughter payload. All seemed to work well except E-field daughter for Jan launch.

#0089, 0474; Holmgren, Rees, launch at Esrange on 2 Mar at 2349 UT. TNT-Cesium and Tri-methyl-aluminium release. Injection-Trigger project: E-fields and neutral winds at 100-160 km.

#0096; Kreplin, launch of SOLRAD 11 A and B at 0238 UT on 15 March. See SSC Report on Active and Planned Spacecraft and Experiments, and detailed information in IMS Bulletin No 2 (0096). See also detailed notes on page 5 of this newsletter.

#0004; IISN Program, Bauer reports that from March 16 0300 UT to March 18 1900 UT gravity wave observations at medium scale were performed with good results at Nancay, Mende and Monpazier.

A-17; Heppner launched 4 Nike Tomahawks each carried 4 cannisters of Barium for sequential release to monitor E-fields & neutral winds between 220-310 km and a trail generator for lower altitude neuwinds from 180-80 km. Poker Flat launches were: 7 March 0643 UT; 27 March 1250 UT; 28 March 1300 UT; and 30 March 1230 UT, all payloads worked.

A-13; Heikkila, Ft. Churchill, successful launch at 0639UT March 31 into a series of multiple quiescent arcs. Carried multinational complex of 12 experiments by 8 experimenters from 4 institutions. See NL-3, p2, for further details. Also coordinated ground-based TV aurora obs. by T. Berkey, U. Calgary, during exp. and 2 weeks prior. See also #0356 below. Only partially usable data on suprathermal ion composition, swept frequency admittance probe and low energy electron spectrometer. Other exp. seem good. Auroral event may prove to have been rather complicated for analysis.

#0356; Sheldon, Ft. Churchill, successful launch at 0638UT March 31 in conjunction with A-13 above, x-ray bremmstrahlung and E-fields.

A-12; Crochet, coherent ground-based radar at Addis Ababa; observations 1000-1900UT on April 14,15,16,17,19,21,22,23,24,25,26,29,30, May 1,2.

Schloss Elmau Planning Meeting

The special IMS planning meeting at Schloss Elmau, sponsored by ESA, on 3-7 May was devoted to the planning of rocket and ballon experiments in auroral zone. Two multinational projects of a few rockets were established devoted respectively to study of D region aeronomy and magnetospheric/ionospheric regions: Launching planned for August 1978 and winter 1978-79; leaders D. Bryant, B. Hultqvist, B. Landmark. A resolution was adopted urging the relevant authorities on making available to GBR experimenters in real or near real time the solar wind and magnetic data from ISEE-C. P. Simon reported on the activity of the IMS European Information Exchange and suggested definite formats for experiments and project announcements.

Scandinavian (SAR) Planning and Coordination Meeting

We have received word of a March 15-17 meeting of SAR (Skandinarisk Arbetsgrupp for Rymdforskning (Space Science)) at Stockholm attended by 51 scientists from 4 Scandinavian countries and 13 from elsewhere. There were full reports and discussions in working groups on Rocket, Balloon, Ground and D-Region programs plans for the IMS period.

Notice of Continued Operation of AE Satellites

Dr. Spencer advises both AE-C (Explorer 51) and AE-E (Explorer 55) are still being operated several times each day. The AE-C orbit is inclined 68 degrees while the AE-E orbit is inclined 19.5 degrees. AE-C is in a nearly circular orbit, and, in general, is obtaining data while over the north polar cap. AE-E, whose perigee is about 150 km, is being operated about 30 minutes around perigee, 4-5 orbits per day. The operational schedule varies and can be modified for special experiments upon request to the investigators. The instrument complement corresponds quite well to the descriptions published in the April 1973 issue of Radio Science and in SSC's 1975 Report on Active and Planned Spacecraft and Experiments, pp 7-17.

Although data transfer to the data center is beginning, it is suggested that inquiries in regard to the availability of data be directed to the individual investigators or the Project Scientist, N.W. Spencer, Goddard Space Flight Center, who will see that requests for data or information receive a prompt response. AE-D (Explorer 54) ceased operation in mid-February 1976.

Satellite Postions for June & July Special Periods

Dr Vette of the SSC has provided up-to-date information on the times when high altitude satellites of opportunity are passing the magnetopause and bow shock. These include data for SOLRAD 11 A and 11 B which could not be included in SSC Report No. 6 and also data based on the latest orbital elements for all satellites. The data are for the Special IMS Periods June 23-26, July 9-10 and July 7-9 and replace the corresponding information in SSC Report No. 6.

Magnetopause			Bow Shock		
June	UT	Satellite	June	UT	Satellite
23	24.0	IMP-J	24	2.0	IMP-H
24	9.0	Vela 5B	24	18.0	SOLRAD 11A
25	5.1	IMP-H	25	17.7	SOLRAD 11B
25	6.1	SOLRAD 11B	26	8.0	Vela 5B
25	9.3	SOLRAD 11A	26	17.1	IMP-J
25	13.5	Hawkeye 1			
25	13.5	IMP-J			
July			July		
7	15.0	IMP-H	7	16.0	SOLRAD 11B
7	17.5	SOLRAD 11A	7	20.0	Vela 5B
8	7.5	SOLRAD 11B	8	5.0	SOLRAD 11A
8	9.0	Hawkeye 1			
8	10.5	Vela 5B			
8	12.0	IMP-J			
10	7.5	SOLRAD 11B	10	6.0	SOLRAD 11A

Notes from the U. S. Coordinator for IMS

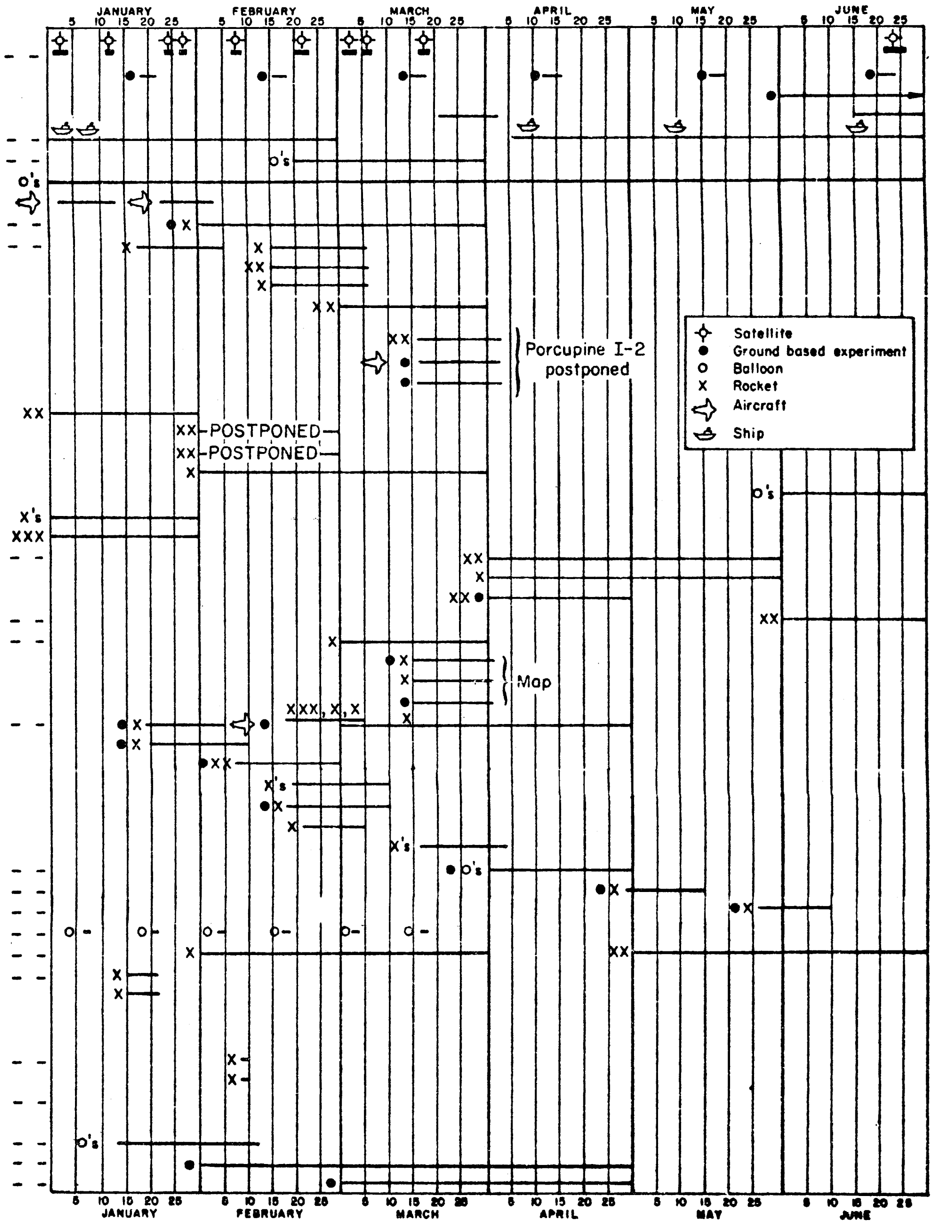
Drs. Manka and Vette report that due to a fine cooperative effort on the part of the University of Iowa experimenters (Drs. van Allen, Frank, and Gurnett), NASA, and the U.S. Office of Naval Research it appears that Hawkeye I data will be available for the IMS Special Intervals for the remainder of 1976. The U.S. Coordination Office would still appreciate hearing about research programs that make measurements coordinated with Hawkeye, or use Hawkeye data.

There will be a meeting June 17 in Boulder during the STP symposium to discuss the status of the Canada-U.S. IMS Magnetometer Network. There will also be a demonstration of the NOAA/SEL real-time data system.

Development of the U.S.-Canada IMS Magnetometer Network is proceeding. The hardware components are being procured and will be available later this summer. The data processing system is being developed for the NOAA Boulder Space Environment Laboratory and the World Data Center A. Further information can be obtained from Dr. R. H. Manka, the U.S. Coordinator, Dr. D.S. Peacock of NSF or Dr. M. Sugiura of NASA.

IMS CALENDAR OF GBR CAMPAIGNS   JANUARY - JUNE 1976
(AS OF 26 APRIL 1976)

WORLD-WIDE Special IMS Periods (SSC, Vette)
IISN (Bauer, et al.)
IPPDYP (Carpenter, et al.)
ASHAY (Radicella, et al.)
SURFACE A-9, A-10 (Westhuysen)
MULTIPLE SITES #0479 (Sokolov) Apatity, Tixi, Zhigansk
#0458 (Charakchyan) Mirny, Murmansk, Moscow, Alma Ata
#0522 (Truttse) Moscow, 50-70 deg N.
HEISS ISLAND #0159 (Chanin, Tulinov)
KIRUNA (ESRANGE) #0443 (Hultqvist)
#0041 (Thrane)
#0089, 0474 (Holmgren, Rees)
#0474 (Rees)
#0183,0037,0305,0308,0028,0251 PORCUPINE (Haerendel, Storey, Studemann, Theile, Riedler, Mozer) Coord with #0164 (Davis); #0312,0243 (Untiedt,Maurer); #0066 (Siebert); #0228 (Lange-Hesse)
ANDOYA (ANDENES) A-2 (Multi-national, CCOG)
#0152 (Bryant)
#0450 (Johnstone)
#0028 (Riedler)
#0311 (Ungstrup)
ARENOSILLO A-1 (Otterman)
#0474 (Rees)
SOUTH UIST A-18 (Woolliscroft)
A-19 (Williams)
#0149, 0208 (Bullough, Rycroft)
SONDRE STROMFJORD #0263, 0311 (Olesen, Ungstrup)
FORT CHURCHILL #0100 (McEwen)
A-13 (Heikkila)
#0356 (Sheldon)
A-16 (Berkey)
POKER FLAT #0400 (Fitz, formerly Berning)
A-8 (Winckler)
#0404 (Cloutier)
A-21 (Kennedy)
#0164 (Davis)
#0328 (Christensen)
A-17 (Heppner)
FORT WAINWRIGHT #0104 (Niles)
WHITE SANDS #0070 (Davis, formerly Vaiana)
KAUAI A-22 (Jefferies, formerly Peek)
ASPENDALE #0342 (Kulkarni)
WOOMERA #0090 (Horton)
KAGOSHIMA #0193, 0429, 0258 (Hirao, Tonmatsu, Obayashi)
#0193,0250,0416,0435,0417,A-3,A-4,A-5,A-6 (Hirao, Obayashi, Miyatake, Kaneda, Kato, Kawashima, Itoh, Nakamura, Ozio)
SYOWA #0427,0217,A-4,A-11 (Kamada, Oya, Itho, Miyazaki)
A-11, 0218, 0429 (Miyazaki, Kodama, Tonmatsu)
CONJUGATE POINTS EXPERIMENT
(Perrault) Iceland-(Hirasawa) Syowa-Training Cancelled
SANAE #0303 (Stoker)
ADDIS ABABA A-12 (Crochet)
DJIBOUTI A-12 (Crochet)



IMS CALENDAR OF GBR CAMPAIGNS JULY - DECEMBER 1976
(AS OF 26 APRIL 1976)

WORLD-WIDE
- Special IMS Periods (SSC, Vette)
- IISN (Bauer, et al)
- IPPDYP (Carpenter, et al)
- ASHAY (Radicella, et al)

MULTIPLE SITES
- #0458 (Charakchyan) Mirny, Murmansk, Moscow, Alma Ata
- #0162 (Corcuff et al)
- #0522 (Truttse) Moscow, 50-79 deg N.
- A-20 (Koons et al)

USSR #0019 (Jakimiec)

PRETORIA #0474 (Bertnellier)

SODANKYLA #0069 (Ranskanen) — POSTPONED

KIRUNA (ESRANGE)
- #0443 (Hultqvist)
- #0172 (Faltnammer)

ANDOYA (ANDENES)
- A-19 (Williams)
- #0152 (Bryant)
- #0145 (Wrenn)
- #0450 (Johnstone)
- #0474 (Rees)
- #0114 (Rothwell)
- A-23 (Martelli)
- #0449 (Thomas)
- #0308 (Theile)

SOUTH UIST
- A-18 (Woolliscroft)
- A-19 (Williams)
- #0085 (Dickinson)

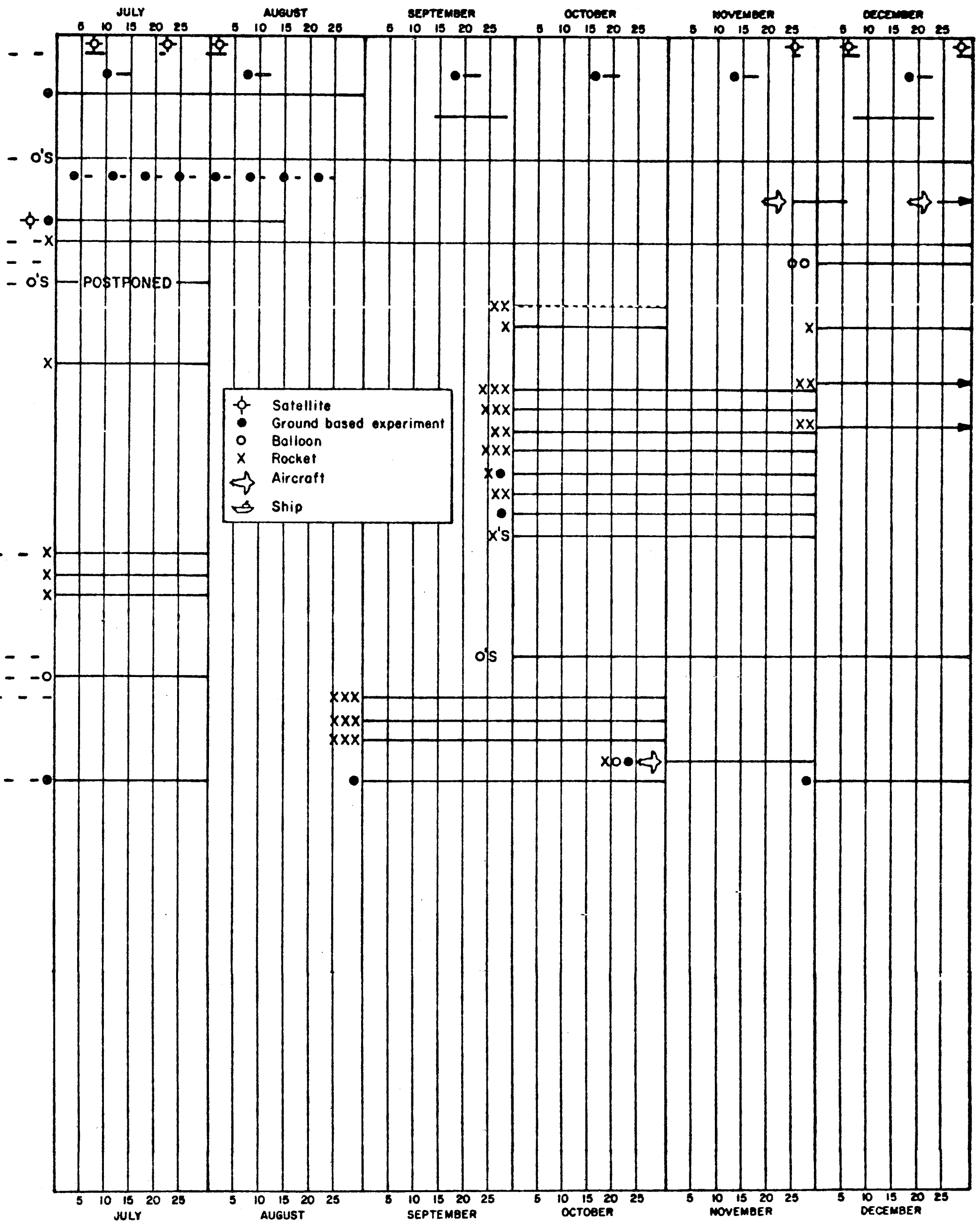
CONJUGATE POINTS EXPERIMENT -Training Cancelled
#0011(Perrault)Iceland-#0429(Hirasawa)Syowa

SAO PAULO #0332 (DeMendonca)

FORT CHURCHILL #0005 (Bland)

POKER FLAT
- A-24 (Goldberg)
- A-25 (Hilsenrath)
- #0337 (Heath)
- #0400 (Fitz)

ADDIS ABABA A-12 (Crochet)



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Iwata, A.
Kai, K.
Kakinuma, T.
Kamada, T.
Kamiyama, H.
Kaneda, E.
Kanno, T.
Kato, S.
Kawamura, M.
Kawashima, N.
Kikuchi, H.
Kimpara, A.
Kimura, I.
Kitamura, T.-I.
Kodama, M.
Kokubun, S.
Kondo, I.
Kozai, Y.
Kurahashi, K.
Kuwashima, M.
Maeda, H.
Maeda, R.
Matsui, M.
Matsumoto, H.
Matuura, N.
Miyatake, S.
Miyazaki, S.
Mori, S.
Morioka, A.
Morioka, S.
Morita, Y.
Moriyama, F.
Murakami, K.
Nagashima, K.
Nagata, T.
Nakamura, M.
Nambu, M.
Nishida, A.
Nishimura, J.
Obayashi, T.
Ogata, Y.
Ogawa, T.
Ogawa, T.
Ogawa, T.
Oguti, T.
Ohshio, M.
Ohtsu, J.
Okuda, M.
Okuzawa, T.
Ondoh, T.
Oya, H.
Saito, B.-I.
Saito, T.
Sakurai, K.
Sakurai, T.
Sato, T.
Sato, T.
Sekido, Y.
Shibata, T.
Takagi, M.
Takahashi, H.
Takiguchi, T.
Tanabe, H.
Tanaka, H.
Tanaka, K.
Tanaka, Y.
Tohmatsu, T.
Tsujii, T.
Tsuruda, K.-I.
Tsutsui, M.
Uchida, Y.

(continued)

JAPAN (cont.)
Ueno, H.
Wada, M.
Wakai, N.
Yahagi, N.
Yamashita, F.
Yanagihara, K.
Yoshino, T.

KENYA
Kelleher, R.F.

MEXICO
Gall, R.
Perez de Tejada, H.

NETHERLANDS
Arens, M.
[illegible] L.D.
de Jager, C.J.
Domingo, V.
Estec, D.
Grard, R.J.L.
Guyenne, T.D.
Jones, D.
Jongen, H.F.
Knott, K.
Mullinger, D.E.
Page, D.E.
Pedersen, A.
Petersen, A.
Rosenberg, J.
Skolnik, J.
Slottje, C.
Thie, F.J.
Van Gils, J.N.
Van Sabben, D.
Vinje, J.A.
Wenzel, K.P.

NEW ZEALAND
Allcock, G.M.
Andrews, M.K.
Bennett, R.G.t.
Dowden, R.L.
Edwards, P.J.
Fraser, G.J.
Gill, P.J.
Keys, J.G.
Roper, C.A.
Stanbury, A.C.
Storey, J.R.
Stuart, G.F.
Thomas, I.L.
Titheridge, J.E.
Tomlinson, L.A.
Unwin, R.S.

NIGERIA
Oni, C.E.F.

NORWAY
Bratteng, O.
Holtet, J.A.
Larsen, T.R.
Maehlum, B.N.
Thrane, E.V.
Trefall, H.

PAKISTAN
Ahmad, M.S.

PERU
Heraud, J.

PHILLIPINES
Badillo, V.L.
Hennessey, J.J.
Santos, C.M.

POLAND
Grzedzielski, S.
Jakimiec, J.
Klos, Z.

PORTUGAL
Silva de Sousa, A.

REPUBLIC OF KOREA
Pak, B.-S.

REPUBLIC OF SOUTH AFRICA
Baker, D.C.
Barker, M.D.
Clarence, N.D.
Currie, R.G.
Gledhill, J.A.
Haggard, R.
Kuhn, G.J.
Poole, A.W.V.
Scheepers, G.L.M.
Scourfield, M.W.

REPUBLIC OF SOUTH AFRICA (cont.)
Stoker, P.H.
Sutcliffe, P.R.
Van Wijk, A.M.
Van der Westhuysen, O.A.
Walker, A.D.M.
Zeeman, P.B.

RHODESIA
Stevenson, R.W.H.

ROMANIA
Moldovanu, A.
Popovici, C.J.

SENEGAL
Masson, H.

SPAIN
de Miguel, L.

SRI LANKA
Gnalingam, S.
Kannangara, M.L.T.
Ratnasiri, P.A.J.

SWEDEN
Andersson, L.E.
Bjorn, L.
Bjurstedt, H.
Block, L.P.
Borg, H.
Bostrom, R.
Derblom, H.
Fahleson, U.V.
Falthammar, C.G.
Gustafsson, G.
Hedberg, A.
Holback, B.
Holmgren, L.A.
Hultqvist, B.K.G.
Jonsson, G.
Karlson, E.T.
Lundin, R.
Stenflo, J.O.
Stoffregen, W.
Westerlund, S.
Zetterqvuist, P.

SWITZERLAND
Balsiger, H.
Debrunner, H.
Eberhardt, P.X.
Fischer, G.
Geiss, J.
Ghielmetti, A.
Hirt, P.
Kronebach, G.W.
Loidl, H.
Magun, A.
Rieker, J.
Schnegg, P.-A.
Sesiano, J.
Young, D.T.

TAIWAN
Horng, J.-T.
Hsieh, T.-L.
Huang, C.-M.
Huang, Y.-N.
Jeng, B.-S.
Juan, V.C.
Teng, Y.-C.

THAILAND
Bhavilai, P.

UNITED KINGDOM
Argent, C.R.
Bain, W.C.
Balough, A.
Barnett, J.J.
Barr, R.
Boyd, R.L.F.
Brown, G.M.
Bryant, D.A.
Bullough, K.
Burrows, K.
Christiansen, P.
Dickinson, P.H.G.
Dudeney, J.R.
Dungey, J.W.
Evans, R.E.
Gadsden, M.
Gibbons, W.
Greer, R.G.H.
Hargreaves, J.K.
Harris, T.J.
Harwood, R.S.

UNITED KINGDOM (cont.)
Hedgecock, P.C.
Hewish, A.
Houghton, J.T.
Hudson, P.D.
Hughes, D.W.
Hunter, A.N.
Hutton, V.R.S.
Hynds, R.J.
Jennison, R.C.
Johnstone, A.D.
Jones, D.L.
Jones, T.B.
Kaiser, T.R.
King, J.W.
Leaton, B.R.
Martelli, G.
McIntosh, D.H.
Moffett, R.J.
Muller, H.G.
Norman, K.
Orr, D.
Piggott, W.R.
Quenby, J.J.
Raitt, W.J.
Rees, D.
Rishbeth, H.
Rodgers, C.D.
Rothwell, P.H.M.
Rycroft, M.J.
Sawyer, J.S.
Schlapp, D.M.
Simnett, G.
Smith, R.W.
Sneath, P.H.A.
Southwood, D.J.
Spracklen, C.T.
Stuart, W.F.
Thomas, L.
Wallis, M.K.
Walshaw, C.D.
Wigley, P.
Williams, E.R.
Williams, P.J.S.
Williamson, R.E.J.
Willis, D.M.
Woolliscroft, L.J.C.
Wraight, P.C.

USA
Aarons, J.
Acuna, M.H.
Adams, G.W.
Agnew, H.M.
Ahluwalia, H.S.
Ahmed, M.
Aikin, A.C.
Akasofu, S.-I.
Alldredge, D.R.
Allen, J.H.
Altschuler, M.
Anderson, H.R.
Anderson, K.A.
Armstrong, T.P.
Arnoldy, R.L.
Asbridge, J.R.
Auer, P.L.
Austin, T.
Balsley, B.B.
Bame, S.J.
Bandeen, W.
Banks, P.M.
Barcus, J.R.
Barfield, J.N.
Baron, M.J.
Bartley, W.
Bates, H.F.
Bauer, S.J.
Baum, P.J.
Beard, D.B.
Beckers, J.M.
Bedinger, J.F.
Behnke, R.
Belmont, A.D.
Bena, R.A.
Benbrook, J.R.
Bering, E.A.
Berman, A.
Bestul, A.

(continued)

USA (cont.)
Billing, D.E.
Biondi, M.A.
Bissell, E.
Blake, J.B.
Blank, C.A.
Bohlin, J.D.
Booker, H.G.
Bostrom, C.O.
Bowles, K.L.
Bowhill, S.A.
Brace, L.H.
Bracewell, R.N.
Brandt, J.C.
Bratenahl, A.
Bretherton, F.
Brown, N.B.
Brown, R.R.
Bruce, M.M.
Bucknam, D.
Buhmann, R.W.
Burch, J.L.
Burlaga, L.F.
Cahill, L.J.
Cain, J.C.
Calvert, W.
Campbell, W.H.
Carey, R.
Carignan, G.R.
Carlson, H.C.
Carovillano, R.L.
Carpenter, D.L.
Castelli, J.P.
Cauffman, D.P.
Chamberlain, J.W.
Champion, K.W.
Chapman, G.A.
Chappell, C.R.
Chasson, R.L.
Chen, A.
Chernosky, E.J.
Chivers, H.J.A.
Christensen, A.B.
Chubb, T.A.
Cladis, J.B.
Clark, J.F.
Clark, K.C.
Clark, M.
Cloutier, P.A.
Coffee, T.
Coleman, E.
Coleman, P.J.
Coles, W.A.
Coon, J.H.
Coroniti, F.V.
Crain, C.M.
Craine, L.B.
Crary, A.P.
Craven, J.D.
Croft, T.A.
Crombie, C.D.
Crooker, N.U.
Cummings, W.D.
Cronyn, W.
Damon, K.R.
Dardis, J.G.
Davidson, G.T.
Davies, K.
Davis, J.M.
Davis, L.
Davis, T.N.
Deforest, S.E.
Dennett, J.T.
Dessler, A.J.
Dodge, J.C.
Dodson-Prince, H.
Doeker, R.B.
Doering, J.P.
Doherty, R.H.
Dolezalek, H.
Donahue, T.M.
Donnelly, R.F.
Dorman, J.
Dow, R.Y.
Dryer, M.
Dubin, M.
Dulk, G.A.
Dunn, R.B.
Dyer, E.R.

USA (cont.)
Eather, R.H.
Ecklund, W.L.
Eddy, J.
Edgar, B.C.
Elliott, D.D.
Epstein, E.S.
Erickson, K.N.
Erickson, W.C.
Evans, D.S.
Evans, J.E.
Evans, J.V.
Evans, J.W.
Evenson, P.
Fainberg, J.
Fairfield, D.
Fan, C.Y.
Farley, D.
Farley, T.A.
Fava, J.A.
Fazio, G.G.
Fejer, J.A.
Feldman, P.D
Fennell, J.F.
Ferguson, E.E.
Ferraro, A.J.
Feynman, J.F.
Firor, J.
Fisher, D.
Fisk, L.A.
Fitz, H.C.
Fletcher, J.C.
Fletcher, J.D.
Fleischer, R.
Fong, L.B.C
Fontheim, E.G.
Fougere, P.
Foukal, P.
Fowler, A.n.
Frank, L.
Fredricks, R,.W.
Freeman, J.W.
Freier, P.S.
Friedlander, M.W.
Friedman, H.
Frischknecht, F.C.
Fritz, S.
Fritz, T.A.
Frutkin, A.W.
Garriott, O.K.
Gassman, G.J.
Gautier, T.N.
Gehrig, J.J.
Geisler, J.E.
Geller, R.F.
Gillmor, C.S.
Glaser, H.
Gloeckler, G.
Goedeke, A.D.
Gold, T.
Goldberg, L.
Goldberg, R.
Goldstein, M.L.
Golmb, D.
Goodman, J.M.
Goody, R.M.
Gosling, J.
Graedel, T.E.
Graf, W.
Grahn, D.
Grebowsky, J.M.
Green, A.W.
Greenstadt, E.W.
Grubb, R.N.
Gunton, R.C.
Gurnett, D.A.
Haddock, F.T.
Hagen, J.
Hagen, J.P.
Hagyard, M.
Hale, L.C.
Hall, C.F.
Hamlin, D.A.
Hanna, W.H.
Hansen, R.T.
Hanson, W.B.
Harker, K.J.
Harper, R.
Hart, P.J.

USA (cont.)
Hart, R.
Harvey, J.W.
Hasegawa, A.
Haymes, R.C.
Hays, P.B.
Heacock, R.R.
Heath, D.F.
Heckman, H.H.
Hedeman, E.R.
Heer, R.R.
Heicklen, J.
Heikkila, W.
Helliwell, R.A.
Heppner, J.P.
Hess, W.N.
Hildebrand, V.E.
Hill, T.W.
Hills, H.K.
Hilsenrath, E.
Hinners, N.W.
Hinteregger, H.
Hirschberg, J.F.
Hoffman, J.H.
Hoffman, R.A.
Hollweg, J.V.
Holtet, J.A.
Holzer, R.E.
Holzer, T.E.
Hones, E.W.
Horan, D.M.
Hornback, C.E.
Horvath, J.J.
Howard, R.
Howard, R.A.
Hudson, R.
Hughes, G.
Hughes, J.
Hughes, R.
Hundhausen, A.J.
Hung, R.J.
Hunten, D.M.
Imhof, W.L.
Intriligator, D.
Jacchia, L.G.
Jean, A.G.
Jeffries, J.T.
Johnson, F.S.
Johnson, R.G.
Joiner, G.
Jokipii, J.R.
Jones, L.M.
Jordan, S.
Joselyn, J.A.
Josephs, M.J.
Joyce, G.R.
Jukes, T.H.
Kamide, Y.
Kan, J.R.
Kaplon, M.F.
Katz, L.
Kaufman, R.L.
Keath, E.P.
Keeley, J.T.
Keller, G.E.
Kelley, M.
Kellogg, P.
Kellogg, W.W.
Kennel, C.F.
Kern, J.W.
Kerr, D.
Kerr, J.
Kim, J.S.
King, J.H.
Kintner, P.
Kivelson, M.G.
Kliore, A.
Klumpar, D.M.
Knecht, D.
Kolstad, G.A.
Komradi, A.
Koomen, M.J.
Koons, H.C.
Kraft, C.C.
Krall, N.A.
Kreplin, R.W.
Krimigis, S.M.
Kroehl, H.
(continued)

USA (cont.)
Kundu, M.R.
Landisman, M.
Langel, R.A.
Lanzerotti, L.J.
Latham G.
Lazarus, A.J.
Leadabrand, R.L.
Ledley, B.
Leinbach, H.
Lenchek, A.M.
Levy, R.H.
L'Heureux, J.
Liebenberg, D.H.
Liemohn, H.B.
Lin, C.
Lin, R.
Lincoln, J.V.
Lindzen, R.
Linson, L.M.
Lippincott, C.R.
Lockwood, J.A.
Lockwood, G.W.
London, J.
Low, G.M.
Lui, T.T.Y.
Lundquist, C.
Lynn, W.D.
Lyons, L.R.
MacLeod, M.A.
MacQueen, R.M.
Madden, J.J.
Madey, R.
Maeda, K.
Maier, E.J.
Mange, P.W.
Manion, C.
Manka, R.
Masley, A.J.
Mason, G.M.
Mather, K.B.
Matsushita, S.
Matthews, D.L.
Mauk, B.H.
Mavromichalaki, H.
Maxwell, A.
Mayfield, E.B.
Maynard, N.C.
McCabe, M.K.
McClay, J.
McCoy, J.E.
McDonald, F.B.
McElroy, M.B.
McIlwain, C.E.
McIntosh, P.S.
McKelvey, V.E.
McPherron, R.L.
McWilliams, A.S.
Mead, G.D.
Mechtly, E.A.
Megill, L.R.
Mende, S.B.
Meng, C.I.
Meredith, L.H.
Meyer, P.
Michel, F.C.
Michels, D.J.
Midgley, J.E.
Mihalov, J.D.
Miller, F.D.
Mitchel, F.C.
Mizera, P.
Moe, O.K.
Mohler, O.C.
Morgan, M.
Morris, R.G.
Morse, D.L.
Mosier, S.R.
Motz, H.
Moser, F.S.
Mulholland, J.D.
Murcray, D.G.
Murcray, W.B.
Nagy, A.F.
Najita, K.
Nakada, M.P.
Nakagawa, Y.
Narcisi, R.S.
Naugle, J.

USA (cont.)
Ness, N.F.
Neugebauer, M.M.
Newell, R.E.
Newkirk, G.
Nier, A.O.C.
Niles, F.E.
Nobles, R.A.
Nordberg, W.
Norton, R.B.
Nothrop, T.
Noxon, J.F.
Noyes, R.
Oberle, R.J.
Oertel, G.
Ogilvie, K.W.
Olson, W.P.
Ong, R.S.B.
Pace, N.
Papadopoulos, K.
Papagiannis, M.D.
Park, C.G.
Parker, L.W.
Parks, G.K.
Parthasarathy, R.
Patel, V.L.
Paulikas, G.A.
Pazich, P.M.
Peacock, D.S.
Peaurralt, P.
Peek, H.M.
Perkins, F.W.
Peterkin, E.W.
Peterson, A.M.
Peterson, L.E.
Pfister, W.
Philbrick, C.R.
Pickering, W.H.
Pieper, G.F.
Pierce, A.K.
Pierce, E.T.
Pomerantz, M.A.
Pongratz, M.
Pope, J.H.
Poppoff, I.G.
Porter, R.W.
Potemra, T.A.
Potter, W.E.
Prag, A.B.
Prasad, S.S.
Pytte, T.
Querfeld, C.W.
Rabin, H.
Radoski, H.R.
Raney, W.P.
Rasool, I.
Ray, D.L.
Reed, S.G.
Rees, M.H.
Regan, R.D.
Reid, G.C.
Reidy, W.P.
Reinisch, B.W.
Rense, W.A.
Rice, C.J.
Rickett, B.
Riddle, A.O.
Rino, C.
Rizzi, A.W.
Robbins, D.E.
Roberts, D.L.
Roberts, W.O.
Robinson, R.D.
Roederer, J.G.
Roelof, E.C.
Roelofs, T.H.
Romick, G.J.
Rosen, A.M.
Rosenau, P.
Rosenberg, N.W.
Rosenburg, T.J.
Rothmuller, I.J.
Rugge, H.R.
Rush, C.
Russell, C.T.
Rust, D.M.
Rutford, R.
Sagalyn, R.C.
Sauer, H.

USA (cont.)
Sawyer, C.B.
Scarf, F.L.
Schardt, A.
Scherb, F.
Schmerling, E.
Schultz, M.
Sechrist, C.F.
Seliga, T.
Sen, A.K.
Shapiro, M.M.
Shapley, A.H.
Sharp, G.W.
Sharp, R.D.
Shaw, G.E.
Shaw, R.R.
Shawhan, S.D.
Shea, M.A.
Sheeley, N.R.
Sheldon, R.
Sheldon, W.R.
Shelley, E.G.
Silver, S.
Simpson, J.A.
Sims, A.R.
Singer, S.F.
Sipler, D.P.
Siscoe, G.L.
Smagorinsky, J.
Smart, D.F.
Smith, D.F.
Smith, E.J.
Smith, E.K.
Smith, J.B.
Smith, L.G.
Smith, L.L.
Smith, P.H.
Smith, Z.K.
Snider, D.E.
Snyder, A.L.
Soberman, R.K.
Sonnerup, B.U.O.
Sonnett, C.P.
Speiser, T.W.
Spencer, N.W.
Spreiter, J.R.
Steg, L.
Steinolfson, R.
Stern, D.P.
Stone, E.C.
Stone, R.G.
Strong, I.B.
Sturrock, P.A.
Suess, S.T.
Sugiura, M.
Suomi, V.E.
Svalgaard, L.
Svestka, Z.
Swenson, G.R.
Swider, W.
Swift, D.
Swinson, D.B.
Szuszczewicz, E.P.
Tandberg-Hanssen, E.
Taschek, R.F.
Taylor, H.A.
Teer, T.
Tepper, M.
Thomas, G.E.
Thorne, R.M.
Timothy, A.
Tinsley, B.A.
Todd, E.P.
Tobias, C.A.
Tolk, N.H.
Toman, K.
Torr, M.R.
Tousey, R.
Townsend, J.W.
Trainor, J.
Tsunoda, R.T.
Tsurutani, B.T.
Ulwick, J.C.
Vaiana, G.S.
Van Allen, J.A.
Van Doren, M.D.
Van Hoven, G.
Van Zandt, T.E.
(continued)

USA (cont.)
Vampola, A.L.
Vesecky, J.F.
Vette, J.
Vondrak, R.
Vorpahl, J.A.
Wagner, W.J.
Walker, J.C.G.
Walt, M.
Warwick, J.W.
Waynick, A.H.
Weaver, P.F.
Webber, W.R.
Wehrenberg, P.J.
Weiffenbach, G.C.
Weinburg, E.H.
Weller, C.E.
Weller, C.S.
Wentzel, D.G.
Wescott, E.M.
Whang, Y.C.
Whipple, E.C.
Whipple, F.L.
White, R.M.
White, R.S.
Whitten, R.C.
Wickwar, V.
Wilcox, J.M.
Williams, D.J.
Wilson, C.R.
Winckler, J.R.
Winningham, J.D.
Withbroe, G.L.
Wolf, R.A.
Wolfe, J.H.
Wood, J.D.
Wright, J.P.
Wright, J.W.
Wright, W.E.
Wu, C.S.
Wu, S.T.
Yeates, C.
Yuen, P.C.
Zimmerman, S.P.
Zirin, H.
Zirker, J.B.

USSR
Alpert, Ya.L.
Balayan, G.S.
Banin, V.G.
Baranski, L.N.
Barhatov, N.A.
Bazilevskaya, G.A.
Beloglasov, M.I.
Beloussov, V.V.
Benkova, N.P.
Bobrov, M.S.
Bondarenko, A.P.
Bondarenko, V.I.
Borovkov, L.P.
Brunelli, B.E.
Bushmarin, V.A.
Charakhchyan, A.N.
Chavdarov, S.S.
Cherkashin, Ju.
Chernouss, S.A.
Chernysheva, S.P.
Chertkov, A.D.
Chetaiev, D.N.
Chimiddorge, G.
Chirkov, N.P.
Danilov, A.A.
Danilov, A.D.
Dmitrieva, L.A.
Dolginov, Sh.Sh.
Dorman, L.I.
Dubinin, N.P.
Dubrovskiy, V.G.
Elizariev, Ju. N.
Emelyanov, A.P.
Erofeev, N.M.
Feigin, V.Z.
Feldstein, Ya.I.
Frank-Kamenetsky, A.W.
Galperin, Yu.I.
Gemilev, G.
Gorchakov, E.V.
Gorshkov, Yu.N.
Grib, S.A.

USSR (cont.)
Grigoryev, V.M.
Grigoriev, Yu.G.
Gul'elmi, A.V.
Gulmedov, Ch.D.
Horkov, V.D.
Hotko, De.G.P.
Imshenetsky, A.A.
Ivanov, K.G.
Ivanov, N.A.
Ivanov, V.E.
Ivanova, L.N.
Jaremenko, L.N.
Javkov, V.A.
Kalinin, Yu.D.
Kapustin, I.N.
Karpman, V.I.
Karpov, V.P.
Kazimirovsky, E.S.
Khrutschinsky, A.A.
Kiselev, B.V.
Kleimenova, N.G.
Klimov, N.N.
Kokourov, V.D.
Kolomeets, E.V.
Korchak, A.A.
Kornilov, I.A.
Koshelevsky, V.K.
Kovalevsky, I.V.
Kovner, M.S.
Kravtsova, M.K.
Krylov, S.M.
Kuklin, G.V.
Kurilov, V.A.
Kushnerevskiy, Yu.V.
Kuzmin. A.D.
Kuzmin, I.A.
Kuznetsov, Yu.N.
Latov, Y.O.
Lazutin L.L.
Lebedev, L.A.
Leontyev, S.V.
Leskov, L.
Levitin, A.E.
Likhachev, A.I.
Likhter, Ja.I.
Lobachevskiy, L.A.
Loginov, G.A.
Luzov, A.A.
Lyatskaya, A.M.
Lyatsky, W.B.
Lyubimov, G.P.
Maltsev, Yu.P.
Maltzeva, N.F.
Mamrukov, A.P.
Mandelshtam, S.L.
Mansurov, S.M.
Marov, M.Ya.
Melnikov, A.O.
Melnitshuk, I.A.
Migulin, V.V.
Mishin, V.M.
Misun, Yu.G.
Misyura, V.A.
Molchanov, O.A.
Nadubovich, Yu.A.
Namgaladze, A.A.
Novikov, A.M.
Novikov, Ju.P.
Ostapenko, A.A.
Ovezgelbyev, O.
Parkhomov, V.A.
Petrova, G.A.
Petrova, N.N.
Pochparev, V.I.
Pogrebnoy, W.N.
Polozjentseva, T.A.
Poncmarev, E.A.
Potapov, A.S.
Pudovkin, M.I.
Pushkov, N.V.
Pyatsi, A.H.
Raspopov, O.M.
Rezhenov, B.V.
Roldugin, V.K.
Rubashev, B.M.
Rudina, M.P.
Rumjantsev, S.A.
Ryss, I.K.

USSR (cont.)
Sagdeev, R.
Sakharov, Ia.A.
Samsonov, V.P.
Savroughin, A.P.
Sazhin, S.S.
Sedov, L.I.
Selivanov, V.P.
Semenov, A.I.
Sergeev, A.V.
Shafer, Yu.G.
Shaftan, V.A.
Shapiro, V.A.
Shefov, N.N.
Sheftel, V.M.
Shevnin, A.D.
Shirmammedov, M.
Shirman B.L.
Shulgina, N.V.
Shumilov, O.I.
Skripin, G.V.
Smirnov, V.S.
Smirnova, N.A.
Smolkov, G.Ya.
Sobolev, A.V.
Sokolov, S.I.
Solovyov, S.I.
Sorokina, L.P.
Sosnovets, E.N.
Stakhanov, I.P.
Starkov, G.V.
Stepanov, V.E.
Stozhkov, Yu.I.
Suchoivanenko, P.Ya.
Sukhorukova, E.V.
Sverdlov, Yu.L.
Tcirs, G.P.
Terestshenko, E.D.
Titova, E.E.
Totunova, G.F.
Toulinov, G.F.
Troitskaya, V.A.
Troshichev, O.A.
Truttse, Yu.L.
Tsyganenko, N.A.
Tverskoy, B.A.
Tverskaya, L.V.
Tyurmina, L.O.
Tzedilina, E.
Undsenkov, B.A.
Uspenski, M.V.
Vaisberg, O.L.
Vashenuk, A.V.
Vashkov, V.I.
Vershinin, E.F.
Vinogradov, P.A.
Vinogradova, V.N.
Vlaskov, V.A.
Vorobjev, V.G.
Yeroshenko, Ye.G.
Yevlashin, L.S.
Yukhimuk, A.K.
Yurchenko, O.T.
Zaitzev, A.N.
Zaitzeva, S.A.
Zevakina, R.A.
Zherbtsov, G.A.
Zhulin, I.A.
Zhuzgov, L.N.
Zolotukhin, N.A.
Zonov, Yu.V.
Zverev, V.L.
Zybin, K.Yu.

VENEZUELA
Claria, J.
Stock, J.

The above list of names was taken from the IMS NL distribution list as of 28 August 1976.