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NASA News

National Aeronautics and
Space Administration

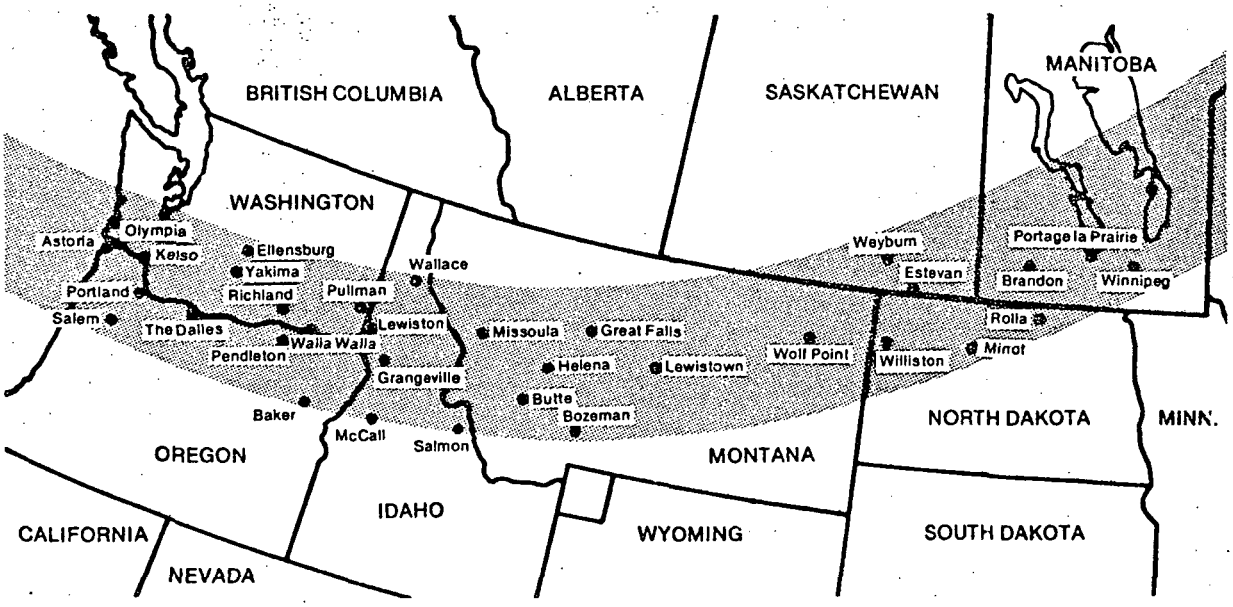
Washington, D.C. 20546
AC 202 755-8370

For Release TUESDAY,
February 20, 1979

Press Kit

Project Solar Eclipse

RELEASE NO: 79-18



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AMERICANS AND CANADIANS TO STUDY FEB. 26 ECLIPSE

Four organizations in the United States and Canada have formed a joint sounding rocket program centered in Canada to study effects on the atmosphere and ionosphere of this month's total solar eclipse.

The Feb. 26 eclipse will be visible in its totality only in the northwestern United States and central Canada. The eclipse will be partial across the rest of the nation.

The total eclipse will be the last one observable from the North American continent in this century. It will begin at dawn over the Pacific Ocean, west of Puget Sound, and will terminate at sunset over northern Greenland.

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The eclipse will range, in per cent of totality, from 100 per cent in the U.S. northwest to a maximum of 31.5 in Miami. The maximum percentages for other cities include: New York 60.8, Dallas 66.6, St. Louis 74.7, San Francisco 86.4, San Diego 74.1, Phoenix 75.3, Memphis 66.4, Chicago 79.3, Denver 87.5, Atlanta 56.7 Duluth, Minn., 93.1 and Juneau, Alaska 85.9.

The participating organizations in the sounding rocket eclipse study are NASA, the Army's Atmospheric Sciences Laboratory (ASL), the Air Force Geophysics Laboratory (AFGL) and the National Research Council of Canada (NRC).

Objectives of the research are to produce improved models with which to predict atmospheric responses under a variety of disturbances.

There will be two rocket launching and tracking sites, both located in western Ontario, Canada, about 800 kilometers (500 miles) north of Minneapolis. The NRC and the ASL small rocket site will be at Cochenour and the NASA/ASL major rocket site will be on the Chukuni River. The closeness of the sites will allow positive safety controls to be maintained and the sharing of support facilities.

NASA will act as the U.S. government's lead agency for the western Ontario eclipse activities. NRC will support the U.S. program, providing construction, ground and flight safety support, launch coordination and other required launch site support on a reimbursable basis.

NASA's Wallops Flight Center, Wallops Island, Va., will support seven launches during the operation: three payloads with joint experiments for the University of Illinois and the University of Bern, Switzerland; one payload with experiments for Cornell University and the Naval Research Laboratory; one payload for the University of Pittsburgh; and two payloads for Pennsylvania State University.

Site preparation in Canada began last June and the launchers were installed in September.

Wallops Flight Center mobile range equipment transported to the launch site includes: three radar vans, two telemetry vans, five sounding rocket launchers and miscellaneous vans and equipment to support launchings, tracking and data acquisition. Also transported to the site was a mobile power van to supply electric power for the entire Chukuni complex. The other site will use commercial power.

About 70 Wallops employees and other U.S. personnel participating in the field operation will stay in the Red Lake area, a cluster of gold-mining communities (Red Lake, Balmertown, Cochenour, McKenzie Island and Madsen) with a population of about 5,000. Most of the mines are inactive now, but between 1930 and 1972 over $300 billion worth of gold was produced. Mining is still the major industry with timber and tourism close seconds.

Twelve U.S. satellites also will provide measurements to be used in interpreting the eclipse experiments -- GOES-2, GOES-C, Nimbus 4, Nimbus 6, Nimbus 7, SMS-1, SMS-2, SOLRAD 11B, Atmospheric Explorer-E, NOAA-5, Tiros-N and UK-5. (See table on page 14.)

On the ground, the ASL will sponsor a partial reflection experiment for measuring electron densities and the AFGL will sponsor a mobile observatory for measuring infrared radiation from the high atmosphere.

The National Science Foundation is coordinating numerous other eclipse studies at widely-scattered locations.

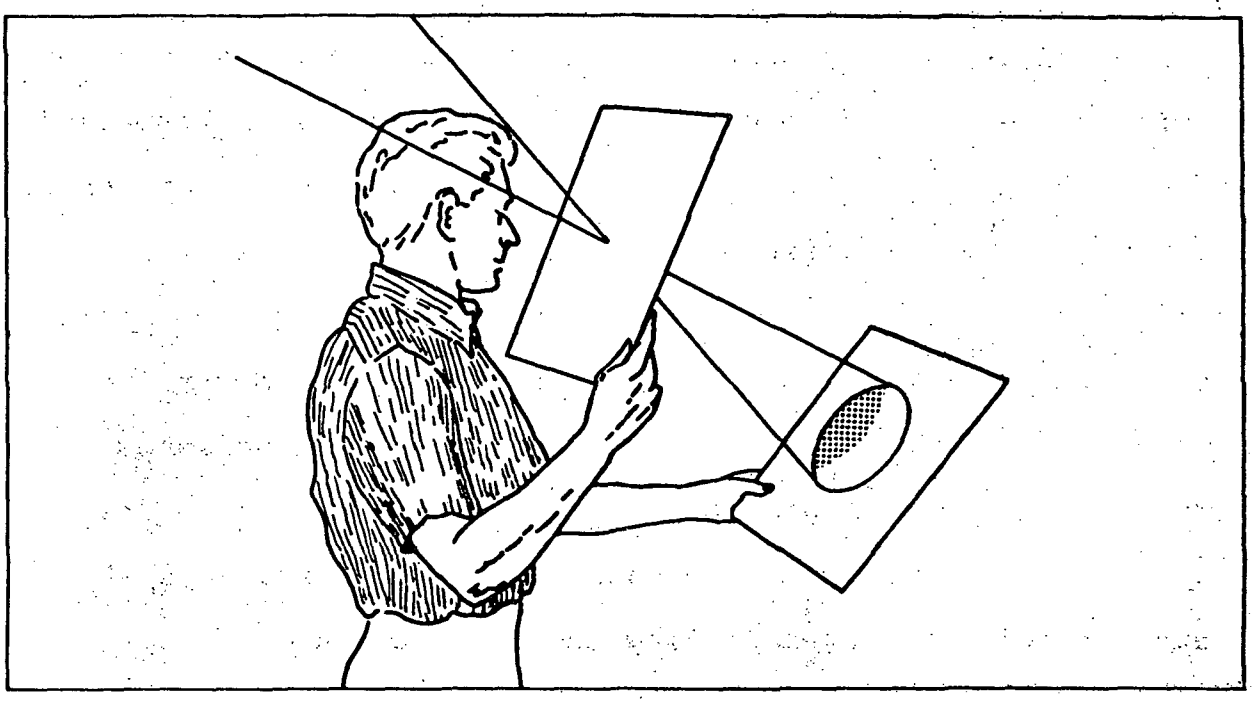
The sounding rocket launches (a total of 15, with all but two being launched on eclipse day) from the two Canadian sites are expected to attract a large number of people to the area.

The NRC has established a viewing site for the public near the Chukuni rocket launch area. The site, about 16 km (10 mi.) north of Ear Falls, Ontario, can be reached by taking Route 105 from that community.

Warnings of permanent eye damage from looking at the Sun during the eclipse have been issued by the American Association of Opthalmology and the National Society for the Prevention of Blindness. The organizations say damage to the eyes from eclipse-watching involves burning the retina. They emphasize that it is difficult to tell when such damage is occurring because the retina is insensitive to pain. No sunglasses, smoked glass or photographic film is absolutely safe. They may eliminate glare but they do not block infrared rays which cause damaging burns, according to the experts.

The opthalmology association advises watching the image of the eclipse by using a pinhole method. This involves using two pieces of white cardboard with a pinhole in the top cardboard which projects and focuses the solar image on the second cardboard.

The size of the Sun's image may be changed by altering the distance between the cardboards. The observer can view the eclipse with his or her back to the Sun.



The Wallops center has produced a guide for elementary and secondary school teachers to use in science curriculum exercises related to the eclipse. Copies of the 26-page guide will be distributed prior to the eclipse to U.S. and Canadian school officials in or near the path of totality.

(END OF GENERAL RELEASE. BACKGROUND INFORMATION FOLLOWS.)

THE 1979 SOLAR ECLIPSE EXPEDITION

The 1979 Solar Eclipse Expedition in Ontario Province, Canada, will consist of scientific rocket and ground based measurements by researchers from the United States and Canada. Participating U.S. agencies are NASA, the Army Atmospheric Sciences Laboratory (ASL) and the Air Force Geophysical Laboratory (AFGL). Investigators also are from university and industry groups supported by the agencies. Canadian investigations will be conducted by scientists from the National Research Council of Canada (NRC) and university scientists supported by NRC.

Scientific investigations will be conducted from two launch sites near the Red Lake area of western Ontario. The following operations will be conducted:

Cochenour-Balmertown area --

- NRC large rocket launches, tracking and telemetry
- ASL small rocket launches, tracking and telemetry
- Partial Reflection Experiment
- Mobile Optical Observatory

Chukuni launch and instrumentation sites --

- NASA large rocket launches, tracking and telemetry
- ASL large rocket launches, tracking and telemetry
- AFGL large rocket launches, tracking and telemetry

The rocket impact areas have been designated the North Range and East Range. NRC, ASL and AFGL will impact in the North Range and NASA will impact in both the North and East Ranges.

The expedition is a joint operation conducted under an agreement between the U.S. and Canada covering U.S. use of the Churchill Research Range and other Canadian facilities for scientific sounding rocket and balloon operations.

The project is known as the Solar Eclipse Atmospheric and Ionospheric Measurements Project (SEAIMP).

NASA SCIENTIFIC OBJECTIVES AND PAYLOADS

The NASA 1979 Eclipse scientific program has four experimenter groups as follows:

- Three payloads with joint experiments from the University of Illinois and the University of Bern, Switzerland.
- One payload with joint experiments from Cornell University and the Naval Research Laboratory.
- One payload with an experiment from the University of Pittsburgh.
- Two payloads with experiments from the Pennsylvania State University.

The University of Illinois/University of Bern payload consists of two experiment sections plus associated power and telemetry systems, a solar aspect sensor and a clamshell nose cone. Information to be obtained includes: electron density, solar Lyman-Alpha (direct and scattered), solar X-rays, precipitating electron/proton flux, visible radiation and positive and negative ion composition.

Near the end of the flight the payload system is separated from the rocket motor and the recovery system begins operation when initiated by a barometric switch.

Object of the Pennsylvania State University experiment is to determine the processes controlling charged particle densities in the ionospheric D-region, with particular emphasis on attachment and detachment processes. This will be done under daytime (solar eclipse) and nighttime conditions. A blunt conductivity probe will be used to sense positive ions and electrons. Multiple lamps at visible and ultraviolet wavelengths will be cycled to determine their relative influence on the charged particle environment. An auxiliary experiment will be an antenna to measure vertical electric (E) field, which may also affect charged particle densities.

The cylindrical payload uses an ejectable fiberglass nose cone. The 17.2-kilogram (37.9-pound) payload separates shortly before apogee and descends on a parachute decelerator.

The University of Pittsburgh experiment is designed to measure directly the primary photoionization rates for the principal atmospheric ions: N_2+, O_2+, O+ and N+, and to search for significant chemi-ionization sources at F region altitudes with particular emphasis on the associative ionization processes. Instrumentation also will measure the ion and neutral composition of the atmosphere, measure the electron temperature and concentration, study the EUV airglow in the 1100 A to 1600 A wavelength region with a 1/8-meter scanning monochromator, measure the $N(^2P)$ and $N(^2D)$ concentrations with a dual-channel tilting-filter photometer, and measure the photoelectron flux and energy distribution.

The Cornell University experiment that will fly with one from the NRL will measure ambient electric fields and plasma waves using two spherical sensors extended from the payload. The differential signals between sphere pairs is amplified and filtered as a "DC" signal corresponding to ionospheric fluid motion and as an "AC" signal corresponding to plasma waves.

The NRL ionospheric plasma experiment (flying with the Cornell sensors) employs two types of diagnostic devices: a pulsed-plasma probe (p3) for the determination of electron density, temperature and density fluctuation power spectra, and a quadrupole ion mass spectrometer (QIMS) for determining ion composition. Two p3 probes will be extended from the payload in conjunction with the booms. The QIMS will be mounted on the forward surface of the payload.

ASL/AFGL/PSL SCIENTIFIC OBJECTIVES AND PAYLOADS

Scientific objectives for the ASL and AFGL experiments focus on the testing and improvement of models which describe the middle and higher atmosphere. These scientific objectives are met through a set of measurement objectives. Measurement objectives of large rocket payloads flown for ASL, AFGL and the Physical Science Laboratory (PSL) of New Mexico State University are:

- The Lyman Alpha radiation intensity will be measured in the altitude range of 65 to 100 km (40 to 60 mi.) using an ionization chamber.

- The atomic oxygen number density will be measured between 65 and 100 km (40 to 60 mi.) using an on-board resonance lamp-detector system.

- The altitude profile of the ozone concentration will be measured from ground level up to about 80 km (50 mi.) by measuring the absorption of solar ultraviolet radiation with the filtered photometers.

- The nitric oxide number density will be determined by measuring the intensity of solar ultraviolet light.

- 0_2 and OH number densities will be measured by rocket-borne cryogenically cooled radiometers.

- The electron density above 50 km (30 mi.) will be measured with an impedance probe.

- A 25.4-centimeter (10-inch) diameter rigid falling sphere, instrumented with a sensitive three-axis strain gauge will be used to determine atmospheric density in the altitude range of 35 to 105 km (22 to 65 mi.).

- Hard solar X-ray intensity will be measured with a Geiger-Mueller counter.

- Total ionizing radiation (precipitating electrons, bremsstrahlung, cosmic rays) intensity and energy distribution will be measured with a scintillation spectrometer. Six channels of count rates will be telemetered to the ground station.

- The electron density above 50 km (30 mi.) will be measured with an impedance probe.

- Lyman-Alpha will be measured by ionization chambers.

- Ultraviolet radiation will be measured at 2050A°.

- A liquid helium cryopumped quadrupole mass spectrometer will be used to identify the mass number and to measure the number density of positive and negative ions.

- Gerdien condensers will be used to measure the total positive and negative conductivities of the atmosphere as a function of height.

- An 18-cm (7-in.) diameter, rigid falling sphere, instrumented with time of flight, accelerometer, will be used to determine atmospheric temperature and density between 20-100 km (10-60 mi.).

ECLIPSE LARGE ROCKET LAUNCH SEQUENCE

No.	Agency	Launch Day	Vehicle	Experiment	Experimenter (Organization)
1	NASA	Feb. 24	Nike Tomahawk	Plasma physics	University of Bern, Switzerland and University of Illinois
2	NASA	Feb. 24	Astrobee D	Plasma physics	Pennsylvania State University
3	ASL	Feb. 26	Nike-Orion	Aeronomy	Utah State Univ. and New Mexico State Univ.
4	ASL	Feb. 26	Nike-Orion	Aeronomy	Utah State Univ. and New Mexico State Univ.
5	AFGL	Feb. 26	Nike-Orion	Aeronomy	AFGL and Utah State Univ.
6	NRC	Feb. 26	Black Brant VA	Aeronomy, solar physics	NRC, York Univ., Univ. of Saskatchewan
7	NASA	Feb. 26	Nike Tomahawk	Plasma physics	Univ. of Bern, Univ. of Illinois
8	NASA	Feb. 26	Nike Tomahawk	Plasma physics	Univ. of Bern, Univ. of Illinois
9	NASA	Feb. 26	Taurus-Orion	Aeronomy	Univ. of Pittsburgh
10	NASA	Feb. 26	Taurus-Orion	Plasma physics	Cornell Univ.
11	NASA	Feb. 26	Astrobee D	Plasma physics	Pennsylvania State University
12	AFGL	Feb. 26	Paiute-Tomahawk	Aeronomy	AFGL
13 (Backup to No. 12)	AFGL	Feb. 26	Paiute-Tomahawk	Aeronomy	AFGL
14	AFGL	Feb. 26	Niro	Aeronomy	AFGL

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ASL/PSL SCIENTIFIC OBJECTIVES AND PAYLOADS

The scientific objectives of the these small sounding rocket flight experiments sponsored by ASL and the Physical Science Laboratory of New Mexico State University are measurements of the following parameters:

- D and lower E-region electron densities.
- Absorption profiles of solar Lyman-Alpha.
- Positive and negative ion conductivities and mobilities in the altitude range of 30 to 85 km (20 to 50 mi.).
- Positive and negative charge densities from 30 to 85 km (20 to 50 mi.).
- Wind, temperature, density from 30 to 65 km (20 to 40 mi.).

The electron densities are derived using an impedance and a DC probe. The Lyman-Alpha is measured using a non-absorption cell.

A decelerator deployed subsonic Gerdien condenser will measure positive and negative ion conductivities and mobilities during descent. This data will be used to derive ion densities. Temperature, densities and winds will be measured by deploying a bead thermistor sensor on a decelerator.

Experiments are being flown for: University of Texas at El Paso, Utah State University, ASL, Wallops Flight Center and the U.S. Air Force Air Weather Service.

ECLIPSE SMALL ROCKET LAUNCH SEQUENCE

Date	Local Time	Rocket	Payload
Feb. 19	1200	Super Loki	Meteorological Probe
Feb. 23	1200	Super Loki	Meteorological Probe
Feb. 24	1050	Super Arcas	Electron Density
	1110	Super Arcas	Blunt Probe
	1200	Super Loki	Meteorological Probe
Feb. 25	1050	Super Arcas	Gerdien Condenser
	1110	Super Arcas	Electron Density
	1150	Super Loki	Blunt Probe
	1215	Super Loki	Meteorological Probe
Feb. 26	1053	Super Arcas	Gerdien Condenser
	1110	Super Arcas	Electron Density
	1138	Super Arcas	Gerdien Condenser
	1215	Super Loki	Meteorological Probe
	2130	Super Arcas	Gerdien Condenser
	2200	Super Loki	Blunt Probe
	2230	Super Loki	Meteorological Probe
Feb. 27	*0700	Super Arcas	Gerdien Condenser
	0730	Super Loki	Blunt Probe
	0800	Super Arcas	Electron Density
	0830	Super Loki	Meteorological Probe

*Sunrise

SATELLITE MEASUREMENTS RELATED TO 1979 ECLIPSE

Satellite	Measurement	Principal Investigator
GOES-2 (Geostationary)	• Solar X-Ray(0.5-3.0A; 1-8A) • Electron Flux (> 500 keV)	D.J. Williams, NOAA
GOES-C (Geostationary)	(Same as GOES-2)	(Same as GOES-2)
Nimbus 4 (Polar Orbit)	Backscattered Ultraviolet for total 0_3 content	D.F. Heath, GSFC/ NASA
Nimbus 6 (Polar Orbit)	CO_2 Radiance for Temperature Distribution; 45-70 km	J.T. Houghton, Oxford University
Nimbus G (Polar Orbit)	• Mapping of Total 0_3 Content • Altitude Profiles, to 90 km of H_20, N_20, CH_4, CO and NO. • 0_3 Altitude Profile • Backscattered Ultraviolet • Solar Radiation in the EUV	Various
SMS-1 (Geostationary)	(Same as GOES-2)	(Same as GOES-2)
SMS-2 (Geostationary)	(Same as GOES-2)	(Same as GOES-2)
SOLRAD 11B	• Solar Ultraviolet(1175-1800Å) • Solar EUV(170-1050Å) • Solar X-rays (1-8Å)	P.D. Feldman, Johns Hopkins University R.W. Kreplin, NRL R.W. Kreplin, NRL
Atmospheric Explorer-E (Earth Orbiting)	• Solar EUV Spectrophotometer (140-1850Å)	H.Hinteregger, AFGL
NOAA-5	• Temperature and H_20 Profiles, Surface to 30 km • Electron Flux (> 250 keV)	NOAA Staff
UK-5	• All-sky monitor of galactic X-ray flux	S.Holt, GSFC/NASA
Tiros-N	• Temperature and humidity profiles, surface to stratosphere • Meteorological observations • Solar proton monitoring	NOAA Staff

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U.S.-CANADIAN SOLAR ECLIPSE TEAM

NASA Headquarters

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Andrew J. Stofan	Deputy Associate Administrator for Space Science
Dr. Adrienne F. Timothy	Assistant Associate Administrator for Space Science
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Dr. E. R. Schmerling	Discipline Scientist
Dr. Robert Murphy	Discipline Scientist

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Robert E. Carr	Systems Manager
M. Keith Wible	Administrative and Public Relations Manager
Bobby J. Flowers	Payload Engineer
David F. Detwiler, Jr.	Payload Engineer
Jay F. Brown	Payload Engineer

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Wallops Center (cont'd.)

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Dr. Paul Eberhart University of Bern, Switzerland	Chief Scientist
Prof. Edward Zipf University of Pittsburgh	Chief Scientist
Prof. Mike Kelley Cornell University	Experimenter
Dr. Ed. Szsuzczewicz Naval Research Laboratory	Experimenter
Prof. Leslie Hale Pennsylvania State University	Experimenter

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Dr. Melvin Heaps	Program Scientist
Robert Olson	Small Rocket Scientific Manager

Physical Science Laboratory (PSL), New Mexico State University

Dr. Warren W. Berning	Program Manager
Arthur Gilcrease	Deputy Program Manager
John Cross	Small Rocket Program Manager

Experimenters

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Dr. Jack Mitchell University of Texas at El Paso	Principal Scientist

Air Force Geophysical Laboratory (AFGL)

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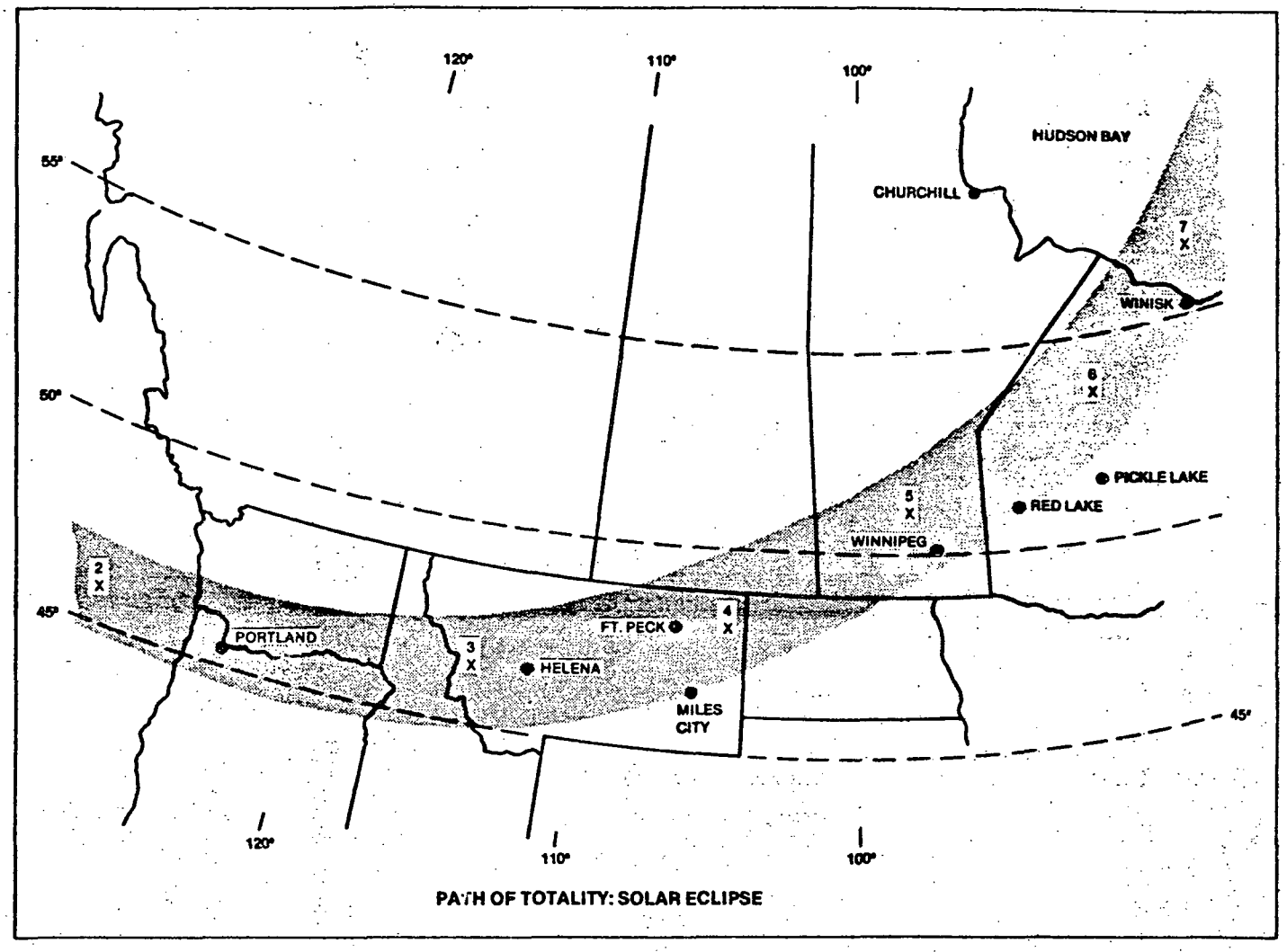
Ed McKenna	Launch Manager
Dr. Russ Philbrick	Experimenter
Dr. Andy Faire	Experimenter
Dr. Rocco Narcisi	Experimenter
Jim Ulwick	Experimenter

National Research Council (NRC), Canada

Dr. R. W. Nicholls	Project Scientist
Dr. John Aitken	Director, Space Research Facilities Branch
Jack Tarzwell	Head of Operations
Dr. Allen J. McNamara	Experimenter
Theodore Llewellyn University of Saskatchewan	Experimenter



PATH OF TOTALITY: SOLAR ECLIPSE

Characteristics of the Feb. 26 Solar Eclipse

Map Location	Geographic Longitude	Geographic Latitude	Local Time* h m	Sun Angle	Eclipse Duration m s	Shadow Width km
2	129.04 (230.96)	46.08	07:12	7.5	2 05	253
3	113.87 (246.13)	46.40	09:24	18.4	2 30	295
4	105.30 (254.70)	48.10	09:36	23.2	2 43	307
5	98.29 (261.37)	50.46	10:48	25.4	2 48	304
6	91.63 (268.37)	53.42	11:00	25.5	2 48	292
7	84.46 (275.54)	57.11	12:12	23.6	2 43	277

*Assumes Standard Time

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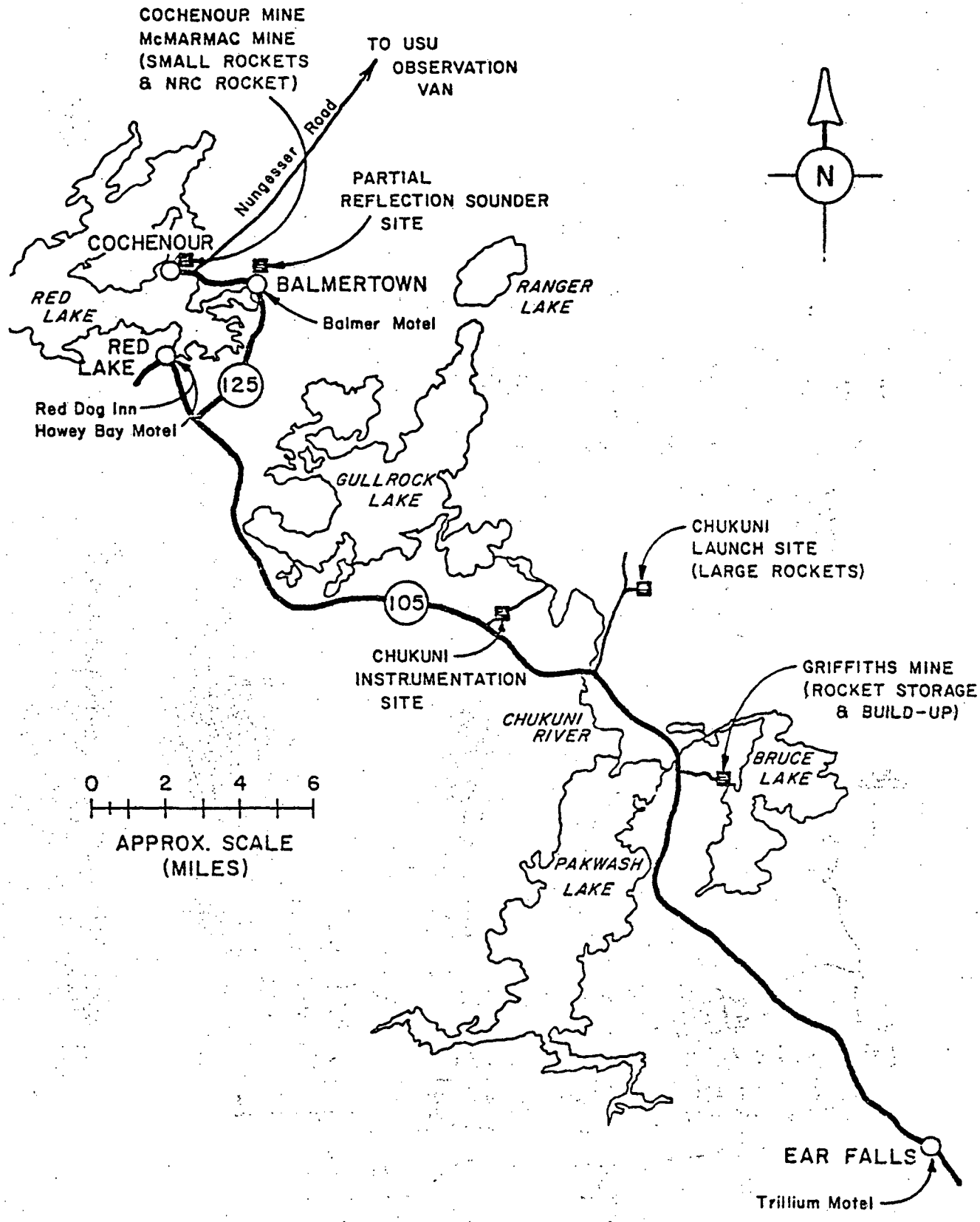

SOLAR ECLIPSE '79 SUPPORT AREAS

RED LAKE, ONTARIO, CANADA

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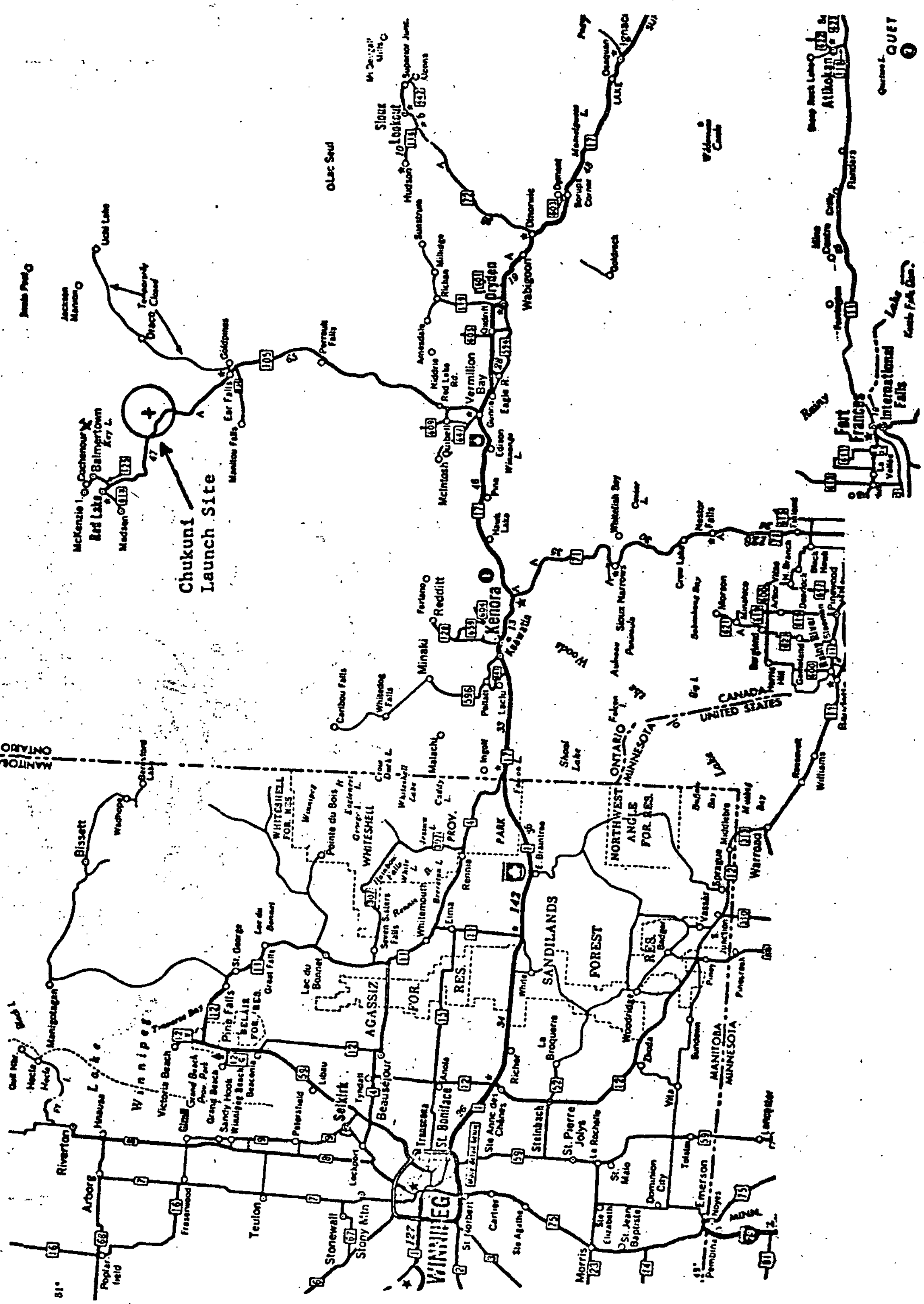

Red Lake Area Map

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