NEWS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: WEDNESDAY A.M.
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PROJECT: BARIUM CLOUD LAUNCH

PRESS KIT

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NEWS

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GERMAN-U.S. CLOUD EXPERIMENT

The German Federal Ministry for Scientific Research (BMBW) and the U.S. National Aeronautics and Space Administration are cooperating in an experiment aimed at ejecting into space a chemical which will produce a glowing, barium ion cloud about 20,000 miles above the Earth.

If successfully launched the cloud will be visible to the naked eye for 15 to 20 minutes after release of the barium as a first-magnitude or bright star over most of the Western Hemisphere the night of April 20.

A Scout rocket furnished by NASA is scheduled to lift off from Wallops Island, VA, between 7 and 9 p.m. EST and about three and one-half hours later the barium payload will be ejected 20,000 miles above Central America (7°N - 75°W) to form a very thin or widely-dispersed ionized cloud about 10,000 miles (17,000 kilometers) long which can only be detected by sensitive ground and airborne instruments.

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Both German and U.S. scientists at observation sites in North and South America will use special camera equipment to view it. In addition, a NASA Convair 990 aircraft will observe the cloud on a flight corridor between Bermuda and the eastern United States. Weather conditions at the various sites must be clear, or expected to be clear, during the viewing time to permit the launch.

The payload of 36 pounds of barium-copper oxide mixture will be released between 10:40 p.m. and 12:30 a.m. EST, depending on the actual time of launch during the period April 20-28. If the weather is bad, another launch attempt will be made in the May 18-27 period.

The purpose of the experiment is to study the behavior of a barium ion cloud at high altitudes. At lower altitudes, the cloud is moved by electric and magnetic fields and can be used to map them in much the same way as iron filings are used to map the magnetic field lines around a magnet. At higher altitudes it is believed that this can also be done if the cloud can be observed for long enough to "settle down" after the initial explosive release.

As the barium ions distribute themselves along a magnetic field line in a long visible cloud, photographs will permit visual mapping of the electromagnetic forces acting in the area in which the barium is released.

The position and motions of the cloud can be determined at successive instants by triangulation from the widely separated observation stations. The strength and orientation of the electric field vectors also may be calculated from these data.

These techniques can be used to measure both magnetic and electrical fields in space and to study plasma physics effects not possible in the laboratory. The barium experiment can also simulate the interaction of the solar wind with an ionized comet trail.

Scientific studies to be performed will include:

1. A study of the expansion of the ionized cloud and the development of fine structure such as bars or ripples in the cloud as noted in earlier experiments.
2. A study of physical effects of the cloud on its magnetospheric environment, in particular, on the magnetic field. (For this purpose, a magnetometer system is part of the payload.)
3. A study of the deformation and disintegration of the cloud in the late phase of its lifetime - the way it changes in relation to the surrounding medium, cannot be reproduced in the laboratory.

Special optical observation sites have been selected in areas where favorable weather patterns are likely to exist. They are located in Arizona and New Mexico in the United States, and near La Serena, Chile and Arequipa, Peru in South America. Additional data will also be obtained from existing ground based geophysical instruments and orbiting satellites.

The barium release technique was pioneered by Professor Reimar Lust, Director of the Max-Planck- Institut for Extraterrestrial Physics, (MPE) Munich. It has been successfully used in numerous sounding rocket experiments at altitudes up to 600 miles. In March 1969, a successful release of six pounds of barium was made by MPE from the European Space Research Satellite HEOS-1, at about 46,000 miles (74,000 km) altitude.

The Standard Frequency and Time Service of the National Bureau of Standards will transmit hourly a taped 45-second announcement for astronomers beginning one week before launch. The announcements, giving information on the project, will be transmitted by stations WWV and WWVH three to four minutes after the hour on 2.55 Megahertz (MHz), 10 MHz, 15 MHz and 20 MHz.

Under the terms of the cooperative agreement, BMBW is providing the payload and NASA the Scout rocket. Each organization is providing observation and data acquisition instrumentation in support of its particular scientific interests. NASA will conduct launch operations and provide tracking and communications services. Each agency will bear the cost of its respective responsibilities.

The results of the observations will be shared by both NASA and BMBW, who will publish their results and make them available to the scientific community.

MPE designed and built the payload. The Scout rocket project is under the direct management of Langley Research Center, Hampton, VA, and is built by LTV Aerospace Corp., Dallas.

The Scout launch vehicle is a four-stage solid propellant rocket system.

Its four motors -- Algol II, Castor II, Antares II, and Altair III -- are interlocked with transition sections that contain guidance, control, ignition and instrumentation systems, separation systems and the spin motors needed to stabilize the fourth stage. Control is achieved by aerodynamic surfaces, jet vanes and hydrogen peroxide jets.

The launch vehicle is approximately 73 feet (22.25 meters) long and weighs about 40,000 pounds (17,144 kilograms) at liftoff.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS)

SEQUENCE OF EVENTS

Event	Time (sec.)
Liftoff	0.00
First stage burnout	68.47
Second stage ignition	68.47
Second stage burnout	108.83
Third stage ignition	113.83
Third stage burnout	150.52
Spin-up	164.17
Third stage separation	165.67
Fourth stage ignition	170.52
Fourth stage burnout	205.99
Barium release	12,843.70

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OPTICAL OBSERVATION SITES FOR THE BARIUM ION CLOUD EXPERIMENT

Max-Planck-Institut

Location	Latitude	Longitude	Elevation (ft)
Kitt Peak National Observatory, Tucson	31°57'N	111°36'W	8,750
European Southern Observatory La Silla Peak, La Serena, Chile	29°16'S	70°44'W	7,872

National Aeronautics and Space Administration

Location	Latitude	Longitude	Elevation (ft)
Smithsonian Astrophysical Observatory, Baker-Nunn Satellite Camera Site Mt. Hopkins, AZ	31°41'N	110°43'W	7,820
White Sands Missile Range White Sands, NM	32°25'N	106°33'W	5,412
Smithsonian Astrophysical Observatory, Baker-Nunn Satellite Camera Site Arequipa, Peru	16°28'S	71°30'W	8,060
Cerro Tololo Inter-American Observatory, La Serena, Chile	30°10'S	70°49'W	7,200

The NASA CV-990 High Altitude Research Aircraft (NASA-711) will be instrumented and operated in a corridor between Bermuda and Wallops Station as an airborne optical observation site. Flight altitude will be 35,000 feet or higher.

In addition to the prime observations, data will also be obtained from observers at or near the Great Whale Geophysical Station, Great Whale River, Canada, operated by the National Research Council of Canada, and from a similarly instrumented site at Byrd Station, Antarctica, operated by the U. S. National Science Foundation.

The cloud may be viewed throughout the Western Hemisphere and England, weather permitting, by looking in the relative directions below.

Washington, DC	Elevation:	53°	above the horizon
	Azimuth:	180°	from true north
Bermuda	Elevation:	58°	above the horizon
	Azimuth:	203°	from true north
Tucson	Elevation:	42°	above the horizon
	Azimuth:	118°	from true north
Los Cruces, NM	Elevation:	45°	above the horizon
	Azimuth:	124°	from true north
Miami	Elevation:	66°	above the horizon
	Azimuth:	160°	from true north
London	Elevation:	6°	above the horizon
	Azimuth:	262°	from true north
Quito, Ecuador	Elevation:	80°	above the horizon
	Azimuth:	025°	from true north
Santiago, Chile	Elevation:	43°	above the horizon
	Azimuth:	353°	from true north
Arequipa, Peru	Elevation:	62°	above the horizon
	Azimuth:	351°	from true north
Los Angeles	Elevation:	34°	above the horizon
	Azimuth:	114°	from true north
Detroit	Elevation:	48°	above the horizon
	Azimuth:	166°	from true north
Houston	Elevation:	55°	above the horizon
	Azimuth:	136°	from true north
Seattle	Elevation:	25°	above the horizon
	Azimuth:	119°	from true north
Rochester, NY	Elevation:	48°	above the horizon
	Azimuth:	176°	from true north
Denver, CO	Elevation:	41°	above the horizon
	Azimuth:	132°	from true north

Oklahoma City	Elevation:	49°	above the horizon
	Azimuth:	139°	from true north
Boston	Elevation:	48°	above the horizon
	Azimuth:	187°	from true north
Helena, MT	Elevation:	31°	above the horizon
	Azimuth:	129°	from true north
Fort Churchill, Canada	Elevation:	28°	above the horizon
	Azimuth:	157°	from true north
Winnipeg, Canada	Elevation:	36°	above the horizon
	Azimuth:	149°	from true north
Natal, Brazil	Elevation:	42°	above the horizon
	Azimuth:	75°	from true north
Rio de Janeiro, Brazil	Elevation:	34°	above the horizon
	Azimuth:	58°	from true north

TRACKING & DATA ACQUISITION SYSTEMS

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Werner Bachschmidt
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Mechanical Systems

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NBS HOURLY TAPED ANNOUNCEMENTS

Time	
T minus 1 week	1. Beginning date of launch window. 2. Time interval in which release is expected. 3. Nominal release position.
Launch Day T minus 4 hours	1. Nominal launch time. 2. Nominal release time and position.
Launch Day T plus 1 hour	1. Notification of launch. 2. Predicted primary release time and position. 3. Time and position of backup timer actuated release.
Launch Day T plus 4 hours	Confirmation of release.

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PROJECT OFFICIALS AND PROGRAM MANAGEMENT

The NASA/MPE Barium Ion Cloud Project is a joint venture of the Bundesministerium fur Bildung und Wissenschaft (BMBW) of the Federal Republic of Germany and the National Aeronautics and Space Administration. Overall responsibility for program direction is under NASA's Office of Space Science and Applications (OSSA) and for BMBW the Max-Planck-Institut fur Physik und Astrophysik, Institut fur Extraterrestrische Physik.

Program Managers

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