Mr. Abe Leiss

Dear Abe:— Here are two copies of the press material submitted to Headquarters in connection with the forthcoming Scout launch. Many thanks for the assistance of the Scout Project Group.

Lee Dickinson 11-28-60
National Aeronautics and Space Administration will launch the third in a series of Scout research rocket vehicles from Wallops Station, Wallops Island, Virginia, in an orbital flight which has two scientific purposes.

The principal aim is to study the performance, structural integrity and environmental conditions of the 72-foot, 36,600-pound four-stage Scout research vehicle and the guidance-controls system.

The second mission is to inject into orbit an inflatable 14$\frac{1}{2}$-pound, 12-foot-diameter spherical satellite, fabricated of mylar plastic film and aluminum foil, for use in studying the characteristics of space -- primarily to measure air drag to determine the density of the earth's atmosphere on the fringe of space.

The launch, part of NASA's Scout development program to provide the United States with a small, reliable and flexible solid-fuel booster capable of deep space probes and of orbital missions, will be a pioneering venture in two respects:

1. This will be the world's first orbital attempt using a solid fuel rocket -- culminating two years of development work by the NASA Langley Research Center's Scout Project Group, in cooperation with industry and other Federal agencies.
2. It will mark the first orbital attempt with any vehicle from NASA's Wallops Station, where more than 3,500 rocket-propelled aerospace research models have been launched since the facility was established in July 1945 on the Eastern Shore of Virginia.

Scout's four rocket motors, all named for stars in the constellations, consist of the Algol first stage, Castor second stage, Antares third stage, and Altair fourth stage. The first Scout orbital attempt follows a completely successful ballistic test— the second in a development series— conducted on October 4, 1960, during which the four-stage vehicle reached an altitude of 3,500 statute miles and traveled 5,800 statute miles down the Atlantic Ocean from Wallops Island.

The first complete Scout vehicle was launched on July 1, 1960, on a ballistic trajectory in another development flight from Wallops Island. A Scout component test to investigate the performance of the previously unflown first and third stages was conducted from Wallops Island on April 18, 1960.

Experience gained during the launching operations and development flights is being applied to improve performance of Scout as a future space research vehicle. In the development flights and in future operational launches from Wallops Island, new facilities completed earlier this year are used. These include a pad, launch tower, block house, and related ground support, electronics and tracking equipment.
The present determination of atmospheric density at satellite altitudes is inferred from calculations of tracking data obtained from numerous satellites of different sizes and shapes. The air density-drag measurements experiment will provide accurate information on the characteristics of space between altitudes of about 400 to 100 statute miles—giving scientists a firm basis for more accurately predicting the orbital life of satellites and other vehicles.

In the air density-drag measurements experiment, the orbiting spherical satellite will be the measuring instrument. As the satellite, an object with a known mass and frontal area and highly sensitive to drag, begins to descend and dip more and more into the earth's atmosphere, it will lose energy. Worldwide radio and optical tracking measurements of the resultant changes in orbit will allow computations of atmospheric density.

Payload of the air density-drag measurements experiment weighs 87 pounds. This includes the 12½-pound inflatable satellite and 75 pounds of satellite ejection and inflation equipment, the fourth stage telemeter system, and necessary hardware—including the metal container in the nose of the Scout fourth stage. The fourth stage rocket motor and the attached payload container which will follow the sphere into orbit will weigh about 140 pounds.
Project engineer for the orbital flight is James R. Hall of Langley's Scout Project Group. Claude W. Coffee Jr. of Langley's Space Vehicles Group is serving as project engineer for the inflatable satellite experiment. The Wallops launch team is being directed by Robert T. Duffy of the Wallops Station staff.

The spherical satellite, about twice the thickness of the cellophane on a cigarette package, is constructed of four alternate layers of mylar plastic film and aluminum foil. The fabrication sequence is a layer of plastic film on the inside, an outer layer of aluminum foil, another layer of plastic film, and a final layer of aluminum foil on the exterior surface. Each layer is 0.0005 inches thick, resulting in a total laminated satellite thickness of approximately 0.002 inches or two mils. The sphere was fabricated at Langley by bonding together 40 flat gores of the aluminum-mylar laminate.

A 2½-pound, 3 by 4-inch radio beacon attached to the satellite will be powered by solar cells and miniature storage batteries. The storage batteries will supply the necessary power while the satellite is in darkness. The beacon's continuous wave crystal control transmitter will have a power output of about 15 mw and transmit on a frequency of either 136.470 or 136.610 megacycles. The satellite is separated by a thin equatorial gap constructed of an insulating material—permitting the resulting two foil-covered hemispheres to form the antenna for the tracking beacon transmitter. This will be the first use of the Minitrack frequency of 136 megacycles in a satellite.
In gathering data for use in the drag measuring experiment, the satellite will be tracked through the small beacon by the Minitrack Receiving Station Network of the NASA Goddard Space Flight Center at Greenbelt, Maryland. Optical tracking of the highly-reflective satellite will be accomplished by the Smithsonian Astrophysical Observatory (SAO) of Cambridge, Mass., through use of Baker-Nunn camera stations and cooperating optical tracking teams. SAO also plans to optically track the fourth stage.

There are 14 Minitrack stations located in various parts of the world, including five in the United States. There is a station at Blossom Point, Maryland; Fort Myers, Florida; Grandforks, Minnesota; San Diego, California; Fairbanks, Alaska; Essecen Park, South Africa; Lima, Peru; St. Johns, Newfoundland; Woomera, Australia; Antigua, British West Indies; Quito, Equador; Winkfield, England; and Antofagasta and Santiago, Chile.

Three Baker-Nunn camera stations are in the United States—at Jupiter, Florida; Maui, Hawaii, and Oregon Pass, New Mexico. Those in foreign countries are located at Olifantsfontein, South Africa; Woomera, Australia; San Fernando, Spain; Tokyo, Japan; Naini Tal, India; Arequipa, Peru; Shiraz, Iran; Curacao, Netherlands West Indies; and Villa Dolores, Argentina.

Scientists at the Langley Research Center will analyze the satellite tracking data for the determination of the atmospheric density.
The deflated mylar-aluminum foil satellite is folded accordian-fashion and scientifically packaged inside a metal tube 8\(\frac{1}{2}\) inches in diameter and about 19 inches long-- mounted on the front end of the fourth-stage rocket. The satellite and its attached tracking beacon components are inserted inside the front end of the tube to occupy a space approximately 8\(\frac{1}{2}\) inches in diameter and 11 inches long. Behind the folded satellite is an ejection bellows, a steel inflation bottle containing nitrogen gas under a pressure of about 1,800 pounds per square inch, followed by a fourth-stage telemeter and its batteries.

The spherical satellite will be launched in a southeasterly direction and will have an elliptical flight path-- with a perigee of about 410 statute miles and an apogee of about 1,275 statute miles. The belt covered by the initial orbits will extend 38 degrees north and south of the equator. The satellite is programmed to travel at a velocity of approximately 16,600 mph as it is injected into orbit and at perigee. Satellite speed at apogee will be about 14,000 mph. Time of the satellite's initial orbital period is estimated at 112\(\frac{1}{2}\) minutes.

The first orbit will carry the sphere across the southern part of Africa and mid-Australia, and it begins its first pass over the United States on the initial orbit near San Francisco--crossing the lower half of the country before passing over the east coast and the Atlantic Ocean above Charleston, South Carolina. During twilight and evening the sphere, when overhead, will be visible to the naked eye at perigee but will be only barely visible at apogee without the use of binoculars or telescopes.
After launch, Scout's first stage remains attached to the vehicle until it is blasted off at second stage ignition at 130,000 feet. The burned out second stage coasts with the vehicle to 315,000 feet and is blast-separated as the guidance programmer ignites the third stage rocket motor and the drag and heat fairings on the third and fourth stages are jettisoned. The spent third stage, with its guidance and control system operating, coasts to apogee attached to the fourth stage. The two stages are aligned with the local horizon as the fourth stage is spun to about 150 rpm by small spin rockets, ignited, and separated from the third stage. The velocity increment gained during fourth stage burning places the payload and fourth stage into orbit.

Injection into orbit is scheduled to occur about 10$\frac{1}{2}$ minutes after lift off--about 1,325 statute miles down range approximately at 52 degrees west longitude and 35 degrees north latitude. A small explosion in the payload container activates the inflation mechanism--opening the inflation bottle valve and permitting the inflation gas to flow into the ejection bellows. The bellows expand immediately and push the folded satellite out of the front end of the container. The satellite remains attached to the bellows by a disconnect mechanism during the inflation process. After it is inflated fully, the sphere is released by the disconnect mechanism and a separation spring pushes the satellite ahead of the combination payload container-fourth stage. The small tracking beacon becomes operative for the first time automatically upon the satellite's ejection from the payload container. It requires 4$\frac{1}{2}$ minutes to eject, inflate and separate the satellite from the rocket.
The combination fourth stage rocket motor-payload container and the inflated sphere are expected to become increasingly separated in orbit because of differences in drag. Since the sphere is hundreds of times more sensitive to atmospheric drag than the heavier satellites which have been launched, it is expected to remain in orbit from a few weeks to possibly a year before spiraling into the heavy, friction-inducing lower atmosphere and burning up. The predicted orbital lifetime of the spent rocket motor is much longer.

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The Scout concept originated in mid-1958 at the Langley Research Center--in the Applied Materials and Physics Division. This division has conducted hundreds of aeronautical and space research programs at Wallops Island, using solid fueled research vehicles having from one to six rocket stages. A special Scout Project Group, including several veterans of Wallops Island research launchings, was formed at Langley to develop the vehicle.

Scout is presently in its development phase. As an operational vehicle, it is designed to place a 150-pound satellite into a circular orbit approximately 300 miles above the earth or to loft a 50-pound scientific probe to an altitude of about 8,400 miles. In reentry body tests, Scout will permit simulation of conditions expected by a space vehicle returning to the earth's atmosphere. With a ballistic trajectory, it will be possible to obtain almost two hours of zero-gravity environment with 100-pound experiments.

The Scout Project Group at Langley is headed by William E. Stoney Jr. He was born September 13, 1925, in Terre Haute, Indiana, and presently is a resident of Hampton, Virginia. After service in the Army Air Corps during World War II, he received his bachelor of science degree in aeronautical engineering from the Massachusetts Institute of Technology in June 1949 and his masters degree in aeronautical engineering from the University of Virginia in August 1951. He has been author or co-author of about 20 technical documents since he began his science career at the Langley Research Center in August 1949.
Management of the Scout program at NASA Headquarters is under R. D. Ginter of the Office of Launch Vehicle Programs.

Prime contractors and vendors in the program are:

Vought Astronautics Division of Chance Vought Aircraft, Dallas, Texas - launch tower fabrication and installation, airframe and motor transition section manufacturer.

Allegany Ballistics Laboratory, a Navy Bureau of Weapons facility operated by Hercules Powder Company at Cumberland, Maryland - third and fourth stage motor developments.

Aerojet-General Division of General Tire and Rubber Company, Sacramento, California - first stage motor development.

Redstone Division of Thiokol Chemical Corporation, Huntsville, Alabama - second stage motor development.

Aeronautical Division of Minneapolis Regulator Company, Minneapolis, Minnesota - guidance and controls. (Hydrogen-peroxide controls were sub-contracted to Walter Kidde, Clifton, New Jersey).

The following is a description of the four Scout rocket stages and the vehicle's auxiliary parts:

First Stage: Algol, 30 feet long, 40 inches in diameter, and developing 115,000 pounds of thrust, is fin stabilized and controlled in flight by jet vanes. The largest solid rocket flown in the United States, its sole operational application to date is as the Scout first stage. Algol is named for a fixed star in the constellation Perseus.

Second Stage: Castor is 20 feet long, 30 inches in diameter and has a thrust of over 50,000 pounds. A modification of the Sergeant motor, it has been used successfully in a cluster in NASA's Little Joe program in support of Project Mercury. On the
Scout, the Castor is stabilized and controlled by hydrogen peroxide jets. Castor is the "tamer of the horses" in the constellation Gemini.

Third Stage: Antares is 10 feet long and 30 inches in diameter with a thrust in excess of 13,600 pounds. Stabilized and controlled by hydrogen peroxide jets and utilizing lightweight plastic construction throughout its design, Antares is a scaled-up version of the fourth stage and is the only motor developed specifically for Scout. Antares is the brightest star in the constellation Scorpio.

Fourth Stage: Altair, six feet long, 18 inches in diameter, and having 3,000 pounds of thrust, is the smallest of the four Scout stages. The spin-stabilized Altair formerly was known as X-248. It is the third stage on the Able and Delta launch vehicles and was the first fully developed rocket to utilize lightweight plastic construction throughout. Altair is a star of the first magnitude in the constellation Aquilae, or Eagle.

Auxiliary Parts: The added Scout airframe parts consist of control surfaces surrounding the nozzle of the first stage, transition sections connecting the four rocket stages, a fibreglas-phenolic protective heat shield which covers the third and fourth stages plus payload, the fourth-stage spin-up table, and the payload attachment structure.
James R. Hall of the Langley Scout Project Group and
project engineer for the orbital flight, was born November
29, 1921, in New York City. He now makes his home in Newport
News, Virginia. He served with the Royal Canadian Air Force
during World War II and received his bachelor of science
degree in aeronautical engineering in 1948 from the Brooklyn
Polytechnic Institute. He has been author or co-author of
about 14 technical documents since he joined the NASA staff
at Langley in July 1948.

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INFLATABLE SPHERICAL SATELLITES

The 12-foot inflatable spherical satellite employed as a research vehicle by NASA was conceived, fabricated, and packaged at the Langley Research Center by a team of scientists, engineers, technicians, and skilled modelmakers. The material for the Scout satellite was laminated to NASA specifications by the Reynolds Metals Company.

The satellite was developed under direction of William J. O'Sullivan Jr., head of Langley's Space Vehicles Group and a pioneer in the field of research with inflatable and erectable space structures. He directed the design, development, and packaging of the Echo I passive communications satellite which has been in orbit since last August 12.

O'Sullivan first proposed in January 1956 the use of lightweight spherical satellites in measuring the minute aerodynamic drag experienced by earth satellites in the outer fringes of the earth's atmosphere--to obtain density data by observation of the orbit decay.

There have been three previous attempts to orbit small spherical satellites in air density-drag measurements experiments from Cape Canaveral. Smallest was a 30-inch satellite launched on April 13, 1959, on a Vanguard vehicle. The other two were 12-footers--the first on October 22, 1958, in a Jupiter C rocket and the second in a Juno II vehicle on August 14, 1959. In all three flights, the launch vehicle failed to make orbit.
The plastic film in the four-ply laminated 12-foot sphere to be launched in a Scout vehicle gives the satellite the toughness it requires to be folded into a compact package for ease of transport into orbit. The aluminum foil serves several purposes—making the satellite stiff, highly reflective of sunlight and radio waves, electrically conductive, helping regulate satellite temperature, and protecting the plastic film from the intense ultraviolet radiation in the area beyond the protective filter cover of the earth's atmosphere.

By providing stiffness, the aluminum foil permits the satellite to remain spherical without internal pressure as it orbits the earth. After separation of the satellite and payload container, the internal pressure in the sphere equalizes with the outside environmental pressure through an open valve stem in the satellite. Any remaining inflation gas is expected to be lost through punctures made in the satellite structure by micrometeorites.

In making the satellite highly reflective of sunlight, the aluminum foil permits the sphere to be tracked optically throughout the world. Studies conducted at Langley indicate that the shiny aluminum foil will reflect about 80 per cent of the sunlight which falls upon the satellite in orbit.

Because the aluminum foil makes the satellite reflective of radio waves, it will be possible to use the 12-foot sphere to conduct passive communications experiments similar to those carried out with the 100-foot Echo I satellite. It is expected that the Scout-launched 12-foot satellite will be used to bounce radio waves between two transmitting stations that are mutually visible
to the satellite.

By making the satellite's outside surface electrically conductive through use of aluminum foil, the sphere itself serves as an antenna for the small radio beacon attached to it for tracking purposes. The satellite is separated into hemispheres by a $\frac{1}{2}$-inch-wide equatorial gap of an insulating material (mylar), permitting the two hemispheres to form the antenna for the tracking beacon.

The aluminum foil will not keep the temperature of the satellite within the limits required for satisfactory operation of the tracking beacon components. In an effort to obtain better heat balance characteristics, about 20 per cent of the satellite surface area has been covered with a scientific application of white epoxy paint in a pattern consisting of approximately 3,400 two-inch-diameter white dots; in a circle 36 inches in diameter around both the transmitter and battery packages of the beacon, there are about 210 one-inch-diameter dots. For protection against heat while they are in sunlight, the beacon and battery package are covered by 8 by 10-inch rectangles of white paint. The beacon and battery package are thermally decoupled from the satellite through application of the thermos bottle principle for protection against cold while they are in shadow.

The equatorial gap separating the satellite into two hemispheres has an application of white paint to protect the plastic material and prevent the sun from shining through the transparent plastic onto the transmitter and battery packages located inside the surface of the sphere.
The tracking beacon components, consisting of a radio transmitter, a storage battery package, and four solar cell packages-- each containing 70 solar cells-- were designed and contracted by the Radio Corporation of America to NASA design specifications. Each solar cell package is located on the outside skin of the satellite in an arrangement to permit continuous charging of the storage batteries while the satellite is in sunlight. The radio transmitter and the storage battery package are located on the inside skin of the satellite, near the equatorial gap. Printed cable interconnects the various components of the tracking beacon system. The storage batteries will operate the transmitter while the satellite is in shadow, making it possible to have continuous day and night tracking.

Claude W. Coffee Jr. of Langley's Space Vehicles Group and project engineer of the air density-drag measurements experiment, has been a Langley research scientist since October 1947. He was born February 24, 1921, in Sanford, Florida, and now makes his home in Newport News, Virginia. He graduated from the University of Florida with a bachelor of science degree in mechanical engineering in July 1942 and returned to the university in 1946 after World War II Army service and received a degree in industrial engineering in June 1947. During his NASA service, he has been author or co-author of a dozen technical publications.

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Radio telemetry systems in the Scout rocket vehicle on its first orbital flight attempt will measure and transmit data on flight environment and performance of the four rocket motors and the guidance system and will report on the ejection, inflation and disconnection of the satellite from the payload container.

A ground station at Wallops Island will record the fourth stage telemetry from launch until satellite separation from the payload container. An auxiliary ground station will be in operation at Bermuda to help insure reception of the ejection, inflation and separation of the satellite during injection into orbit.

The instrumentation systems in the first, third and fourth stages of the Scout vehicle were designed and installed under the direction of Emedio M. Bracalente of the Langley Research Center by personnel of Langley's Instrument Research Division. They were assisted in this work by a team of the Chance Vought Aircraft Company, Inc., stationed at the Langley Research Center and Wallops Station.

There follows a brief description of the functions of the instrumentation in the three stages:

First Stage: One telemeter unit at the base of the first stage transmits 22 measurements of tail fin positions, temperatures, pressures, and accelerations during the early period of flight.
Third Stage: A second telemeter system at the top of the third stage monitors performance of the vehicle from firing through the coast period of the third stage. Seventy measurements of vibrations, temperatures, guidance-control signals, pressures and events give detailed information on the environment and systems performance.

Fourth Stage: The third telemetry system is in the payload in the nose of the fourth stage and performs a dual function. During burning of the four rocket motors, this system measures payload environment, vehicle accelerations and fourth-stage roll rate. At injection into orbit, the telemeter reports on the functions required for a successful experiment—such as sphere ejection from the payload container, inflation, and separation from the fourth stage. Instrumentation in the payload and fourth stage rocket motor was accomplished under direction of John D. Setzer of the Langley Research Center.

Miscellaneous: The instrumentation system also includes a radar beacon which is used to effectively increase the range of the ground-based radar tracking equipment. In the event of systems malfunction, an on-board command-destruct system provides for flight termination by means of a command signal transmitted from the Wallops Island launch site. Weight of the instrumentation in the first and third stages is approximately 80 pounds.

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ANNEX IA

FOR RELEASE AT LAUNCH
DATE

Wallops Island, Virginia - National Aeronautics and Space Administration announced that a four-stage solid-propellant Scout rocket research vehicle was launched here today on its first orbital flight attempt. The vehicle was launched at ___ EST.

x x x

ANNEX IB

FOR RELEASE AFTER LAUNCH
DATE

Wallops Island, Virginia - National Aeronautics and Space Administration announced that all four stages of the Scout research rocket vehicle launched here today on its first orbital flight attempt have fired successfully.

NASA launched the solid-propellant research vehicle at ___ EST.

x x x

ANNEX IC

FOR RELEASE AFTER LAUNCH
DATE

Wallops Island, Virginia - National Aeronautics and Space Administration announced that a 12-foot inflatable spherical satellite launched here today by a Scout rocket research vehicle has been injected into orbit. The vehicle was launched at ___ EST and orbit was achieved at ___ EST.

Information on the characteristics of the satellite orbit will be reported as soon as worldwide tracking data have been analyzed.

x x x
Wallops Island, Virginia - National Aeronautics and Space Administration announced that a 12-foot inflatable spherical satellite launched here today by a Scout rocket research vehicle failed to go into orbit. NASA is investigating to determine the cause of the failure. The vehicle was launched at ________ EST.

Wallops Island, Virginia - National Aeronautics and Space Administration announced that a Scout rocket research vehicle exploded on its launch pad here today during its first orbital flight attempt. NASA is investigating to determine the cause of the explosion, which occurred at ________ EST.

Wallops Island, Virginia - National Aeronautics and Space Administration announced that a Scout research rocket vehicle launched here today on its first orbital flight attempt at ________ EST did not perform as programmed.

The first second third fourth stage of the vehicle failed to ignite exploded ________ seconds minutes after launch at an altitude of about ________ feet miles. The vehicle impacted in the Atlantic Ocean about ________ miles away.

NASA is investigating to determine the cause of the abort.

x x x