NACA LEWIS FLIGHT PROPULSION LABORATORY

WING TIPS

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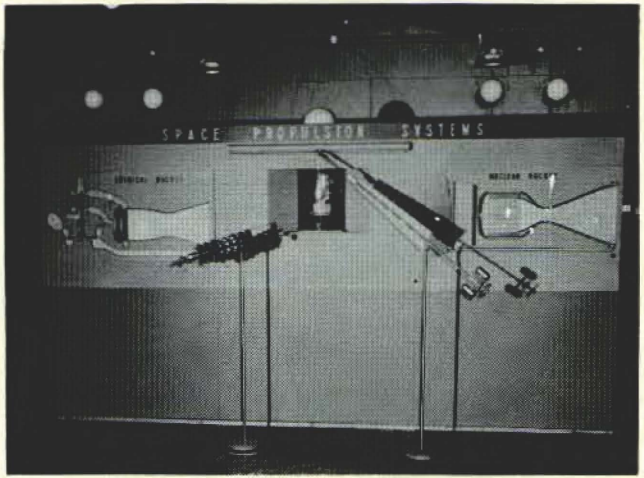
DISPLAY SENT TO AMES



The Triennial Inspection of the Ames Aeronautical Laboratory will be held July 14 through 16. As a part of the Inspection, Lewis Laboratory has sent a display on Space Propulsion Systems.

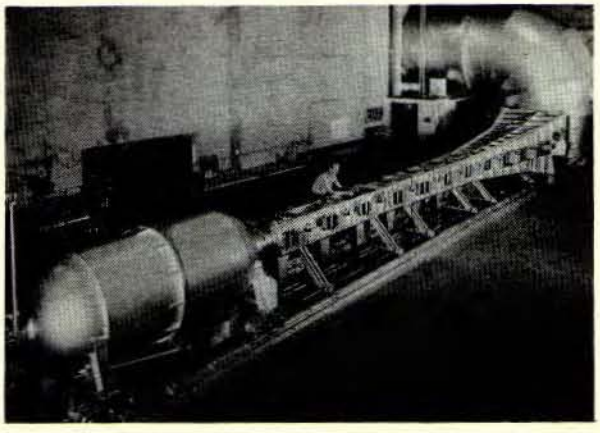
In the photograph of the display as it was assembled in the Wood Model Shop prior to shipment to Ames, can be seen back-lighted diagrams of chemical and nuclear rockets and, in the center, an operating model of an electric jet device. Above the panels are models of typical Earth-Moon trajectories. Standing in front of the display are two small scaled models of space craft. Not shown are models of the Thor-Vanguard moon-strike vehicle, two models to the same scale showing the effect of propellant choice on the size of supply vehicles needed to put 20,000 pound payloads in Earth satellite orbit.

To complete the presentation, a motion picture will be shown depicting configurations and trajectories of missions of nuclear and electric rocket powered space ships traveling from Earth satellite orbit to Mars and return.

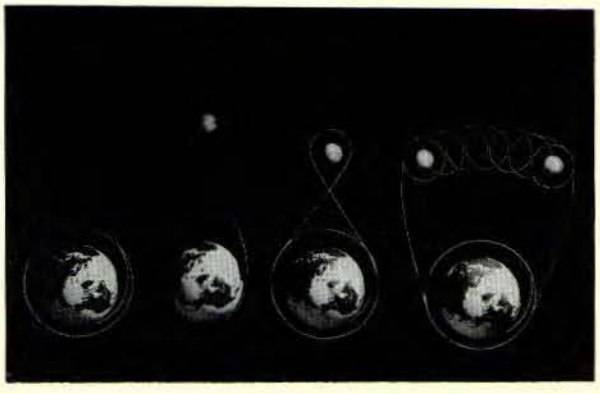
VIEWS OF AMES 1958 TRIENNIAL INSPECTION

Satellite Orbits: A simple device to demonstrate satellite orbits is this curved table. A steel sphere, released from the demonstrator's hand, follows a path very like that of a descending Earth satellite, moving closer to the model Earth with each circuit. Because of friction between the steel ball and the table over which it rolls, the analogy with an actual satellite operating in space is not complete, but the device is useful for visualizing various aspects of satellite entry into the atmosphere. The curvature of the table is intended to simulate the way in which gravitational attraction increases near the Earth's surface.

Atmosphere Entry Simulator: The flight of a ballistic missile as it enters the Earth's atmosphere is duplicated in the Ames Laboratory's Atmosphere Entry Simulator. The device combines a specially shaped supersonic nozzle with a high speed gun to duplicate both the flight of the missile and the changing density of the atmosphere through which it travels. At the left is a storage tank for high pressure air. Next is the trumpet shaped nozzle, ending in a large pipe connected to a vacuum sphere outside the test chamber. Not visible in this photograph is the high speed gun for model launching. Technicians are adjusting two of the 48 shadowgraph stations which make accurate picture and time records of a model flight. When a gun-launched model flies at full re-entry speed into the simulator nozzle, it experiences during a few thousandths of a second the decelerations, stresses, pressures and temperatures of actual entry. The simulator can quickly and economically determine in the laboratory whether a specific design can survive atmosphere entry.

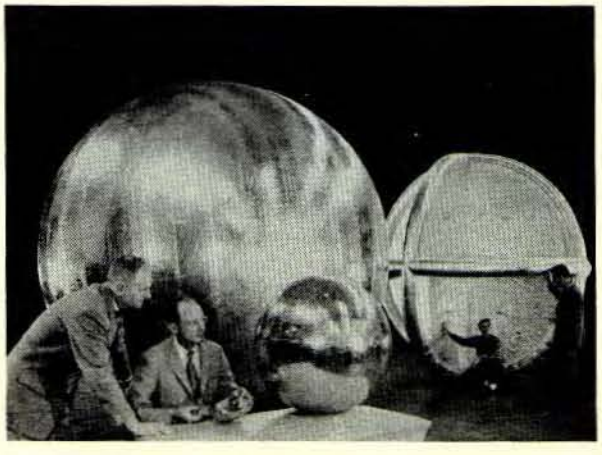


Moon Missions: Diagram of various types of "Moon Missions" showing a satellite in orbit around the Earth, a Moon impact shot, an orbit around the Moon once and return to Earth, and a multiple orbiting of the Moon and return to Earth.



Inflatable Satellites: Extremely lightweight inflatable satellites made of micro-thin plastic covered with aluminum foil have been devised by scientists at Langley Laboratory. These satellites will be used as radar targets and for measuring air density and other characteristics of space.

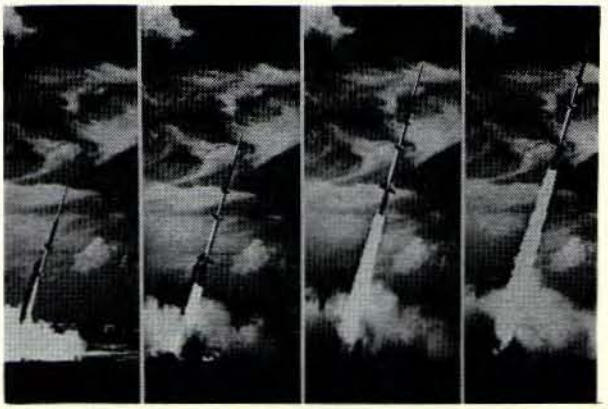
These satellites will be propelled into space in a deflated condition, ejected into orbit and automatically inflated by a nitrogen gas cartridge. Gas pressure is then allowed to escape to prevent the satellite from becoming propulsive in the event of puncture by a micrometeorite. Aluminum foil permits the satellites to maintain shape after pressure is released.



VIEWS OF AMES 1958 TRIENNIAL INSPECTION

Hypervelocity Ballistic Range: Newest of the research tools of the Ames Laboratory is the Hypervelocity Ballistic Range. A light-gas gun capable of launching 3/4-inch aerodynamic models at speeds up to 16,000 miles per hour is located between the large sphere in the foreground and the tank shown at the rear. Technicians are adjusting the high-pressure couplings which link segments of the gun barrel. The sphere in the foreground is needed to absorb the blast of gases which rush from the rear of the gun during the firing cycle. Beyond the view of the camera is a tank 500 feet long and 8 feet in diameter through which models fly during tests. New knowledge to contribute to solving the problems of atmosphere re-entry comes from facilities like this.

Test Vehicle Firing: A five-stage, rocket-powered, instrumented test vehicle is fired at the NACA Pilotless Aircraft Research Station at Wallops Island, Virginia, to obtain information useful in the design of ballistic missiles, satellites and space craft. Speeds of more than 11,000 miles per hour (Mach 16) and altitudes of 200 miles have been reached by NACA rocket research vehicles which are powered by readily available and relatively inexpensive, solid fuel rockets.



Ion-Propulsion Model: Stan Domitz (PAD) is shown operating a miniature laboratory ion-propulsion model which produces thrust detected by the oscillating arm mounted on the model. Electric propulsion systems, such as ion jets, are believed best suited for interplanetary travel or space craft control because of their ability to operate on much smaller propellant requirements then either chemical or nuclear rockets.

A Hypothetical Space Craft Model equipped with the components of a typical electric propulsion system. A nuclear reactor is located at the foremost extremity of the craft at the left. Immediately behind the reactor are a neutron shield, a heat exchanger, a gamma ray shield, and the propellant. The tank-like structure near the center of the model houses turbogenerating equipment through which the working fluid from the heat exchanger is pumped before circulation within the large radiator just aft of this structure. There excess heat is dissipated into space. At the rear of the model are two crew cabins, a landing vehicle, and a ring-shaped propellant accelerator. While this model shows the basic components of an electrical propulsion system it is not intended to be representative of a prototype space craft.