SPACE

Wingless Orbit Craft

A new slender cone-shaped wingless aircraft that can orbit the earth and allow an astronaut to land horizontally after reentry has been developed, William Siegrist reports.

See Front Cover

➤ A COMPLETE departure from conventional aircraft and current spacecraft is represented in the M-2 "lifting body" of the National Aeronautics and Space Administration.

The craft is wingless, yet maneuverable and capable of orbiting the earth and landing like an airplane. It is about to be tested for full-scale flight research at the Ames Research Center, Moffett Field, Calif.

The only identifiable features on the craft are elevons (combination of elevator and aileron), landing gear, vertical fins and a canopy shaped like a "cockpit greenhouse." Its overall shape is like a somewhat slender half-cone body with a blunted nose.

Ames scientists say the craft could give an astronaut over 1,000 miles to maneuver after entering the earth's atmosphere from space flight. This would allow an astronaut to land horizontally at almost any suitable area within the United States.

The X-15 of the Navy, Air Force and NASA also lands horizontally after making its reentry from space.

Because of the rivalry between the Air Force and NASA, there is bound to be a great deal of competition between the Air Force's DynaSoar (X-20), due to be flight tested in 1965, and the M-2. NASA plans to flight test the M-2 early this spring.

The space agency pointedly observes that the M-2 can have a horizontal landing capability "equal to or better than the X-15 hypersonic research aircraft."

Deceleration stress on the astronaut in the M-2 will be reduced from about eight times the force of gravity to less than two times the force of gravity.

Seen on this week's front cover is a model of the wingless, maneuverable space vehicle, conceived and proven feasible at NASA's Ames Research Center. It is shown during the heating phase of testing in a one-foot hypervelocity wind tunnel. The air flow is 14,000 feet per second (9,500 miles per hour), producing temperatures at the blunt nose of about 9,000 degrees Fahrenheit. Under certain conditions and at high altitudes a vehicle in actual flight in space will encounter temperatures well in excess of this level. When this picture was taken, the heat transfer distribution was being measured.

A full-scale vehicle is now under construction for manned piloted low-speed and landing flight research, according to Ames scientist George Kenyon, who carried out the low-speed wind tunnel testing. The craft will have an enlarged canopy and a dorsal fin for safety purposes. The first piloted tests will take place at NASA's Flight Research Center, Edwards, Calif., in the early spring.

According to Dr. Alfred J. Eggers Jr., assistant director for research and development analysis and planning at Ames Research Center, and originator of the idea of lifting bodies in 1957, the M-2 configuration is one of the first steps in demonstrating the lifting body concept and research is continuing in the hopes of advancing this concept to its fullest extent.

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BIOCHEMISTRY

Fleeting Particles Form Each Second in Everyone

➤ MILLIONS of tiny atomic fragments—called hydrated electrons—form each second in everyone. They are produced by natural background radiation and last only one ten-thousandth of a second or less.

U. S. and British scientists have confirmed the existence of these fleeting particles that play an important role in reactions in water brought on by radiation, either natural or artificial. The fragments are called hydrated, or "wet," electrons because they are strongly attracted to water molecules.

Other intermediate chemical fragments, as well, are formed simultaneously. Although these fragments last only for a short time, they are being replenished constantly. Scientists want to know how these fragments are created and destroyed.

The tools of nuclear science—atomic reactors, particle accelerators, and radioactive isotopes—provide intense radiations that make it possible to study what happens when water and many other compounds are irradiated.

Dr. Edwin J. Hart of Argonne National Laboratory and Dr. Jack W. Boag of Mount Vernon Hospital, Northwood, England, identified the hydrated electron from its absorption of light in the red and infrared regions.

Drs. Hart and Boag used a technique known as "pulse radiolysis" in their identification of the hydrated electron. This technique enables the scientists to "freeze" chemical reactions of unstable intermediates so that they can observe what takes place and thus detect atomic fragments that exist for a few millionths of a second.

Pulse radiolysis is used widely in radiation chemistry laboratories, allowing scientists to see what is happening in rapid reactions in somewhat the same way that high speed photography can be made to "slow down" the action of a fast-moving basketball game.

Knowledge of what happens when water is bombarded by radiation is necessary because water is so important to chemical and biological reactions.

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Argonne National Laboratory

PULSE RADIOLYSIS—Dr. Edwin J. Hart, senior chemist at Argonne National Laboratory, is filling a quartz vial with an experimental solution in preparing to conduct a pulse radiolysis experiment. The solution after irradiation is withdrawn with the syringe shown at left. At far left is the linear accelerator through which high-speed electrons will bombard the solution.

PHYSICS

Science Merry-Go-Round Tests Missile Gravity

➤ INSIDE a new scientific merry-go-round, the greatest accelerations that occur in missile flight will be imitated soon.

The U.S. Air Force at Holloman Air Force Base, N. Mex., will use a centrifuge with a 100-inch radius arm to provide acceleration forces up to 25 times gravity to test the instruments used in missile-guidance testing.

The new centrifuge supplements the sled that on a 35,000-foot test track provides a speedy and thrilling method of producing high acceleration in speedy steps.

Another and larger centrifuge, 260 inches instead of 100, will be completed late in the year.

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TECHNOLOGY

Electronic Parts Moving Rapidly Now X-Rayed

➤ RAPIDLY moving electronic inner mechanism of missiles now can be inspected in a flash by a new X-ray device keyed to a small TV camera.

The missile case is placed under a TV screen and photos taken by the X-ray system. An object under inspection can be seen in motion and enlarged some 32 times actual size.

Ohio State University engineers devised the system, using a special one-inch television camera tube sensitive to X-rays.

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