

Joseph T. Kummer of the FoMoCo battery. It could be 60% recharged in about two hours, and completely recharged "easily" overnight, without the need for special, heavy-duty wiring.

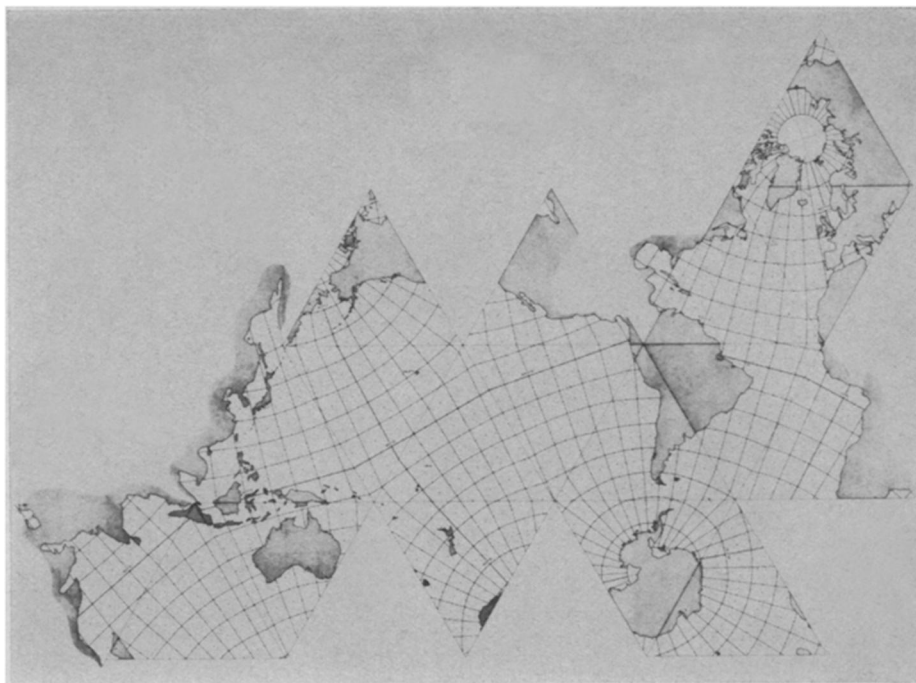
There have been electric cars before, some of which are now eagerly-sought antiques. Others have been tested from time to time by various electric and power companies, to whom they were lent for the purpose by the manufacturers. All, however, have been severely limited in performance by their batteries.

Two prototypes are now being built by Ford of England, one of which will remain there while the other is shipped to the U.S. for evaluation. Intended as low-speed, limited-range vehicles for either suburban errand-running or downtown operation in crowded cities, the vehicles will be little more than hopped-up golf carts.

Since they are intended primarily to test the motor and vehicle concepts, rather than new power sources, they will first be fitted with conventional lead-acid batteries. Not until late 1968 will large enough sodium-sulfur batteries be available.

About six feet long and four feet wide, the cars will hold two adults and two children.

They should be running by next spring.



Lockheed-California Company

"FORECAST" MAP—A new map projection that "flattens" the earth and its oceans with minimum distortion will be used for wave forecasting throughout the world. It accurately converts the globe into 20 triangular map segments joined together in this icosahedral-gnomonic projection. →

TECHNOLOGY

New 'Window' for Planes

See Front Cover

➤ SOME DAY a pilot may fly from New York to Los Angeles without ever looking through the windshield of his plane.

Instead he will rely on the "eyes" of a tiny computer that generates synthetic pictures of the ground, clouds and other objects on a television screen in front of him.

The computer determines how these objects should look to the pilot on the basis of altitude, speed and attitude of the plane in the air.

Designed by General Electric Company's Electronics Laboratory in Syracuse, N.Y., the computed display system is now being used on the ground to train astronauts and pilots at the Houston Manned Space Flight Center and the U.S. Navy Missile Center at Pt. Magu, Calif.

As the astronaut or pilot moves the control stick in his ground training vehicle, he watches the television screen. Objects grow larger as he "flies" closer, the ground falls away as he "takes off" or the deck of an aircraft carrier looms ahead as he prepares to "land." He can even crash a few times to get the feel of it.

The picture, although composed of

computer-made symbols, is in the same perspective as if the pilot were looking out the window. It changes constantly as the plane moves.

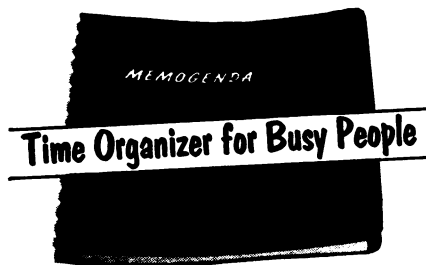
The symbols can give the pilot additional information, such as direction. Clouds, for example, may be represented as arrows pointing north. By checking the position of the arrows on the screen, the pilot learns his direction.

In addition to training pilots and astronauts and simulating flight, the computed display systems can be applied to the design and evaluation of new aircraft and spacecraft.

The National Aeronautics and Space Administration uses its display to evaluate new space guidance and control systems, while the Navy's is used to investigate the control and information requirements of future high performance aircraft.

In the cover photograph, the clouds are seen as airplane-shaped symbols headed toward the viewer. The "L's" at the bottom represent land and also help the pilot judge the direction in which the airplane is moving. The black box to the left is the computer's representation of the aircraft carrier on which the plane will "land."

(Cover photograph by General Electric.)



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Wind and Waves Forecast

Sailors soon will be able to chart their courses around gigantic, dangerous waves, predictable up to 48 hours in advance—By Barbara J. Culliton

► OCEAN WINDS and waves throughout the world may soon be forecast almost two days in advance, thanks to a super-weather-system with a satellite sending an endless stream of data to a huge electronic computer.

Predictions covering the entire Northern Hemisphere and part of the Southern Hemisphere may be possible within a year, Dr. Willard J. Pierson Jr., of New York University School of Engineering and Science, reported in Washington, D.C.

Mathematical techniques for a computer-based system created by Dr. Pierson and a flat-map projection of the world's oceans developed by scientists at Lockheed-California Company, Burbank, are ready to go.

What they need is to be fed with accurate initial information.

Trying to make forecasts from present data is like playing the stock market with yesterday's tapes, Dr. Pierson believes.

Predictions are now made on the basis of often sparse and inaccurate data sent in from ships at sea. A captain often determines wind speed by judging its feel as it blows in his face, and wave heights are estimated by long-time sailors standing on deck.

A possible remedy is a satellite that could be launched into a near-polar orbit and pick-up data around the globe.

Making two complete ocean sur-

veys each day, it could feed back accurate data on the North Pacific for example, in about ten hours, Dr. Pierson told SCIENCE SERVICE.

With data from the satellite, accurate wind and wave predictions could be computed to provide advance warning of hazardous sea conditions, increase the safety of rescue operations on the ocean, give information on wave conditions for the benefit of ship builders and assist the U.S. Navy in operations such as troop deployment and aircraft carrier landings.

Boat and dock owners at seaside resorts could use this data as well.

Weather satellites and computers already record the behavior of the upper levels of the atmosphere for the Environmental Science Services Administration (ESSA), but few computations are made for surface layers, the first 600 feet of air above the ocean.

Even when surface weather and sea conditions are reported, there are large expanses of the ocean in which no ships are sailing.

For these areas, no data are presently available.

The orbiting satellite would gather data equivalent to that reported from 2,800 ships spaced fairly uniformly over the world's oceans.

Reporting the observation-forecasting system with Dr. Pierson were Dr. Leo J. Tick, also of NYU, and Dr. Ledolph Baer of Lockheed-California.

CHEMISTRY

New Coating Repels Water

► CHANCE DISCOVERY of a long-life water repellent coating while searching for an aircraft structure ice inhibitor has lead to an important new technical product.

Dr. Helen Su and Frank W. Thomas of Lockheed-Georgia's organic research laboratory near Marietta, Ga., are co-inventors.

Called Lockheed Windshield Water Repellent, it forms an invisible layer of film which provides continual water repellency for several months when applied to a glass surface.

Dr. Su first applied the coating to her own car in 1965.

She made a second application recently. During a three-week test period she found that nothing would remove the film once it was applied.

Windshield cleaning at service stations merely removed dust leaving the protective water repellent film intact.

Car windshields are only one of several test applications conducted during the past year. The material has been used for coating naval optical devices and a large defense contractor is considering it for optical aircraft systems. A worldwide study is now underway utilizing the coating on F-104 Starfighter windshields under various climatic conditions.

Other applications include coating of electronic parts to prevent moisture-induced malfunction, waterproofing of furniture to protect original finishes and numerous space vehicle applications.

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