

will meet modern demands for smoothness of operation—a problem that did not exist in the days of the Stanley Steamer. One clear-cut advantage of the steam engine is complete combustion of fuel, which eliminates harmful emissions, leaving carbon dioxide and water.

The hybrid car would use a small heat engine—perhaps internal combustion—to power a generator which would operate an electric motor. The engine would operate at a near uniform speed, the one which produces the least amount of harmful emissions. The car could operate on batteries—which could be charged by home current—in the city. For highway driving, the heat engine would be linked into the propulsion system to provide a supplement for the electric motor. The result would be a major reduction in emissions. Dr. Ayres believes the car has possibilities, but he points out that it would substitute four basic units—engine, generator, motor and batteries—for today's single internal combustion engine, and thus would be costly.

Dr. Starkman, who favors the gas turbine so far, believes problems connected with it (SN: 12/21/68, p. 617)—mainly those of cost—can be solved. Gas turbine engines, although they eliminate carbon monoxide and hydrocarbon emissions, do emit nitrogen oxides.

While the complicated process of selecting an alternative goes on, NAPCA will begin tightening up emission standards for internal-combustion engines, which Detroit so far seems determined to save.

The main thrust will be toward more efficient testing by 1972, so as to get actual emissions down near levels envisioned in earlier published standards. Carbon monoxide from test cars will be directly measured rather than estimated, for example. And flame ionization techniques that measure total hydrocarbons will be substituted for old methods which measured only certain hydrocarbon molecules.

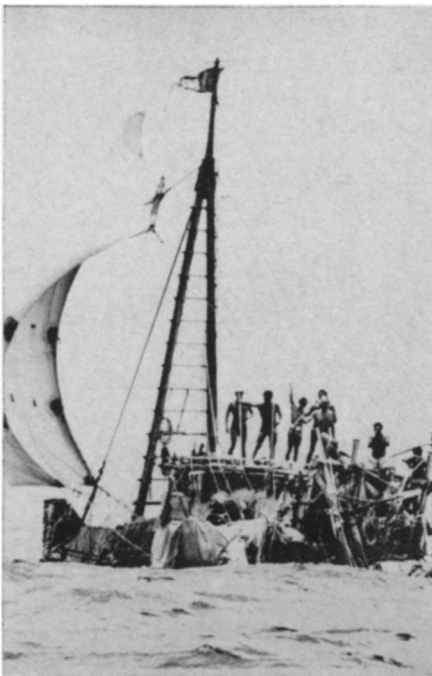
But even the very highest emission standards for internal combustion engines, even if they could be rigidly enforced, would be only a stopgap. By the mid-1980's, if there is no substitute for the internal combustion engine, the sheer proliferation of automobiles would cause auto-caused air pollution to begin rising again, according to Train.

Thus the solution lies in alternative means of propulsion. Or, as Dr. Starkman suggests, it lies in substituting mass transportation for the automobile, at least in urban areas—an alternative that has been given little emphasis by the Nixon Administration.

Mass transit will work only if people are willing to use it: "a matter of changing us instead of changing machines," says Dr. Starkman. □

RA II

Second time success



ESS

Ra II: Egyptians could have done it.

In a museum in Oslo, Norway, rests Kon-Tiki, the balsa raft in which the Norwegian explorer-ethnologist Thor Heyerdahl drifted 4,000 miles from Callao, Peru, to Tahiti during a 101-day period in 1947.

Kon-Tiki will now be joined in the museum by a papyrus vessel, the Ra II, which sailed across another ocean, the Atlantic, also to demonstrate that the seas could once have been a bridge, not a barrier, to the distant movement of earlier peoples.

Greeted by a cheering crowd and a calypso band, Heyerdahl's Ra II arrived in Bridgetown, Barbados, on July 12 after 57 days at sea. Heyerdahl and his seven-man international crew (SN: 5/16, p. 480) had set sail from Safi, Morocco, on May 17 in the boat, built according to ancient Egyptian designs, in an attempt to demonstrate that Egyptians could have reached the New World centuries before Columbus.

If such a theory was shown to be possible, scientists could consider the proposition that the bearded white men who legend says were the highly civilized precursors of the Incas of Peru, the Mound Builders of North America or the Mayas of Mexico, were the Egyptians.

Among the cables Heyerdahl received upon his arrival was one from a doctor in Martinique who was sending him a coin he found under three feet of sand while digging a trench near his home on the site of the island's ancient harbor. Remembering the Ra I voyage, he had sent the coin to the Institute of

Numismatics in Paris, which identified it as a genuine Ptolemaic coin of the Second or Third Egyptian Dynasty. The doctor said that due to the success of the Ra II expedition he would present Heyerdahl with the coin. Heyerdahl had also just seen an article about an earthen jar of coins from the same Mediterranean period found in the Azores.

"I believe we have only scratched the surface of what can be discovered about the common origins of some of our ancient cultures," Heyerdahl says.

Last year's voyage in Ra I was aborted when the craft broke up in heavy seas some 600 miles from Barbados and sharks in the water made repairs on the papyrus craft impossible (SN: 7/26/69, p. 79).

SST EFFECTS

Sweeping up studies

The Department of Transportation's supersonic transport program, now in its seventh year and scheduled to be complete through prototype testing in 1973, has been under attack from environmentalists since its inception.

The Government and the aircraft industry have been sensitive to the criticism, but their counter arguments have been weak. The SST's program Director William M. Magruder appeared to be going to the root of the issue when he announced this week that DOT will direct spending of about \$27 million over the next three years in studies of environmental problems in connection with the SST. The announcement was deceptively like the unveiling of a new effort; actually little new money is being spent.

The research—much of it not really new—will be done under DOT's direction by the Environmental Science Services Administration, the National Aeronautics and Space Administration, the Air Force and DOT's own Federal Aviation Administration. To be emphasized are effects of atmospheric pollutants and water vapor from the plane, noise problems and radiation hazards.

But, says DOT, about \$22 million of the total is already in the budgets of the involved agencies, and newly scheduled spending will be only about \$5 million. DOT says some of the research is already under way in non-SST programs.

To date, about \$700 million has been spent on the SST prototype program, with the final amount expected to hit between \$1.5 billion and \$3.5 billion, depending on where in the prototype-to-production chain the Government steps back. The House of Representatives in May approved \$290 million for the current fiscal year (SN: 6/6, p. 552), the largest amount for any single year of the program. The Senate has not yet acted on the request. □