AERONAUTICS

Nuclear Aircraft Doubtful

➤ THE MORE engineers investigate the feasibility of nuclear-powered airplanes, the more convinced they become that the problems involved are insurmountable.

This was reported to the American Rocket Society meeting in New York by David L. Clingman, graduate student in aeronautical engineering at Purdue University in Indiana.

Shielding, he said, was one of the most serious problems, since even optimum distribution of shielding material would involve a weight of about 50,000 pounds.

Also, if the aircraft is to be economically sound, it would have to carry a payload of considerable size. This, in turn, would imply a gross weight in excess of a B-52 bomber, or 500,000 pounds.

Runways of sufficient length to enable the craft to get airborne is another problem that has to be overcome, Mr. Clingman said. Making the nuclear airplane a seaplane would alleviate this problem, but introduce another difficulty, that of limited sites for potential bases.

Two choices of reactor configuration to propel such a craft would be the direct air cycle and the liquid-cooled reactor cycle. The former has the disadvantage of requiring the reactor to be mounted between the compressor and the turbine. Since the reactor must be located at the greatest possible distance from the crew compartment, and the propulsion system must consist of multiple units, design of a shieldable reactor capable of accommodating these units is a big problem. The second configuration choice somewhat relieves this shielding problem by the use of water, but offers the penalty of increased weight.

While as great a separation as possible between crew and reactor is desirable, he declared, it must be remembered that the weight economy achieved in this manner through reduced shielding may be offset by a greater over-all weight and increased drag.

The region of the atmosphere in which nuclear aircraft would have to operate has almost reached the point of aircraft saturation.

Should just one accident involve a nuclear aircraft, he said, the populace would be up in arms instantly, and rightly so.

"It is inconceivable that an airborne reactor could remain intact after a midair collision or severe ground impact," he said. Development of nuclear-powered spacecraft, on the other hand, was imperative, according to Mr. Clingman. Nuclear propulsion lends itself naturally to the current conception of space vehicles, with few of the objectionable qualities inherent in atmospheric aircraft. The very nature of rocket flight precludes the necessity of sustained flight over densely populated areas. Shielding would be simplified in space, too, since radiation scattering would be negligible in the rarefied gases.

Mr. Clingman recommended that reactor developments be concentrated in three specific areas to provide the greatest long-range economic stability for existing natural resources. The first two areas were marine transportation and central power stations. The third was the field of rocket-type vehicles.

Since nuclear power is destined to be the key to space exploration, he said, "it behooves the United States to transfer funds from the nuclear aircraft project, of doubtful value other than as propaganda, to the vital nuclear rocket program."

Science News Letter, December 6, 1958

CYTOLOGY

Find Cell "Power Plants"

➤ FRAGMENTS of mitachondria, microscopic "islands" in the cell protoplasm surrounding the nucleus, are helping scientists find out how a cell gets its energy to carry on vital life processes.

All energy comes from combustion of foodstuffs, but exactly how the living cell does absorb, store and release energy is unknown.

Now, Dr. Albert L. Lehninger of the Johns Hopkins School of Medicine has reported, the mitachondrion membrane has been taken apart and analyzed. It has been found to play an essential role in the exchange of electrons needed for energy storage and release.

Of all the parts of the cell, Dr. Lehninger pointed out, only the mitachondrion is known to play a part in combustion. Work by Dr. Lehninger and his colleagues indicates that after dissolving away about 90% of the mitachondrion, membrane fragments remain that could be described as the "power plants" of the cell.

On a weight basis, this power plant material was from four to six times as active as the whole mitachondrion.

Previous research has shown that cell energy is absorbed and stored with the conversion of ADP (adenosine diphosphate) to ATP (adenosine triphosphate). Energy is released with the reverse process, the breakdown of ATP to ADP. Electron transfer is believed to provide the energy to make ATP from the union of a phosphate group and the ADP molecule.

Enzymes working in identical assemblies in the mitachondrion membrane apparently catalyze electron transport, Dr. Lehninger explained. These appear close together in recurring units throughout the membrane, providing for electron transfer and thus the energy needed for cell life.

Dr. Lehninger and Drs. Charles L. Wadkins and James L. Gamble of Johns Hopkins University, Dr. Thomas L. Devlin of the Merck Institute for Therapeutic Research, Rahway, N. J., and Dr. Cecil Cooper of Western Reserve University are now attempting to determine the exact structure of the mitachondrion membrane parts and how they function.

The American Cancer Society, the U. S. Public Health Service and the National Science Foundation are supporting the research.

Science News Letter, December 6, 1958

● RADIO

Saturday, Dec. 13, 1958, 1:35-1:50 p.m. EST
"Adventures in Science" with Watson Davis, director of Science Service, over the CBS network. Check your local CBS station.
Mr. Jacob Rabinow, president, Rabinow Engineering Company, Takoma Park, Md., will discuss "Mechanizing Letter Sorting."

MEDICINE

Heart Disease Used As Anxiety Defense

➤ SOME PATIENTS in order to face life need to believe they have heart disease, even when there is proof they do not.

Their conviction may represent a necessary defense against "potentially overwhelming anxiety," three doctors report in the *Journal of the American Medical Association* (Nov. 22).

They studied 52 patients with symptoms of chest pain for a six-year period. Of these, 27 "had no evidence of heart disease but were convinced of its presence," and 25 had angina pectoris, a disease marked by paroxysmal chest pain with a feeling of suffocation and impending death.

The 27 patients who believed they had heart disease were "all intensely anxious people whose neurotic behavior was readily apparent," the doctors say. They tended to to dramatize their symptoms and often referred to their "heart pain."

Studies of these 27 patients showed that for some the pain represented a means of setting limits to their activities and freed them temporarily from intense pressures of responsibilities. Their neurotic cardiac condition seemed to act as a means of getting attention and of controlling family members.

In others, the pain represented an acceptable "excuse" for failing to attain certain objectives. For some, there was a definite monetary compensation from their pain.

The study also showed that the average number of doctors consulted by each patient in the cardiac neurosis group was 4.7, compared to only 1.5 for each patient with angina pectoris.

It was not unusual for the neurotic patients to be consulting a number of physicians simultaneously, the doctors found. Drs. William N. Chambers, Mary Hitchcock Hospital, Hanover, N. H.; Joseph L. Grant, Veterans Administration Hospital, White River Junction, Vt., and Kerr L. White, University of North Carolina, made the follow-up study on heart patients.

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