AERONAUTICS

Low-Drag Promotes Speed

➤ LOW-DRAG wings for airplanes, known technically as laminar flow wings, were made practical during the war by the National Advisory Committee for Aeronautics, it is now revealed. Applied to both fighters and bombers, this aerodynamic principle contributed greatly to the superiority of American aircraft.

The low-drag airfoil principle, one of America's top secrets during the war, was disclosed by Dr. J. C. Hunsaker, chairman of the NACA. Employment of the low-drag principle enables a plane to fly faster and farther, he said, by virtue of its low drag. By a coincidence, he added, the pressure distribution which promotes smooth air flow also permits a higher flight speed before the onset of compressibility shock.

Laminar flow, as applied in aerodynamics, is a type of streamlined flow of the air over and under the airfoils or wings with a constant or steady motion of the air particles near the body of the wings, and with a minimum of eddying or turbulence. The term is used in contrast with turbulent flow, which is an unsteady air movement, with the air velocity varying at any given point in magnitude and direction.

In disclosing the principles of laminar flow as applied to aircraft, Dr. Hunsaker gave full credit to European scientists who applied them to correct form for ships, and to later men who, in the early days of airplanes and with no knowledge of hydromechanics, discovered that, in a plane, an arched wing profile was advantageous.

An English scientist named Lanchester, he said, showed how a wing would cause the air to rise to meet it and then descend. He found that a vortex would trail behind each wing tip. Later, theoretical work in England and elsewhere led to a conclusion that a smooth surface and a falling pressure gradient are necessary to maintain an extensive laminar flow. Theory then seemed to have reached its limits. The practical development of the laminar flow wing was carried out at the NACA's Langley Memorial Laboratory in Virginia.

A low-turbulence pressure wind tunnel at this station, completed in 1938, made this possible. By May, 1941, the technique of airfoil design and testing at Langley had advanced to a point where low drag could be obtained. The theory served a useful part; it showed how to obtain a favorable pressure drop over the forward portion of the airfoil, and the sharp pressure recovery over the rear portion needed to prevent boundary-layer interruption and flow separation.

To obtain stable laminar flow, complete control of pressure gradients was found necessary. Work at Langley Field resulted in the discovery that the airfoil, designed to give desired pressure distribution, could be obtained with precision by an angular distortion of the curve into which the airfoil was transformed, and then correction of both the airfoil and the corresponding pressure distribution by successive approximations. The method was systematized in 1944, and reduced to engineering practice in 1945.

Science News Letter, August 31, 1946

CHEMISTRY

Refrigerant, Freon, Also Puts Out Gasoline Fires

➤ THE FREON chemical compounds that are used in household refrigerators and in air-cooling systems now have a new job. They are found to be more effective in extinguishing gasoline fires than the long-used carbon dioxide and other inert gases.

Freon is well-known to soldiers. It is the carrier for DDT, compressed into the aerosol bomb, which when released made an effective spray to kill mosquitoes and other insect pests. The Freons are harmless to men, being nontoxic, non-combustible, non-explosive and non-irritant.

The use of Freons to extinguish gasoline fires is recommended by the U. S. Bureau of Mines because of their effectiveness determined by a study of six inert gases and their effects on three different types of gasoline. The study was made by Bureau scientists and others from the Mine Safety Appliances Company.

Among the six gases tested, Freon 11 was found to be the most effective flame-quenching agent. Freon 12, Freon 21, carbon dioxide, automobile-exhaust gas, and nitrogen were next best in the order named.

Gasoline is one of the chief causes of costly fires and explosions because it is used by industry, the Bureau states, in a greater quantity and a wider range of applications than any other combustible liquid. Gasoline fires in or about mines are not uncommon.

The Freons are a series of compounds containing the same elements but in different proportions. They are made by introducing fluorine into chlorine derivatives of methane gas. Their chemical names indicate that they contain both chlorine and fluorine.

Freon 11 is trichloromonofluoromethane, a long word but easily understood when divided into syllables: tri-chloro-mono-fluoro-methane. Freon 12 is dichlorodifluoromethane, and Freon 21 is dichloromonofluoromethane. Freon 21 is probably the one most commonly used in refrigerating and air-cooling systems. Freon 11, the best flame-quenching agent among the six inert gases tested, is used in centrifugal compressors feasible only for large refrigerating or air-cooling units.

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GENERAL SCIENCE

Associated Universities, Inc. New Research Center

➤ WORLD'S largest cyclotron and synchrotron and a uranium pile for producing radioactive elements for laboratory work are planned for the new Associated Universities, Inc., that is going to turn the former Army camp at Camp Upton, N. Y., into an atomic research center, Dr. Philip M. Morse, professor of Physics at Massachusetts Institute of Technology and newly-appointed director of research for the institution has disclosed.

A cyclotron of 500,000,000 volts and a synchrotron of comparable size are among the items of equipment scheduled to be constructed, Dr. Morse reported.

Ten to twelve buildings will house biological, chemical, physical, medical and engineering research groups on the 3,700-acre tract. About 1,000 persons will comprise the community, including both technical and non-technical personnel.

Associated Universities, Inc., is sponsored by nine universities: Columbia, Cornell, Harvard, Johns Hopkins, Massachusetts Institute of Technology, Pennsylvania, Princeton, Rochester and Yale. Edward Reynolds of Harvard is president of the new university, and the project's scientists will not be limited to the cooperating schools.

Dr. Morse emphasized that pure research looking to peacetime applications of atomic energy will be the primary purpose of the project.

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