

"With such tools as the light spectrum, the X-ray spectrum, and the bombardment and transmutation of atomic nuclei, men search into the atom and slowly find the answers to their questions. Which theory of atomic structure is the most nearly true? The Bohr Theory is the most comprehensive but how can it explain convincingly the phenomenon of crystallization or the formation of molecules? Is there really one fundamental substance that composes all matter? The electron and the neutron seem to be the most basic substances. Perhaps they are only states of strain in a field of electricity and the Bohr Theory is merely a pictorialization of mathematical facts. Such knowledge would have countless applications: The formation of new substances with any desired properties, cheaper and better radioactive substances for medical work, all kinds of electronic devices. It will take years of preparation and study, but someday I want to contribute one small piece of knowledge toward answering these questions, and toward the understanding of the ultimate nature of the universe."—From the essay of Anne Hagopian.

cost of manufacture, but even these items are weighed differently than in other industries. The first two are given careful quantitative analysis so that no more weight or complication is added than is absolutely required to meet the forces for the intended life of the aircraft. Cost of manufacture is considered, of course, but in view of the fact that an extra pound of weight in the aircraft costs about \$30 a year per airplane to carry around, or about \$12,000 per pound for a large airline using airplanes of a given type for five years, as is common. For this reason, ease of manufacture is attained more by refinement of design and improved methods, such as joining by spot welding or Cycleweld and making simplified parts with special equipment, than by standardizing on one part for several jobs or by redesigning to make the part in a machine tool having arbitrary limitations of size and ability.

What, then, are the requirements the airplane is designed to meet? We find that the shape of an airplane is all-important. Its external form in every detail and the shape of all internal passages that carry air or any gases are determined by the principles of fluid flow.

The power plant installation must provide for proper and efficient functioning

of the engine without harming the aerodynamic characteristics of the airplane and with a minimum total weight.

To meet the exacting requirements of airplane design with great precision and with no excess weight, the designer must follow rational, scientifically correct methods and must pass up the temptation to adapt previously-used forms to his design.

Another characteristic of aeronautical work is the desire, if not the necessity, to eliminate unknown quantities. Many factors that are a matter of guesswork in other fields must be brought to the point of complete familiarity in aeronautical design by measurement, and by statistical information where the events are complex and do not repeat themselves exactly.

As an example of the collection of information difficult to obtain but vital to the success and safety of all aircraft, an instrument known as the NACA V-G Recorder has been at work automatically plotting the severity of bumps experienced for a total flying time of 150,000 hours amassed with landplanes and flying boats on routes all over the world over a period of ten years. This information, taken with other data obtained in flight research, fixes the probability of encountering gusts (air pockets) of different intensities, and we design our aircraft to be proportionately strong—and no heavier. The instrument is used similarly to determine how roughly military pilots handle their combat airplanes. In the cases I have discussed the information obtained has been used to specify the strength that should be built into aircraft of different types and, as a result, structural failures have been exceedingly rare.

The subject of fatigue suggests pilot and passengers who are sensitive to the same things to which the airplane structure is sensitive. We must study their physiological disposition to put up with given conditions for the same length of time as the airplane itself—that is, determine the extent of human fatigue. It will be seen that other human capabilities and limitations such as pilot strength and reaction, piloting habits, vision, comfort, etc., must be considered in airplane design. This field of research which touches both biology and aeronautical engineering is just now beginning to receive widespread attention. The names of various phases such as aeromedicine and biomechanics indicate the combined physiological and engineering viewpoint.

Science News Letter, March 18, 1944

CONSERVATION

Americans Should Attack Soil Erosion Causes

By DR. W. C. LOWDERMILK

Assistant Chief, Soil Conservation Service,
U. S. Department of Agriculture

*Excerpts from address given before
the Science Talent Institute.*

► FOOD comes from the soil of Mother Earth. The land and its water nourish us, the children of men. Our wartime goals, as those of post-war will be, are production enough for needs of our people and some for export. This food must come almost entirely from crops growing in soils of the land.

This land is the silent partner of tillers of soil in growing food for today and tomorrow. If either partner weakens or fails, crops are lessened or fail. The land yields its increase to husbandmen who work it and care for it with understanding and skill. The earth rewards richly the knowing and diligent; it impoverishes the wasteful. This partnership of land and farmer is the rock foundation of our complex social structure. On this foundation is built our many industries and professions, and our opportunity of the ages to build the American dream.

But this land partner may be damaged—seriously damaged and destroyed for further use by inconsiderate, wasteful and reckless use. The land may be destroyed for further growing of needful crops if soil erosion is let run riot through our fields. We have learned this from a long series of scientific studies. The facts shock thinking people; they challenge our youth. We have now an understanding of this insidious menace to our food supply from year to year and how we may bring it under control for security and welfare of the nation in times of war as well as in times of peace. We have only made a beginning in this great task.

When young and old fully understand this insidious enemy of civilization—soil erosion—we shall then make an all-out attack on the waster of the Good Earth. We shall find a substitute for war, full of adventure and challenge, that should lure mankind, weary of destruction, to the saving and healing works of use with conservation of the Holy Earth as the necessary basis for a new world of peace, with hope of abundance for all, and of happiness.

Science News Letter, March 18, 1944