INSPECTION OF LABORATORY

INTRODUCTION TO INSPECTION

Before you inspect the Laboratory today it might be well to describe briefly the National Advisory Committee for Aeronautics or NACA, and say a few words about its function. The Committee from which the organization takes its name is composed of 17 members drawn from the Military Services, the aeronautical industry, from other government agencies, and scientists from private life. These men are appointed by the President and serve without pay. Most of them are here with us today. The purpose of the Committee is to supervise and direct aeronautical research and experiment. The Committee is the policy-making body, or board of directors, which governs the activities of the staff of research scientists and supporting personnel who are civilians under Civil Service.

For advice in framing research programs there are four main technical committees: Aerodynamics, Power Plants, Construction, and Operating Problems, and 23 technical subcommittees, all composed of leading authorities in various specialized fields. These men also serve without pay and are drawn from military, industrial, and other civil organizations.

The NACA operates three laboratories: at Langley Field, Virginia, at Cleveland, Ohio, and here at Moffett Field. In addition, it operates two special-purpose research stations: the Pilotless Aircraft Research Station at Wallops Island, Virginia, and the High-Speed Flight Station at Edwards Air Force Base, California.

The research conducted by these laboratories is of several types. One type is long-range research in which the basic principles of fluid mechanics and other fundamental subjects are explored. Then there is shorter-range research in which these principles are applied to develop promising aircraft components, and efficient combinations of these components, that is, wings, bodies, controls, power plants, structures, and other elements of aircraft design. Theory is used as a guide in the selection of these elements and combinations and their characteristics are determined by means of wind-tunnel tests or other laboratory experiments or by flight tests. The search is for means to increase the performance, efficiency, and safety of flight. The practical requirements of both civil and military aviation guide the efforts in this short-range research, which accounts for a major fraction of the NACA effort.

Another kind of work carried on by NACA is the investigation, for the Military Services, of specific designs of future military aircraft where NACA has research equipment and experience that is particularly applicable. In this way it is possible to learn the characteristics of a new military airplane or missile at an early date so that deficiencies may be corrected or improvements made.

The NACA conducts tests and acts in an advisory capacity, while the contractor retains control of his design. Thus, NACA equipment and experience are brought to bear in improving designs in the early stages and also sometimes in correcting deficiencies or making improvements to military aircraft which have reached the flight stage. At the same time, research workers are confronted with the actual problems encountered by designers of advanced aircraft, which helps guide research into the most useful channels.

The facilities most in demand for these specific investigations are large transonic and supersonic wind tunnels. In your inspection tour you will visit the Ames Unitary Plan Wind Tunnel which will soon be available for this work. The name derives from the unified plan for providing the country with the wind tunnels required for development of airplanes and missiles for the Military Services. Its use will be directed at specific designs rather than general research.

We have prepared for you today a number of talks and demonstrations which will show the scope of our work, indicate methods and tools used, and point to fields in which progress is being made. The talks will be in general terms avoiding as far as possible the language of the specialists. You will be looking at the Ames Laboratory but the presentations will also reflect the work done at the other NACA laboratories and research stations. These demonstrations are samples only and do not cover all the fields in which the NACA undertakes research..

Much of our work feeds into the design of military aircraft, airplanes, and missiles, and hence a large part of our research results have a security classification of Confidential or Secret, and cannot be discussed at this Inspection. However, it is not our purpose today to present detailed results of research but to outline the area in which we are working, using unclassified examples of our work.

One of the most striking features of our newest high-performance airplanes is the tremendous range of speeds over which they must operate. They must not only be able to reach their maximum speed but they must be stable and controllable throughout the speed range and, in general, must land at speeds which are little higher than the landing speed of the airplanes of 10 years ago. Hence, aerodynamic research divides itself into two parts, one to provide shapes which permit attainment of the desired performance, the other to maintain stability and control over the entire operating range of speed and altitude.

The very changes to airplane configuration which are necessary to attain higher speed introduce problems in stability and control at all speeds and render a low landing speed difficult to obtain. You will see evidence during your inspection of the Laboratory of work directed at both these ends - the attainment of higher maximum speeds and the solution of the stability and control problems.

The term "high speed" in connection with aircraft is used constantly, but the actual speed represented by the term keeps changing

with the advancing performance of airplanes and missiles. Furthermore, what is high speed for an airplane may be considered low speed for a missile. We should perhaps confine ourselves to the terms, subsonic, transonic, and supersonic when describing the speed capabilities of aircraft or the operating speed range under discussion. More recently the term "hypersonic" has been introduced, which is usually used to mean very high supersonic speeds, say of the order of five times the speed of sound or greater. You will hear hypersonic research discussed during one of today's demonstrations. The interest in these extremely high speeds is not purely academic. Missiles will certainly operate at speeds many times the speed of sound in the not-too-distant future, and it appears that man-carrying aircraft which can reach these fantastic speeds may in time become technically and economically feasible.

A part of our research effort is directed at problems of the distant future. In looking far ahead we try to anticipate the kinds of information which will be needed so that research techniques and equipment will be available when the need appears. The problems of the distant future have a way of suddenly becoming immediate problems.

We hope your tour of the Laboratory today will be interesting, and that the talks and demonstrations will serve to outline for you the fields in which we are working, and illustrate ways in which research contributes to the advancement of the design and development of aircraft.