INTRODUCTION

On July 14 and 15, 785 registered guests attended the 4th Biennial Inspection of the Ames Laboratory. To accommodate this large number of guests the Inspection was conducted in two sections with identical programs, one on the 14th and the other on the 15th. Those attending the Inspection represented the airlines, aircraft and associated manufacturers, the U. S. Congress, the military services, various government departments, the NACA, and local municipalities.

Special busses obtained from the U. S. Navy provided transportation to Ames from the San Francisco Airport, the St. Francis Hotel in San Francisco, the railway depot in San Jose, and the Sainte Claire Hotel in San Jose. Other guests either flew to Moffett Field or came by private automobile. Guests were registered in the lobby of the Administration Building upon arrival (starting approximately 9:30 a.m.). An introductory session was opened in the auditorium at 10:00 a.m. by Dr. S. J. DeFrance. This session included brief welcoming addresses and an introduction to the material to be presented during the inspection. At the conclusion of this session Dr. DeFrance briefed the guests on the mechanics of the tour and turned them over to their group leaders.

Luncheon was served in Hangar No. 2. Sufficient time was allowed in the lunch period for the visitors to examine at their convenience several exhibits of research instruments and techniques which lined two sides of the luncheon area. After lunch the group was photographed in front of the hangar and the tour was resumed.

Upon completion of the Inspection at 4:45 p.m. the guests were returned to the Administration Building. Bus transportation was provided at regular intervals to San Jose and San Francisco.

The foregoing is only a brief outline of the inspection day. The detailed program of the Inspection, the text of the talks together with photographs of the exhibits, and other material used in planning and executing the Inspection are presented in the body of this report.

INTRODUCTION TO INSPECTION

Our Inspection today is really a sampling process because we are looking at only one laboratory and there is just not enough time today to see all of the work of this one laboratory. It seems worthwhile then to say a few words about the organization of NACA work as a whole so that we can relate today's sample to the whole.

The NACA is, officially, the Committee of seventeen men, most of whom are with us at this Inspection. For advice in framing research programs there are four main technical committees: Aerodynamics, Power Plants, Construction, and Operating Problems, and twenty-three technical subcommittees, all composed of the country's leading authorities, serving without pay, and drawn from all of the types of organizations represented by today's visitors.

NACA operates three laboratories: at Langley Field, Virginia, Cleveland, Ohio, and Moffett Field, here. It operates two special-purpose research stations, the Pilotless Aircraft Research Station at Wallops Island, Virginia, and the High-Speed Flight Research Station at Edwards Air Force Base, California. Some work and results from all of these, except the Cleveland Flight Propulsion Research Laboratory, will be discussed today by the Ames staff.

What is done by the staff in these NACA laboratories? Perhaps the best and most durable description is that of NACA's enabling Act: to conduct "scientific study of the problems of flight with a view to their practical solution." The "scientific study" includes long-range research in which the principles and basic facts of fluid mechanics and other fundamental subjects are explored. It includes shorter-range research in which these principles are used to devise promising shapes, efficient combinations of shapes, controls, control systems, and similar elements of aircraft design. The characteristics of these elements, with suitable variations, are determined by theory, by the wind tunnel, test stand, or flight. The search is for means to increase performance, efficiency, and safety of flight. This shorter-range research with practical requirements in mind accounts for the largest fraction of NACA effort. The results are data suitable for use in design.

Still another kind of work carried on by NACA - increasing now as it did in World War II - is the investigation for the Military Services of specific future military designs where NACA research equipment or experience is particularly applicable. The object is to learn as early as possible the characteristics of a military machine so that possible improvements or required corrective measures can be initiated. The contractor maintains control of his design. The NACA acts in a technical and advisory capacity. By common consent proposals for this kind of work by NACA are scrutinized closely so that they do not unnecessarily crowd out research. They provide a definite aid to research, however, as will be seen.

Having mentioned NACA work in support of aircraft development, it may be well to continue and say what NACA does not do. NACA considers and studies the aerodynamics of complete aircraft, but it does not design aircraft. It does not deal with all the factors that enter into aircraft design. It, therefore, cannot do the designer's complex job of harmonizing, compromising, not to say juggling, all of the equipment, armament, mechanisms and required loads that go with the airframe, power plant, and structure. NACA does provide the designer with quantitative information on the effects of various alternative configurations so that the designer can assess the aerodynamic penalty or benefit of alternative arrangements and thus make his decisions on a sound basis. NACA must work in an interesting or practical range of variables if its results are to be applicable by designers and it, therefore, wishes a maximum of contact with designers' problems; this is a standing invitation to discuss current and contemplated designs and design problems with NACA Headquarters and laboratories.

At today's Inspection we will encounter some of the serious problems that are occupying our research teams. These problems and their solutions are of current concern to airframe designers, or there is reason to believe that they soon will be of concern. These are new problems brought about by the advancement into the transonic and supersonic speed range.

They include the airloads imposed by gusts in very high altitude flight and by buffeting in flight around the speed of sound; these must be understood before safe and efficient structures can be designed. They include the problem of obtaining a high enough lift for landing from high-speed wings that seem inherently poor for low-speed flight; boundary-layer control looks promising here. There is the problem of providing acceptable stability and control for aircraft near the speed of sound where lift location varies and controls lose effectiveness, and for missiles where the air-flow pattern over after surfaces is more complex than those dealt with previously. There are problems involving the interaction of the aerodynamic and guidance characteristics of missiles that affect their flight path and accuracy. There are problems stemming from the application of high-powered turbo-propeller power plants to high-speed aircraft.

There are studies of the effect of increased speed and altitude on the ability of an airplane to track a moving target; dynamic characteristics enter here along with the reaction time of the human pilot and we see the result of using automatic control. There is the problem of the heating due to supersonic flight and the cause and effect of laminar versus turbulent boundary layers on supersonic missiles. There is the effect of wing and body shapes on supersonic aircraft performance. There are the additional findings of research aircraft flights at ever faster speeds and higher altitudes. Finally, there are the devices and techniques actually used in getting the required answers from the research equipment.

As you can imagine, some of these investigations and their results are classified security information and their discussion is therefore limited.

Some fields of research were squeezed out of the Inspection for lack of time; a number of these are briefed in the Inspection Booklet. Today's charts, you will note, are reproduced in a second booklet for your easy reference.

Since NACA results are primarily for designers, it has been suggested that those of you who are not designers try to put yourself in the position of a designer today. What do you get from NACA? If this Inspection gives you a true impression, you may conclude that you can look to NACA for some new ideas, for some clarification and organization of the fundamentals underlying aeronautical development, and for systematic design information that can be used to lay down the optimum aircraft for any specified function. If assistance is required in the development of specific aircraft, it can be had.

We hope your inspection today will show the nature of current problems and the direct connection of research results to the complex business of developing future aircraft that will be second to none.