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A VISIT TO THE RESEARCH LABORATORIES OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS AT LANGLEY FIELD, VIRGINIA*

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It is an honor and a privilege to present to the National Association of State Aviation Officials and their guests moving pictures of the research equipment and methods used at the laboratories of the National Advisory Committee for Aeronautics at Langley Field, Virginia. Before showing the pictures, it may be of interest to refer briefly to the history of aeronautical research apparatus, especially wind tunnels, and to review briefly the origin of the N.A.C.A. and its present organization and status as an agency of the Federal Government.

In recording the various stages of man's success in solving the problems of flight, it should first be emphasized that each step was based on knowledge. The first problem that had to be faced in fiying was that of support. Implicit in the earliest legends of flying that we have was the recognition that birds sustained themselves by the pressure of air on their wings, but it was not until the time of da Vinci that we have any authentic records of a recognition of the actual basis for the solution. At that time it was clearly stated that in its beat the bird's wing encountered a resisting medium which permitted the bird to raise itself above the earth. On the basis of this principle da Vinci constructed a number of small flying models that flew successfully. It was not, however, until much later, say the middle of the nineteenth century, that man began seriously to study the actual qualities of the air which permitted it to sustain objects by the dynamic forces it could exert. In terms of historical developments the present success of world air transportation has come very suddenly from man's study of the air and its properties. One finds consistently throughout the work of the early pioneers that their efforts were frustrated largely by a lack of information on the forces the air could exert on wing surfaces. This led directly to the beginnings of the wind tunnel, which has been the most productive instrument in furthering man's knowledge

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of the air for purposes of flight yet developed. The first studies of the force exerted by air on wings were made by mounting the wings on balances on tops of hills and buildings, and recording the forces exerted. With the crude methods employed for measuring and for maintaining steady conditions of test, it was inevitable that much disagreement between the early students resulted, and one of the important foundations of the Wright brothers' success lay in their provision of an accurate means of measuring the forces with which they had to deal—a wind tunnel.

Nine days before the Wright brothers made the first successful flight of an airplane the effort to launch the Langley aerodrome by catapult failed in December, 1903, and the craft fell into the Potomac River. The wreckage was pulled from the water, wiped off, and removed to Dr. Langley's workshop in the Smithsonian Institution, known as the Langley Aerodynamical Laboratory. Three years later he died, leaving his aerodrome untouched. The Wright brothers proceeded to develop flying and made many demonstrations in various countries. European powers engaged in the development of aviation for military purposes.

The late Dr. Charles D. Walcott had succeeded Dr. Langley as Secretary of the Smithsonian Institution. Dr. Walcott was a geologist and not an aeronautical engineer, but he had the vision to realize something of the future vital significance of aeronautics, and that it was a wholly new branch of science, about which the world knew but little and America even less. So, in 1913, he obtained from the Board of Regents of the Smithsonian Institution authority to reopen the Langley Aerodynamical Laboratory and to form an Advisory Committee for Aeronautics. That committee held its first meeting on May 23, 1913, and included in its membership Orville Wright and Glenn Curtiss. The committee held several meetings, appointed subcommittees, and was beginning to function, when in March, 1914, the Comptroller of the Treasury rendered a decision to the effect that the committee not having been established by law, the detail of employees from any governmental agency to serve on the committee was contrary to law. Accordingly the committee was dissolved.

Five months later, in August of that year, the World War broke out. Dr. Walcott approached President Wilson with a plan to establish by law a National Advisory Committee for Aeronautics. President Wilson at first withheld assent, on the ground that it would be an unneutral act. Dr. Walcott persisted, and secured

the enactment of legislation establishing the N.A.C.A. which was approved by President Wilson March 3, 1915.

The National Advisory Committee for Aeronautics, as thus established by law, was charged with the supervision, direction, and conduct of fundamental scientific research and experiment in aeronautics. With the farsighted support of the Congress the Committee has developed at Langley Field, Virginia, one of the largest and best equipped aeronautical research laboratories in the world. The research programs include problems initiated by the Committee and its subcommittees and also investigations requested by the War and Navy Departments and the Civil Aeronautics Authority. The results of researches conducted in one central Government laboratory at Langley Field serve, without overlapping or duplication of effort, the needs of all branches of aviation, civil and military, and exert a profound influence on the progress of aeronautics by improving the performance, efficiency, and safety of aircraft.

The President is authorized to appoint fifteen members on the Committee, including two representatives each of the Army Air Corps, the Naval Bureau of Aeronautics, the Civil Aeronautics Authority; one each from the Smithsonian Institution, the United States Weather Bureau, and the National Bureau of Standards, and six others from private life, scientists and leaders in aeronautic circles outside the Federal Government. Under the main Committee there are 12 technical subcommittees, similarly organized, with a total membership of 78.

The members of the Committee and of the subcommittees serve as such without pay. However, a research staff of 470 employees, paid from funds appropriated by the Congress, is busily engaged in studying problems of almost every conceivable kind having to do with improvement in aircraft performances, efficiency, and safety.

There are 13 wind tunnels at Langley Field, including a full-scale wind tunnel having an oval-shape throat 60 by 30 feet, large enough to investigate full-size airplanes; an 8-foot 500-mile-per-hour wind tunnel; a 20-foot propeller-research tunnel; a 5-foot variable-density wind tunnel; a 7- by 10-foot wind tunnel; a 5-foot vertical wind tunnel; a 15-foot free-spinning wind tunnel; two high-velocity jet-type wind tunnels of 11- and 24-inch throat diameters, respectively; a gust tunnel; an engine research laboratory; a flight research laboratory; an instrument research laboratory; a hydrodynamic laboratory—a seaplane model towing basin; a refrigerated

wind tunnel; and a vacuum chamber for propeller testing. There are under construction at this time a 19-foot pressure wind tunnel and a 12-foot free-flight wind tunnel.

With the aid of motion pictures, I will now take you on a conducted tour of the Langley Field laboratories.[1]

Other governments have set up similar publicly-supported institutions, and there are now in existence aeronautical laboratories, in England, France, Switzerland, Germany, Italy, Russia, and Japan, as well as the United States. In this connection it is interesting to note the great surge of aeronautical interest on the part of Russia, Italy, and Germany. It is further interesting to note in this connection the way in which the various countries have followed the United States in their development of research equipment. There have recently been built in England and Germany variable- density wind tunnels based on the same ideas that led the National Advisory Committee for Aeronautics to build such a wind tunnel in the middle 1920's. In the case of the German wind tunnel, their effort has been extended even farther to combine the qualities of the variable-density tunnel and our own propeller-research tunnel, which was also built during the 1920's. Likewise, as to large-scale research equipment, such as the propeller-research tunnel and full-scale tunnel, the English, Germans, and French have followed quickly in our steps. In Italy the development seems to have been more toward a high rate of research production. One may quote the example of a battery of six identical wind tunnels of approximately the same characteristics as the Committee's 7- by 10-foot atmospheric wind tunnel.

The recent remarkable improvement in the performance, safety, and efficiency of American aircraft, both military and commercial, is an achievement in which Americans may justly take pride. The fact that foreign aeronautical engineers are visiting the United States in steadily increasing numbers to study the methods whereby such characteristics are obtained, and also to procure aircraft for European transport lines, is an indication of the excellence of the American product.

I am privileged to extend to you the cordial invitation of the National Advisory Committee for Aeronautics to visit its research laboratories at Langley Field, near Hampton, Virginia.

1. At this point moving pictures were shown of the research facilities and methods used at the Langley Memorial Aeronautical Laboratory of the National Advisory Committee for Aeronautics at Langley Field, Virginia.
At the conclusion of the moving pictures Mr. Victory continued.