Up in the Air

Aeronautical Engineers have been at work for centuries compiling the knowledge that has brought Air Age. The author presents a brief history of aircraft development

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In 1953 airplanes are travelling higher and higher and faster and faster than even a Buck Rogers' fan of 20 years ago would have dreamed possible.

Within the past few years the graph that charts speed and altitude of aircraft has taken a sharp turn upward and indications are that the next few years will see the climb continue at a brisk clip.

Behind the upward movement of graphs and of airplanes are hundreds of years of research and tireless invention by many men.

These men, who we may consider Aeronautical Engineers, experimented with devices to enable man to fly long before the memorial flights of Wilbur and Orville Wright in 1903. This does not take any credit from the Wright brothers in their development and production of the first man carrying heavier-than-air aircraft, in fact it adds much to the laurels they so rightly deserve.

Man, not given wings by our great Creator, looked to the birds for an answer to flight. This was the beginning of scientific investigation in flight and Aeronautical Engineering research was started. The study was simple and investigation indicated that wings had much to do with flight; therefore man designed and built wings for his own use. Various stories and folklore tell of the success and failure of man-made wings.

Recorded history as far back at 67 A.D. show that experiments in human flight were made. By the beginning of the 15th Century much progress had been made in the theory of flight. Leonardo da Vinci (1452 to 1519) made drawings that prove that he had considerable knowledge of aerodynamics and flight. These sketches show that his main thinking was in terms of flapping wings, the ornithopter. Da Vinci invented the propeller and also built a model helicopter that flew.

Progress was slow in the 15th through 18th Centuries with unsuccessful attempts of flight made in man-powered devices. The drawing and sketches of Da Vinci were in part responsible for the research along the line of these man-powered devices.

Experimenters, having failed in their attempts to fly with human-powered heavier-than-air devices turned their efforts to designing gliders and balloons. The glider development of Otto Lilienthal (1848 to 1896) in Germany was a tremendous step in man's conquest of the air. It was indeed unfortunate that his untimely death resulted from a glider accident just as he had started experiments in longitudinal control by using a movable horizontal tail surface. During the latter part of the 19th Century Octave Chanute (1832–1910) experimented with gliders in America. He was a Civil Engineer well known for his works in railroad and bridge design and construction. Chanute began his glider experiments in 1896 and developed a number of successful gliders. One, a biplane, was extremely stable in flight.

The advent of the steam engine in the early years of the 19th Century turned aeronautical experimenters to thinking in terms of mechanical power. The first steam engines were much too heavy for aircraft use, weighing as much at 160 lbs. per horsepower. John Stringfellow (1799–1833), an Englishman, flew the first powered heavier-than-air model about 1850 using steam power. He also developed a steam engine of one horsepower weighing only 16 lbs.

The gasoline engine finally solved the power problem. The Wright engine at 15 lbs. per horsepower was extremely heavy by standards of today. Charles M. Manly built a 52 horsepower engine that weighed only 2.4 lbs. per horsepower. This remarkable engine went to Samuel Langley and was installed in his airplane in 1903. Mr. Langley had successfully flown powered models, but his full-scale, man-carrying airplane crashed into the Potomac River when launched. This occurred nine days before the successful flights of Orville and Wilbur Wright.

The Wright brothers didn't have it easy. In the early years of their flight experiments, they were called the lying instead of the flying brothers. In spite of criticism, the famous Wrights developed their airplane, engine, and designed and built their propellers. Also with the aid of a crude home-made wind tunnel they worked out the important problems of lift and drag and of control and stability. The propeller designed had the remarkably high efficiency for that time of 66 percent and was a major contributing factor to their success.

The Wrights first successful flight, made on December 17, 1903 with Orville flying the airplane, lasted 12 seconds. Several flights were made on that day with the following records: distance flown—852 feet; time aloft—59 seconds and airspeed—30 miles-per-hour. Scientific research had paid off for the Wrights in their development and production of the first successful heavier-than-air aircraft. Even with its importance very few newspapers even bothered to print anything concerning this epic making flight.

Aircraft move in space with freedom of linear motion in three directions and rotation about three axes. The Aeronautical Engineer refers to this as forward, up (or down), and sidewise (skid or slip) in linear motion, and as pitch, roll and yaw in rotation. Successful flight requires controlled motion much the same as one drives an automobile around a corner. The Wright brothers designed control devices that by 1908 enabled Orville Wright to fly with perfect control for one hour in a demonstration flight for the Army.

The conquest of the air moved at an accelerated rate, but still slow. The United States government refused two times to aid in the experiments of the Wright brothers. The Army purchased its first airplane, a "Wright Flyer," in 1908 and Congress appropriated $30,000 for Army Aviation in 1909. The first transcontinental trip by aircraft from New York City to Long Beach,

California was in 1911 and took 49 days.

The airspeed indicator, gyroscopic compass, automatic pilot and the "life-pack" parachute made their appearance in 1912–1914. Maximum speeds had jumped to 125 miles-per-hour.

Research was to become the key to unlock many here-to-fore secrets. Research in aviation was given a tremendous impetus by establishment of the National Advisory Committee for Aeronautics by Congress in 1915. With the Langley Field Aerodynamics Laboratory started in 1913, the Ames Aeronautical Laboratory at Moffet Field, California established in 1939 and the Engine Research Laboratory established in Cleveland, Ohio in 1940 the N.A.C.A. facilities for research and development of aircraft and aircraft components excel all others.

These facilities include wind tunnels large enough to test full size airplanes in subsonic airflow and wind tunnels with just as in the days of the Wright brothers, for loading, stability, and control with ever increasing speed.

The present and the future—two views of aircraft development are presented in "Up in the Air" and in the companion feature that follows, "The Sky's No Limit." Professor L. A. Comp offers a history of aircraft invention and accomplishment. Dwight V. Swain, outstanding science fiction writer, looks into the future and sees a new frontier in the sky. Both writers pay tribute to the engineers who have made the progress of today reality and the possibilities of tomorrow fabulous—The Editor.

The first invitation for bids to carry air mail was sent out by the U. S. Post Office Department in 1916. The routes at first were short and the schedules erratic. Later fixed scheduled day and night service across the nation prevailed. The Boeing airplane "Monomail" of 1930, used for mail model testing. Answers must be found, supersonic test chambers for high speed and passengers, was the first streamline low-wing all-metal airplane and a forerunner of the present modern transports. Air mail, air express, and air freight are moving around the world in ever increasing tonnage.

The first regularly scheduled passenger airline service was in 1914 between St. Petersburg and Tampa, Florida. Other short local lines were established. National Air Transport, Inc., was organized in 1925 to carry mail, express, and passengers. The Ford Trimotored transport made its appearance in 1926.

The development of air transportation is a story in itself. Airplane and engine development racing neck and neck to provide speed and safety to the air traveler. From the "Clipper" planes of 1930 and the "Electra" and DC–2 transports of 1934 to the super-sky transports of today, airlines have established dependable air travel facilities. Speeds have increased to approximately 450 miles-per-hour in luxurious comfort with destination anywhere in the world. One travels in a supercharged cabin at 30,000 ft. altitude with the temperature controlled at 70° Fahrenheit while outside the temperature may be as low as 67 degrees below zero.

The place of the airplane in any war effort is well established. It is with the requirements of Military Aircraft that research and development reach an all time high. Jet and rocket powered experimental planes are flying at speeds over 1200 miles per hour. Guided missiles are sent skyward at three times the velocity of sound. These things present the Aeronautical Engineer with exciting problems, problems of materials, heat rise, refrigeration, power, control, stability, instrumentation, etc.

If and when the effort is turned to civil aircraft there can be a "convert-a-plane" in every garage. A machine that will rise vertically like a helicopter, fly horizontally like an airplane and transverse the ground like an automobile. Farmers will sow their grain, spray their crops and trees, and distribute fertilizer from aircraft. Food, medicine, and other aid will be easily and quickly dispatched to any disaster area. We will become one world.

Where is Aeronautical Engineering leading us—up in the air!

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. . . Man Looked to the Birds