Latest Facts from Science, Mechanics and Invention

Flying as Fast as the Speed of Sound

How Experts in Aviation Plan a New Engine That Can Drive An Airplane at the Rate of 1,080 Feet a Second.

Above: Christening a High-Speed Airplane in a Recently Inaugurated One-Day Transcontinental Passenger Service. An Early Stage Coach Is Shown at the Right. Right: A Head-on View of a Speed-Plane Showing the Small Frontal Area.

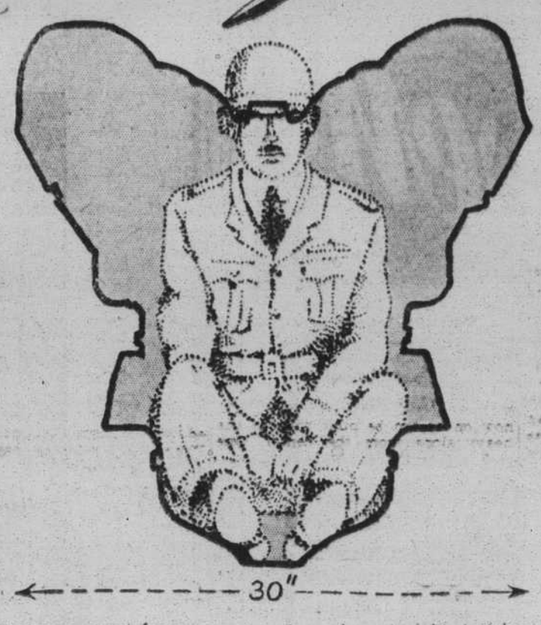
SINCE the flying rate of airplanes, during the last 19 years, has been increased from 50 miles to more than 400 miles an hour and the fact that man feels no discomfort, apart from the noise of the engine, when traveling steadily at the record-breaking speed, is encouraging aviation experts to look ahead to still greater speeds until it may be possible to reach a point somewhere near the speed at which sound travels, which is 740 miles an hour or 1,080 feet a second.

"The question might reasonably be asked whether the speed of sound might be reached for a short time, say one minute, as many small and a few large projectiles start their flight at speeds greater than that of sound," says J. L. Naylor, M. A., in the Scientific American.

"To attain or exceed the speed of sound by any known method except a rocket will need a high acceleration for many seconds, so that experiments in this direction are not likely to produce good results. Moreover, even with rockets the difficulty of landing safely will be great even with an airplane structure; in fact, Herr Opel's experiments on rocket cars and airplanes have not been so successful as to warrant a vigorous prosecution of this line of research.

"In another way high accelerations are sure to be incurred as it is necessary to return at some time to a starting point.

"The amount of acceleration experienced in a fast modern airplane during a tight turn is a measure of the pilot's feelings rather than the speed of the aircraft, as he is trained not to exceed certain stresses so as not to break the structure. Considering the simple turn it is immediately obvious that turning on the same circle at 400 miles per hour will put on stresses nine times as high as 133.3 miles per hour, a fast cruising speed for a civil airplane. The alternative is to turn in a wider circle, which in view of the speed reached means a very wide sweep. Therefore, very high speed aircraft are going to need large maneuver areas, apart from any considerations of the distances required to take off and land even under ideal conditions.



"In the high-speed car problem, the runs have been along straight stretches, the car losing most of its speed before turning for a run in the opposite direction; as in only a few parts of the world are there long straight flat stretches of ground, very high speed motors must remain a pure sport without any commercial development other than a stringent test of materials, manufacture and design. The aircraft, once it is in the air, does not suffer from this restriction, but it is dependent on the care needed not to overstrain the human body. The high-speed aircraft for the average flier will, therefore, have to be flown with care and have large areas in which to maneuver. Apart from this need for care, there is at present no limitation imposed on high speeds by the mere human factor.

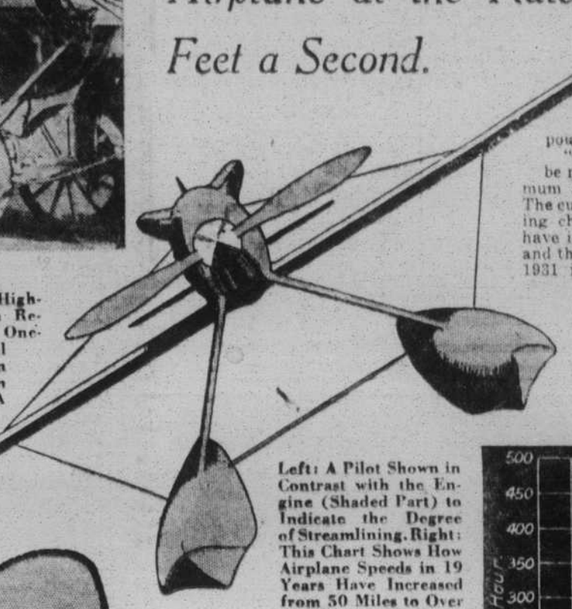
"Until races are inaugurated on pilotless aircraft controlled by wireless or some other means, the first essential is to carry a pilot. Anyone who has seen the small space allowed for the driver of the racing car and the smaller space for the racing plane pilot will realize that very close attention has been paid to presenting the minimum resistance to the air. If we take the frontal area of a man sitting down as four square feet, then his resistance at 400 miles per hour is of the order of 2,000 pounds, nearly one ton.

"The frontal area of one of the most efficient types of airplane yet developed does not greatly exceed that of a sitting man, being 40 inches high and 30 inches wide, dimensions which permit of a streamline body to enclose the pilot suitably behind it and a view forward between the two banks of cylinders. It gains its 2300 brake horsepower at a weight of 1630 pounds, representing a power increase over the 1929 engine of 21 per cent for a weight increase of six and one-half per cent. From a calculation based on the improvement attained in the speed record it would seem that in the 'sprint' engine at least another 300 horsepower must have been developed for approximately the same total weight by running the engine at a higher speed—a remarkable achievement.

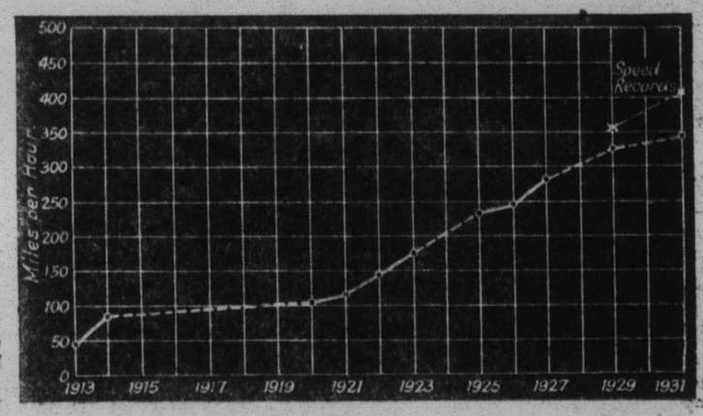
"The high power developed by the engine means a great expenditure of heat," Mr. Naylor continues, "and this has to be dissipated rapidly or else the engine would overheat and fail to function. A rough idea of the rate of fuel consumed can be gaged when it is realized that the gasoline is burned faster than it can be poured out of a two-gallon can.

"At present there seems to be no limit in sight to the maximum speed that can be reached. The curve given in the accompanying chart shows how the speeds have increased steadily each year and the apparent slackening off in 1931 is due to the more severe conditions of last year. The speed record has, however, jumped forward in the two years by at least the same amount as previously.

Courtesy of The Scientific American



Left: A Pilot Shown in Contrast with the Engine (Shaded Part) to Indicate the Degree of Streamlining. Right: This Chart Shows How Airplane Speeds in 19 Years Have Increased from 50 Miles to Over 400 Miles an Hour.



"What then are the limitations?

"If the engine designer can continue to construct engines which will run still faster without a proportional increase in weight, so that the weight per horsepower is still further reduced, then the aerodynamist will devise means, perhaps using wings whose area can be altered at will, so that the engine can be taken into the air, be pulled at still higher speeds by the airscrew (which has by no means reached its limits of design), cooled by devices for making more efficient the available surfaces of the craft, and no doubt, if the power available be large enough, design a much larger body into which the floats with their load of fuel can be absorbed after the craft has left the water.

"Already there are airplanes flying in which arrangements have been made to retract the undercarriage wheels into the body and floats may well be expected to follow. The saving in resistance, if floats and struts were omitted, would amount to as much as one-half the total for the whole aircraft. Given the necessary incentive and the funds, there appears to be no reason why speeds should not continuously increase until they approach the velocity of sound at 740 miles per hour."

When Mosquitoes Bite Their Worst

PERIODS when mosquitoes bite best, or worst, have been revealed by entomologists of the United States Department of Agriculture. Some mosquitoes bite only at night, while others bite only during the day. Some bite most at sunrise, and others are busiest at sundown.

Only the female mosquito bites. The male feeds on nectar and similar substances from plants.

The "rain barrel" or common mosquito bites only at night. When flying it makes a singing noise.

The yellow-fever mosquito usually bites only in the daytime and is busiest early in the morning and late in the afternoon. It flies quietly. It will bite indoors all day.

The fresh-water marsh mosquito is busiest just at dusk. It spends the day in the grass and will bite during the day if disturbed.

Malarial mosquitoes will bite all night long and on dark days.

Paint as a Thermometer

PAINT which will change color with changes in temperature thereby indicating visually the temperature cycle through which the painted surface passes under a given set of conditions is the unique development described in Chemical and Metallurgical Engineering. This paint is made by mixing intimately one part by weight of cuprous iodide with two parts of mercuric iodide, either dry or with the addition of a little water. If water is employed, it must be evaporated by the application of a gentle heat at a temperature below 140 degrees Fahrenheit. When dry, the mixture should be ground to a fine powder, which is then mixed with a thin, light-colored, non-acid oil or spirit varnish. The resulting paint is applied with brush.

Metals such as tinned iron or brass may be given one or more coats, but the paint should not be applied to aluminum as the resulting chemical action destroys the paint. A surface covered or striped with this paint—for example, a bearing or machine part—will be bright red from room temperature to 130 degrees Fahrenheit, at which temperature perceptible darkening occurs. At 135 degrees, the paint is noticeably darker and at 145 degrees it is maroon. At 155 degrees, it assumes a light chocolate color; and at 160 degrees, it is dark chocolate. When it has reached 190 degrees, it attains the darkest color that can be distinguished; and at 212 degrees, it is almost black.

In cooling, the color cycle is reversed, with the exception that the dark chocolate color appears at 170 degrees instead of 160 degrees, and temperatures between 212 and 170 degrees are not readily determinable. Below 170, the colors re-appear at the temperatures indicated for the ascending scale, and the cycle can be repeated as often as desired. A stripe of the paint on a hot-water tank will show readily the hot-water level.

The Strange "Tree of Destiny" That Sheds Its Blood

When This Mystery Tree Matures, It Bursts Into a Mass of Crimson Blossoms from Which Flow a Bloodlike Liquid. The Tree Then Dies and Its Trunk Becomes a Fragile, Hollow Stalk.

GROWING at the foot of the Acropolis, one of the most famous ruins of antiquity, is one of the strangest phenomena of all plant life—a tree which is described as literally bleeding itself to death.

Early each June this mysterious woody plant, which is known as the "Tree of Destiny," shoots its long trunks into the air as if by magic out of a soil apparently devoid of all nourishment. After several weeks when the trunk of this tree, which is also called the "temple of the light of the Acropolis," because of its resemblance on occasions to a giant candelabra, it suddenly extends its branches at the ends of which appear spongelike growths. At maturity the tree bursts into a mass of crimson blossoms from which drop a liquid that has the appearance of blood. When the last blossom has shed its last drop of "blood" the tree then dies and its trunks become fragil, hollow stalks that are easily broken by the first wind that blows.

The "Tree of Destiny," which reaches maturity within two months after its shoot has thrust its head above ground, is supposed to obtain its nourishment from large parasitic plants growing at its base. These plants closely resemble the cactus that grows on American deserts, although the leaves are not as coarse, but they have sawlike edges and are sharply pointed.

Glass Blackboards

THE familiar slate blackboard of the schoolroom may soon be relegated to the past and its place taken by blackboards of glass.

Slate, and particularly slate suitable for blackboards, is a natural product found in a restricted area in eastern Pennsylvania, according to The Chemical Digest. It is inevitable that it eventually will be exhausted. Hence the substitution of glass.

The problem was one of developing glass by treating it in such a way that it could be given a surface as fine and velvety as slate, and at the same time be perfectly durable by incorporating a fine abrasive.

The tests show perfect results. The glass board is approximately the same thickness, weighs the same per square foot and is erected in exactly the same way as slate.

How Mortar Is Strengthened with Sugar

MORTAR made of lime-sand, when sweetened with cane sugar, is greatly strengthened, according to a paper presented before the Sugar Division of the American Chemical Society recently by Drs. Gerald J. Cox and John Metschl, of the Mellon Institute of Industrial Research, at Pittsburgh. Such an application of sugar is not new, as it is believed that the Romans made use of such materials in mortars that have certainly stood the test of time. Also, in sugar-growing countries, it is known that sugar has been employed to increase the strength of mortar.

Drs. Cox and Metschl found that there is very good reason for the empirical practice of "sweetening" mortar. From their experiments they ascertained that mortar which contains sugar equal to 6 percent of the quick-lime content has a tensile strength 60 percent greater than that of mortar containing no sugar. Further tests are planned of compression strength, setting time, and durability as influenced by cane sugar.

The process of mixing the sugar with the mortar is quite simple. The sugar is dissolved in part of the gaging water and mixed in with the sand and lime. The sugar must not be mixed with the lime before slaking.

With the present low price of sugar, the five or six pounds of sugar necessary for 100 pounds of lime is only a small addition to the cost of laying bricks or plastering a wall.

Bringing the Jungle to the City

Perfect Skins of Tigers and Other Wild Beasts, After Being Chemically Treated, Are Stretched Over Skilfully Sculptured Models of the Originals, Then Placed in Natural Poses and Surrounded by Jungle Scenery.

SHOULD you ever feel the call of a thrilling adventure in the jungle it is now no longer necessary to organize an elaborate expedition and proceed to some distant tropical land in the heart of Africa or India. All you have to do today is to wend your way to the American Museum of Natural History in New York City where you can place yourself in the midst of jungle surroundings of a startling naturalness. The lure of the dense and mysterious jungle with all of its thrills has been brought to blase Broadway and the habitues of that glittering world-famed thoroughfare now need to walk no farther than a few city blocks before they find themselves suddenly plunged into the heart of a tropical jungle and a veritable wilderness of ferocious-looking lions, glowering tigers, menacing rhinoceroses and other wild creatures.

Contrary to the popular conception of a museum as a place where specimens are assembled, stiffly arranged and then left merely to collect dust, the great exhibits at the American Museum of Natural History are constantly being augmented and presented in the most lifelike manner that the science of taxidermy can devise. Thus, as the scientist and explorer extends his sway over the jungle, the beasts of the jungle find their way in all their natural environment into the heart of the world's greatest city.

Ferocious tigers, for example, are seen crouched to spring out of the tall jungle grass upon their unsuspecting prey. Bold lions impudently stare back at the visitor and rhinoceroses stand in the threatening attitude of a charge. A look is a thrill, for the beasts are surrounded by the rocks and foliage of their native lairs. The effect is startlingly realistic, in spite of the fact that the animals are confined in glass cages.

Perfect skins of magnificent specimens of jungle-land, after being chemically treated, were stretched over skilfully sculptured models of the original animals. The figures were then placed in lifelike poses in a setting of trees, grasses and reeds that were either brought direct from the jungle or fashioned from paintings made on the spot.

After the figure of each animal had been completed its fur was carefully brushed to give it a natural sheen. Even the eyebrows of each animal were penciled and its claws manicured to add to its lifelike appearance.