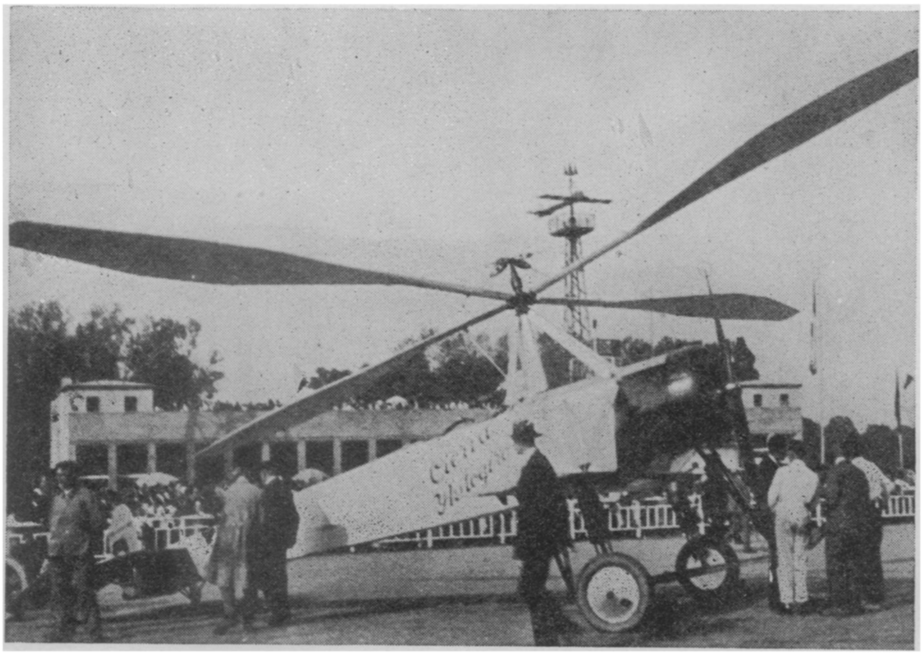
Novel Airplanes for Safe Flying

Aeronautics



THE WINDMILL-LIKE wings of the Autogiro will help prevent stalling of the plane, according to the inventor, Senor de la Cierva. A number of these have been constructed, and have many successful flights to their credit

By Watson Davis

"Quit stalling!"

Good advice to airmen, but it is hard for them to follow it. The airplane, as now built, despite the vast advances made since the pioneering days, has one inherent fault that, in the hands of the inexpert pilot, makes it more dangerous than the automobile, motor boat, railroad train or other means of travel. It will "stall." Pushed to climb too fast, throttled down in speed too quickly, it will lose its "lift," its ability to stay in the air. It tends to get out of control, and unless skilled hands attend it, a crash may occur.

To make airplanes safe has been the ambition of aeronautical engineers. Making the stall less probable and frequent is one step toward greater safety. As airplanes have improved in design in recent years the stall has become less of a factor in the accident record. The latest standard design models are much superior to those of a few years ago and are often controllable under conditions that would have spelt disaster in past years. Engineers have tried many schemes and devices to make the stall less dangerous and the path of aeronautic progress is strewn with such interesting and abandoned experiments.

From the Handley-Page aircraft factory in England there has come the "slotted wing," automatically controlled, that is hailed by some as "the greatest advance in airplane design since the Wright brothers flew." This improvement allows an airplane to be maneuvered under the control of the pilot when, without the slots, the airplane would be stalled and uncontrollable.

The slotted wing, manually controlled, was also developed by the German aeronautical engineer Lachmann and a slot anti-stalling device has also been devised in the laboratories of the Royal Air Force in England.

Another piece of apparatus for making stalls in ordinary airplanes less likely is the Savage-Bramson anti-stall gear, also a British invention.

Queer-looking airplanes have come out upon the flying fields in an effort to conquer the conventional craft's instability. An English craft, tailless, looking like a giant prehistoric flying reptile, the pterodactyl, has shown ability to overcome the nightmare of every pilot, the "stall." From out of Spain has come de la Cierva's autogiro, an airplane that has a windmill for wings and achieves slow speed and steep descent. Here in America a craft like the autogiro in principle is being tested, and also an airplane built on the lines of a gull is being put through its paces.

These are "freak" airplanes. But they are called that in the same way that Langley's pioneer flying machine and the machine used by the Wright brothers at Kitty Hawk were freaks in their days.

As every schoolboy knows, the airplane is kept aloft by the "lift," the pressure or suction on the wings that is created when the airplane is driven or pulled through the air by the propeller. Given enough power, the saying goes, it would be possible to make a barndoor fly. Before the airplane can be sustained in the air it must have gained enough speed to produce this lift. Therefore, the craft must get a rushing start on the ground and it must maintain speed in the air.

In the fact that speed must be maintained in order to support the craft lies most of the danger of flying. And, contrary to popular opinion, engine failure is not usually the cause of the crashes. It is quite possible for a pilot to cut off his engine and bring a plane to a safe landing, provided he has sufficient altitude.

The most dangerous situation develops when the speed reduces below a certain point and the airplane "stalls." This usually happens like this:

In order to climb, the pilot points the nose of the airplane upwards. If he attempts to force too steep an ascent, a passenger watching the speed indicator would see it drop from the 100 miles an hour down to 80, then 60, and then, depending upon the characteristics of the airplane, the speed will be reduced to such a point that the pilot loses all control, the control stick is useless, the airplane slips backward, and if at a low altitude, nearly inevitably falls to earth, with disastrous results. If the stall occurs at a height of 1,000 to 2,000 feet, the pilot can usually regain control by flopping the airplane over on its side and diving it nose down until it picks up sufficient flying speed to regain lift and stability.

Most of the disastrous stalls occur just a few seconds after the airplane has left the ground when the plane is attempting to gain altitude. Or an accident may occur during a forced landing due (*Turn the page*)

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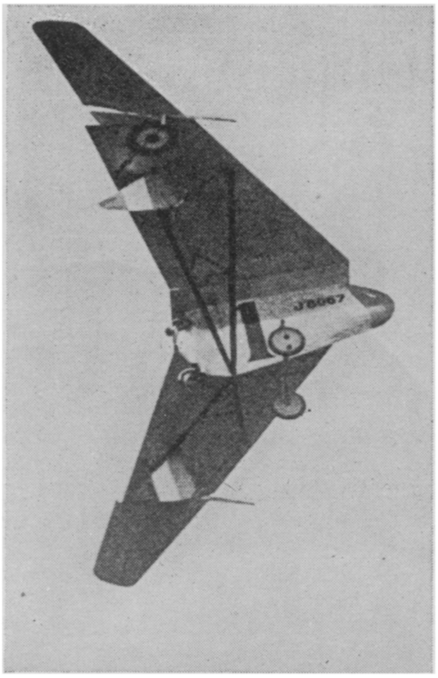
to the high speed necessary to avoid a stall in attempting to fly over some object adjacent to a closely confined landing area.

This failure of an airplane to control normally when its speed is reduced below its "stalling speed" is inherent in most usual designs of airplanes. In spite of its growing application to the carrying of mail, passengers and other services of the commercial world, the airplane is primarily a product of the Great War. The urgent needs of those days hastened the development of aeronautics through its adolescence and even now the principal outlets of aircraft factories are the military departments of the various governments. And safety, stability, ease of handling are not always sought or even welcomed in armies and navies when, in order to attain these improvements, it may be necessary to sacrifice speed, maneuverability or some other quality that is important in combat flying. Infant air transport companies, struggling to get established, have had to use the airplanes already pioneered. It is not surprising, therefore, that experiments to improve aerodynamic safety have been few and often without adequate financial support.

From out of the aerodynamical laboratories, with their wind tunnels, delicate instruments and experimental flying fields, there has come knowledge that has allowed amazing economies and improvements in design of airplanes. For instance, the experts of the National Advisory Committee for Aeronautics have found that a round wire the size of the tiny lead of an ordinary pencil has just as much resistance, or "drag," as a large wooden strut, nearly as big as a man's wrist, that is properly streamlined. Wings tested in the rushing air of a wind tunnel have allowed the determination of the best designs for various sorts of airplanes. Thousands of tests upon models, checked by full-sized performance, have placed in the hands of physicists and engineers the data with which they can create new designs of airplanes.

One of the most promising of the many devices for safer and better airplanes is the Handley-Page automatic slotted wing, illustrated on the cover.

An unobservant layman viewing an airplane fitted with this device would not notice anything very different about it at first glance. Then, if called to his attention, he would see small additional wings or slats attached to the front edges of the wings. These do the trick. The experts call them "auxiliary airfoils." In normal position they fit closely against the leading edge of the main wing and become a part of it. But if the wing during flight loses its lift due to a stall, these slats move forward away from the leading edge of the main wing and allow the formation of a slot, a magic slot, in the wing. The air rushing through the slot is directed along the back of the wing, thus restoring the circulation over the wing and sweeping away the useless eddies which had started to form and destroy the lift. Loss of lift in a stalled airplane comes about through the fact that the air rushing over the wing fails to follow and hug the top surface of the wing. The slot is effective partially by speeding up the rush of air by its small opening and partially by deflecting the air against the wing surface.



THE PTERODACTYL, Capt. Hill's tailless airplane, which looks for all the world like a prehistoric flying lizard. This picture shows it in flight

The first type of slotted wings was not automatic, but just at the point of stalling the pilot had to throw the slotting device into action manually. Then a clever engineer at the Handley-Page plant discovered that the slats would open themselves just as the airplane was about to go into a stall if they were hinged freely. The lift upon them exerted by the airflow over the stalling wing sets them into action. So the automatic slotted wings were invented.

The automatic slots change the character of the airplane's wing, just as though suddenly in midair without the knowledge of the pilot a force of flying mechanics had mysteriously replaced the standard set of wings with a pair that is fit for flying at a greater angle. Some pilots object to the fact that this change is made automatically without action on the part of the pilot and often without his knowledge. Other aeronautical specialists point out that the slots are not a cure for the stall, but just cause a postponement. They save the airplane from stalling at one angle, but if the airplane continues to point its nose upward or decrease speed there will come a point when the machine stalls in spite of the slots.

The past few years have seen a variety of devices designed to change the character of the airplane wings and thus prevent the stall. In one arrangement the wing of a monoplane is made in two sections, so that it can be separated in the air and converted into a sort of biplane. Wings have been so constructed internally that their outside camber can be varied, thus changing the lift and drag.

A rotating cylinder was placed at the front of the wing so that it could be revolved and influence the wing much on the same principle as the rotors of the rotor ships. Jets of compressed air have been sprayed over the top of the wing to check the "burbling" or boiling of air that contributes to the stall. Or air is sucked in to enable a decrease in lift when desired. Many of these devices have gotten no farther than the wind tunnels of test laboratories, but others have been placed on experimental machines.

One device for preventing the stall that is in actual use is more of a warning than a prevention. The Savage-Bramson anti-stall gear, actuated by a vertical rudder, gives a warning to the pilot that his airplane is about to stall by jerking the control stick gently, telling the pilot to nose his airplane down slightly to safety.

Some airplanes of the future may not look like the familiar craft of today's skies. A few years from now we may see a skyscape like an artist's restoration of the ancient Jurassic era, some 150 million years ago, when giant flying reptiles filled the air. Giant tailless mechanical beasts, a new breed of gigantic flying lizards, may be the airplanes of tomorrow.

After the war a (*Turn to page* 187)

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young British aeronautical engineer, Capt. G. T. R. Hill, was fortunate enough to win a scholarship that gave him the opportunity of studying airplanes and how they are built. In a quiet retreat in rural England he spent months of figuring, drawing and thinking. Then at a remote spot on the South Downs he built a glider that embodied his ideas. Unconventional, tailless, with spread wings, it came to look like the extinct lizards he had read about in his geology books. Affectionately he named his creation "Pterodactyl," after those ancient flying lizards.

The pterodactyl glider, after demonstrating the soundness of Captain Hill's design, metamorphosed into an engined tailless airplane that attracted wide aeronautical interest. It flies without stalling. It is lighter in construction than the ordinary plane. "Controllers" on the wing-tips perform the functions of elevators and ailerons. It is a new breed of aircraft. Perhaps further trials will show it worthy of starting a new aeronautical fashion, or it may not survive in the fierce competition for better airplanes.

Bidding for a place in the air is another queer-looking craft, a sort of flying vertical windmill. This is the autogiro, the invention of Senor Juan de la Cierva, a Spanish engineer. Some have called it a helicopter, but it is not. It is essentially an airplane with revolving wings and it flies like an ordinary airplane, not straight up as a helicopter is supposed to. The first of the autogiros were built in 1919, and since then over thirty machines have been constructed and flown. Flights of considerable length have been completed, and many engineers predict that this type of machine, embodying new principles, has a real future before it. Others feel that the standard design of airplanes, improved by further research, will match the autogiros' performance.

Replacing the ordinary wing structure, there is a four-bladed gigantic windmill-like revolving wing. This is free to revolve and is not powered in any way. It is whirled very slowly during flight by the relative wind. In other respects, the craft is built much like an ordinary airplane. The revolving wings give it the advantage of being free from sudden or violent stall and a slower safe landing speed. Although the autogiro cannot be built to attain as great speed as the (*Turn the page*)

California Fights to Save Fig Crop

Botany

Warfare against a plant disease that threatens California's huge fig industry is being waged on a most unique scheme of campaign. It all centers around keeping a certain small insect, a little wasp no bigger than a gnat, aseptically clean. If the fig-wasp can be kept clean the figs will be saved.

This tiny wasp, called Blastophaga by scientists, looms so large in the fig business because she is the only creature that can pollinate the Smyrna fig, which is the most valuable variety in California. The Smyrna fig, being exclusively female, produces no pollen itself, and the wasp is depended on to transfer pollen to it from an exclusively male fig variety, known as the "caprifig," which produces inedible fruits but plenty of good pollen.

The Blastophaga wasps breed only in the fruits of the caprifig, and emerge from them as adult insects covered with pollen. Fig growers fasten caprifig branches in their Smyrna trees, and the wasps, attempting to enter the immature Smyrna figs, accomplish their fertilization. The resulting seeds in the Smyrna figs give them their special value and the medical properties which are claimed for them.

Thus for many years the little fig-wasp has been a vital factor in the prosperity of California fig growers. Now she threatens to be the agent of their ruin, because a serious outbreak of a brown-rot disease has occurred among the figs, and the fig-wasp has been shown to be the unwitting carrier of its germs. Every fig she pollinates she also infects with the virus of destruction, for the pollen-providng caprifigs are infected, and the wasp carries off the infection when it carries off the pollen.

To break this vicious circle a drastic and elaborate clean-up campaign has been necessary. Instead of letting the fig-wasp breed and over-winter in its natural way, the stock of insects that are to fertilize this year's crop has been concentrated in a newly built "insectary" near Fresno, and fig-growers have been required to ship every single caprifig fruit here. Millions of insects, in tons of caprifigs, have been assembled.

The wasps are brought out of their over-wintering condition in special incubators, and are allowed access to the caprifig pollen only after the fruits containing it have been carefully sterilized to kill the brown-rot germs. Then the wasps are induced to enter special mailing tubes which are sent to the fig growers. Released in the orchards, the little pollen-carrying insects proceed to the Smyrna fig flowers and complete their fertilization.

State officers inspect all orchards to see that no caprifig fruits, containing possible infection, are left on the trees. If the clean-up campaign can be made 100 per cent. complete for a few years it is believed that the disease will be completely stamped out.

Science News-Letter, March 24, 1928

Bad Spelling Reveals Language

Archæology

Bad spelling on tombstones in the Jewish catacombs of Rome indicates how the Jews who lived in Rome in the early Christian centuries pronounced Greek and Latin, according to Dr. Harry J. Leon, of the University of Texas.

Scholars have wondered whether the Jews who formed a settlement in Rome clung to their Hebrew ways or whether they did as the Romans did, Dr. Leon explains. Six Roman catacombs where the Jewish residents buried their dead are now known, and study of the inscriptions on the slabs and the gallery walls show that the writing is three-fourths Greek and one-fourth Latin. Often words in the inscriptions are confused with other words of similar sound, so that they are misspelled in characteristic ways. Jewish ritualistic symbols on the tombstones are significant evidence that the epitaphs on the underground tombs were indeed written by Jewish people, using foreign languages, Dr. Leon points out.

The Jewish population in Rome, which grew to about 40,000, was no more familiar with the Hebrew language than the average Jew of today. The more cultured among them spoke Latin as well as the popular Greek, the recent investigations indicate. Their inscriptions afford valuable material in tracing the history of the Greek and Latin languages in their development from the classical tongues of antiquity to the modern Greek and the Romance Languages of our day, Dr. Leon states.

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ordinary type airplane, its other advantages may make it useful.

Such heavier-than-air flying craft embodying the newest ideas of aeronautics will be among those entered in an air contest that has safety rather than speed or endurance as its objective. The Daniel Guggenheim Safe Aircraft Competition, sponsored by the Daniel Guggenheim Fund for the Promotion of Aeronautics, has set standards of performance that are spurring foreign and American manufacturers to their best efforts. The contest is to be open until October, 1929, and some $150,000 in prizes are offered. The minimum performance that can win a prize is: A speed of 35 to 110 miles per hour; glide for three minutes at an air speed of not more than 36 miles per hour; land in not over 100 feet; land over a 35-foot obstacle and come to rest in not more than 300 feet; take off in not more than 300 feet and clear 35-foot obstacle from a standing start at distance of not more than 500 feet. Today no commercial airplane can satisfy these requirements.

Now that the days of wonder at airplanes are past, now that we send an air-mail letter for a dime, purchase a pleasure ride for a dollar or two, and expect airplanes to hop off for foreign ports daily, the principal question about flying is:

"Are airplanes safe?"

Enthusiasts quote mileage figures that should convince the doubter that it is just as safe to fly as to ride in an automobile or on a train. For instance, the British air transport services during seven years had only four accidents involving the death of passengers in flying 5,000,000 miles. The 54 German air lines, in 1926, carried 56,268 passengers and 1,680,000 pounds of mail, freight and baggage, a total of 6,838,425 miles with only one fatal accident. Even more impressive figures demonstrate the safety of army and navy flying in the United States.

But airmen and aeronautic experts admit that airplanes are not as safe as they can be made. They see in the airplanes that are now flown successfully inherent faults and shortcomings. And since they believe that these qualities of the airplane can be improved, they are working, in wind-tunnels and laboratories, at aviation fields and in factories to produce airplanes that are stable, safe, and yet easy to fly.