THE MAKING OF A RACE DRIVER

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The FLYING WING

Building the first all-metal transport designed by the author. This is the Lockheed Electra, famed for its speed. Here we see workmen busy on wing and nose

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TOMORROW'S airplane—a giant flying wing without fuselage or cabin, carrying payloads of 150 passengers and tons of baggage.

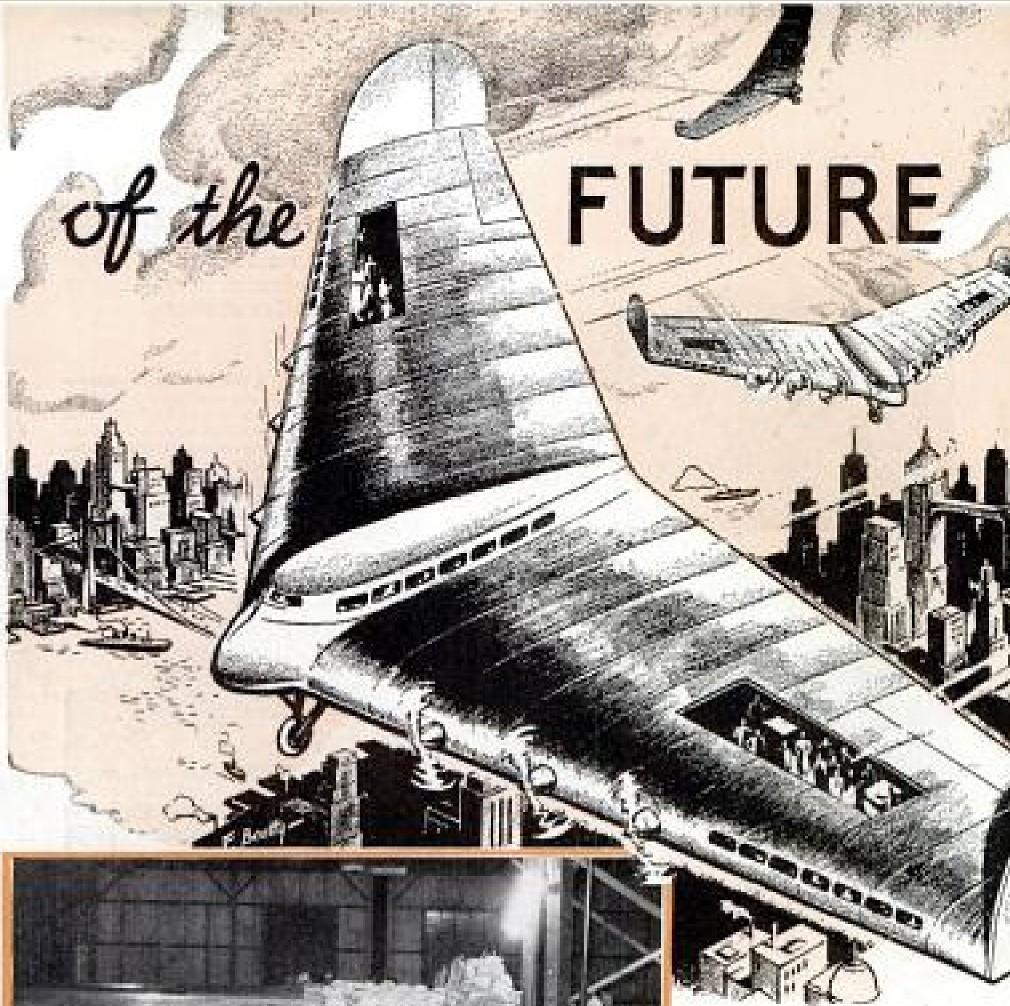
Judging from present developments and trends in aircraft design, it is our belief that such is a rough sketch of the commercial transport that will be flying the sky trails within a decade or so. Of stainless-steel construction, it will be almost twice the size of any plane now under construction with a gross weight of 150,000 pounds and having a tip-to-tip wing spread of 300 feet. For power, it will use six 2,500-horsepower motors, so arranged that the mechanics may work on them during flight.

Travelers will ride inside the giant wing, which will be equipped with individual staterooms, recreational facilities and a promenade deck. Curved windows will be placed in the leading edge of the wing, in the ceiling and parts of the floor. To complete the picture, the tricycle landing gear will be used to land the big transports.

The speed with which these flying wings will travel is difficult to predict. Because we have learned that size has little bearing on speed, 500 miles an hour is not improbable, if certain problems regarding altitude flying can be answered satisfactorily. Speed costs money. The faster a plane travels the more fuel used and the greater the depreciation on equipment, all of which means higher operating costs.

The prediction of such radical changes will not meet with the favor of those who

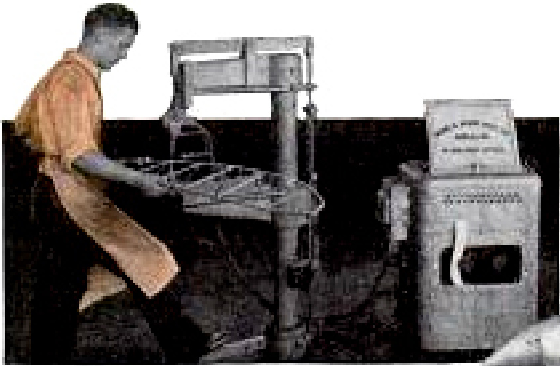
of the FUTURE

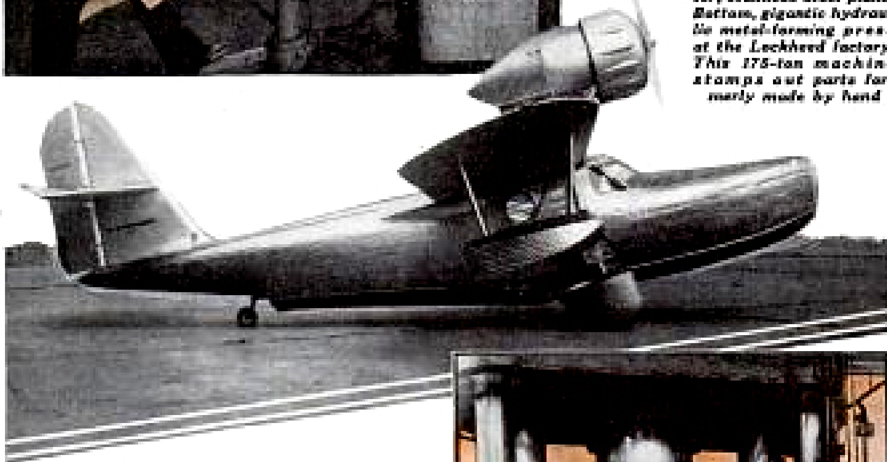


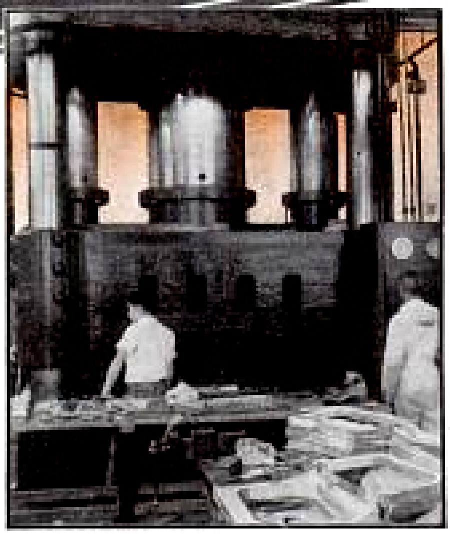
Top, drawing of the "flying wing" envisioned by the author. Left, static load test of a new Lockheed. Plane is inverted and sandbags weighing far in excess of any weight the plane will carry are placed on the wings

feel the ultimate in aeronautical development has been reached. But aircraft designers are not hidebound by precedent or production methods. They have a way of looking beyond the artificial limitations of their tools and in so doing make possible the "impossible." For evidence that the flying wing is not beyond the range of future possibility, we need only to compare one of the earlier planes with a modern transport.

In efforts to improve aircraft, engineers and technicians have sought to eliminate useless, dragging elements. Struts, braces, and guy wires have disappeared. On the big ships, the next important step is removal of the fuselage. And with it will go the tail, lateral and vertical control being attained through weight in a plane the size of a flying wing. Another advantage would be that a new method of fabricating this metal makes possible a further reduction in drag by the elimination of rivets.







Left, shot-weld apparatus, and tape on which are recorded the heat units in each weld. Center, stainless steel plane. Bottom, gigantic hydraulic metal-forming press at the Lockheed factory. This 175-ton machine stamps out parts formerly made by hand

wing-tip fins and wing ailerons. If the size of this future plane seems a bit wild-eyed, consider present developments within the industry. It is no secret that transports are growing larger and larger. There is one plane under construction so big it cannot be assembled within the walls of one of our most modern factories. The building of great supercharged planes operating at 30,000 feet at cruising speeds of 250 miles per hour with flying ranges of between 3,000 and 4,000 miles is tea-time conversation among builders.

The next ten years should see stainless steel come into its own as an aircraft metal. Already aviation's spotlight is being focused upon its structural possibilities with the completion of the first all stainless-steel plane built for commercial purposes. Apart from its non-corrosive quality, stainless steel has much to recommend it. Although heavier than dural, its high tensile characteristics would be the means of saving considerable structural

Stainless steel is more costly than other metals of this character but this is not an important obstacle. When the alloy was first introduced into the commercial field, it was selling for seventy-five cents a pound. It was substituted for a metal costing but four cents a pound. This cost was offset in other ways, however, particularly in the railroad streamliners, and increased production of the metal has made it considerably cheaper.

When stainless steel was first considered for airplane structures, engineers found it couldn't be handled in the manner of spruce, dural or high-tensile steel. This alloy attains its maximum resistance to corrosion by a special heat treatment. When cooled, it has ten times the electrical resistance of ordinary steel, is very ductile, and capable of being drastically cold worked. It was found, however, that any subsequent heating of the metal weakened its resistance to corrosion and impaired its general utility.

Because of this, ordinary welding methods were out of the question, so Col. E. J. W. Ragsdale, chief engineer at Budd Manufacturing company, developed what is known as "shot-welding." This consists of fusing together two separate sheets of metal by passing through them an electric current and generating heat through the resistance offered by the metal to the current. In principle, this is virtually the same as the light-bulb filament except here the current is not strong enough to fuse the filament. Because of the metal's high electrical resistance, the heating time is made so short that the alloy's stainless properties are not affected.

Time is not an essential factor of heat. Lightning has some excellent short-time melting jobs to its credit and some "shot welds" have been consistently made in .0001 second. Thus, a weld consistent with the high-tensile characteristic of the metal was developed. Engineer Ragsdale did not stop there, however. He made his fabricating methods virtually foolproof by designing a mechanism which accurately gauges and records the strength of every weld made or failed. On a tape is written the heat units entering into each weld and also giving notice of any variation.

The aircraft industry in this country has been built around the use of aluminum and its alloys, while in Europe, carbon steel is favored. These are both subject to corrosion. While mindful of the advantages of stainless steel, there is need for a comprehensive study of this metal in terms of modern aircraft requirements.