The Weather
York City and vicinity: Clear with
derate winds. Yesterday's temperature
range to 10 p. m.: High 45, low 32.

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Engineers Cut Wing Pieces From 134 to 21; Stabilizer Reduced From 42 to 10

Orders for 2,500 Four-Seaters

BY RICHARD P. COOKE
Staff Correspondent of THE WALL STREET JOURNAL

FARMINGDALE, N. Y.—Here at Republic Aviation Corp.'s Long Island plant may be seen two parts of a plane, a wing and a stabilizer, that could hold the key to production of small aircraft after the war for sale in the auto price field.

Alfred Marchev, Republic president, has such confidence in his engineering idea that he already has taken orders for more than 2,500 four-passenger amphibian planes. They will be delivered "when possible" after the war at a retail price of $3,500.

Republic hopes eventually to develop a full line of private aircraft, probably down into the lowest-priced two-person group, at about $1,200 to $1,500, or the cost of a medium priced pre-war auto.

If that proves possible, America's aviation enthusiasts will get better-engineered, all-metal planes after the war for as little money as the least expensive pre-war models—despite tremendous rises in labor and material costs.

The final decision will depend on Republic's experience with its amphibian, the company's first venture into this small airplane field. Right now it is head over heels in production of the P-47 Thunderbolt.

Fewer Pieces Save Money

Before the Government clamped down last December on post-war activities of all aircraft companies, however, Republic had gone a long way, Mr. Marchev believes, toward development of a production process which would sharply pare costs. The key to it is fewer parts, therefore less labor.

The history of aviation, including aircraft production, has so far included four clearly defined phases, says Mr. Marchev. They are:

1. Construction of the first plane that would fly, accomplished by the Wright Brothers at Kitty Hawk in 1903.

2. The building of wood and fabric planes, mostly by hand but later in elementary "production lines."

3. Transition to metal construction. This required a wholesale redesigning, with all weight and strength factors changed. But the planes still were handmade.

4. Designing of machines to replace much of the hand work. Many operations can be performed simultaneously; one huge press, for example, can drill a dozen or more holes on a piece of metal at one time.

Through this production evolution, however, the fundamental structure of the airframes had never been radically altered for production efficiency. The remarkable aircraft of today, while being constantly improved aerodynamically, are still a complex combination of thousands upon thousands of parts. Emphasis during the war period, which has seen most of the real advance in the airplane, has been on faster, higher-climbing, longer-range craft. Cost has been in the background.

Proposes Simplified Structure

But now, Mr. Marchev proposes a fifth phase:

> Designs drawn specifically to make planes of much fewer parts and therefore involving fewer production steps.

With this in mind, Republic technicians started with a stabilizer (the fixed horizontal tail surface). By doing away with conventional cross ribs and using, instead, a horizontal spar, they cut down sharply on the number of parts and work involved in assembling them.

The surface of the stabilizer was crimped (ridges put into it) to provide greater firmness than a flat piece of metal. The result of this alteration in the stabilizer was the reduction of the number of parts from 42 to 10.

The engineers did much the same thing with a wing designed for Republic's amphibian. They pared the number of parts from 134 to 21.

Cut Cost to Under $1 a Pound

Careful cost-accounting of these operations shows that materials, labor and overhead in the production of these two parts have dropped to less than one dollar a pound. How radical a reduction this represents is seen in the fact that before the war most airframe production costs ranged from $3 to $10 or more a pound.

Simple planes with fabric-covered wings and metal or wood framing before the war achieved the lowest costs. Some of these models may have been produced, without the engines and instruments, for a little less than $3 a pound. But for designs at all comparable with the all-metal Republic amphibian, costs have often been well over $3 a pound, although there is great divergence in apparent costs of different designs. Military airframe cost often amounts to $10 a pound.

Although the cost saving on the amphibian's 1,775-pound empty weight (without passengers is considerable, this weight also includes the 185 h.p. engine and instruments and accessories. The engine, which weighs between one and two pounds per horsepower, today cannot be purchased for anything like $1 a pound. In fact most manufacturers agree that engines will cost $5 or more a horsepower after the war. Mr. Marchev is aiming at a goal of $3 a horsepower for his purchased engine, and believes good power plants can be built for that amount if principles similar to those used in his own airframe are employed.

Instruments, too, are a costly item, but Mr. Marchev feels that changed designs could radically reduce prices. The ammeter in an automobile, for example, probably costs the car manufacturer less than 50 cents, whereas an airplane ammeter may cost $10 or more. The main reason for this difference is that the auto ammeter is really only a useful indicator to show charge or discharge of the battery while the airplane ammeter is a genuine precision instrument. The Republic Aviation head feels that a simple ammeter of this type would serve the purpose of the private plane quite adequately and that the highly developed plane ammeter is superfluous. Airplane tires, radios and other accessories in the past also have been too expensive, and have not been produced in sufficient quantity to bring prices down, he argues.

This emphasis on low-cost must not be confused with "tinniness" or shoddiness, Mr. Marchec insists. The stabilizer and wing sections were static tested and met full stress requirements with 15% to 25% to spare.

Relatively Cheap Method

Pre-war low-cost planes mostly were built by the use of welded steel tubing and fabric. This method proved relatively cheap and efficient as long as only a handful of planes of each model were being built, but there is very little saving per plane in larger-scale production. In fact some engineers will even argue that cost goes up with volume. This may be contested, but it is apparently true that mass production means little to this type of plane in regard to costs.

Most post-war private planes, whether made by Republic or other manufacturers, will be all-metal if values comparable with those of automobiles are to be achieved. In this regard, Republic estimates that for certain sections of the private plane steel may be used to achieve even lower cost than aluminum, without sacrifice of light weight.

Mr. Marchev believes that ultimately, when the pressure of war is relaxed, military planes can be redesigned along simpler construction lines which will save the taxpayer millions of dollars. Military ships are built of thousands on thousands of separate parts riveted or welded together. Many of these parts could be eliminated with time, and the total number of operations sharply reduced, according to the Marchev theory.