AVIATION

"Tomorrow's Airplane" Seen As Result of New Survey

Doubled in Size With Greater Speed and Comfort, Visioned Craft Will Be Powered by Four Engines

A LUXURIOUS 20-passenger transport plane that will safely and economically span any two points in North America overnight—this is Tomorrow's Airplane.

Approximately 20 tons in gross weight, more than twice the size of our present land transport planes, the coming machine will have a total engine power ranging up to 4000 horsepower, about three times the rated power of today's common carriers of the air.

Only a little more than half of this tremendous power attains a non-stop range of 1250 miles in still air at a cruising speed of 225 miles an hour. The reserve power will maintain flying schedules even in the face of strong head winds.

Added Passenger Comfort

Arrangements for the comfort and safety of passengers will be even more elaborate than those featured by our modern transports. Day and night passenger accommodations will approximate the latest styled Pullman cars, including dressing rooms. A completely equipped galley will eliminate the necessity of landing for meals. In addition, the plane will carry a crew of five, and, of course, the latest radio and navigation equipment.

But most amazing is the fact that improvements already tested can keep the direct operating cost of such service down to approximately 23 cents per ton-mile of pay-load, just about the direct operating cost of today's smaller and slower transports.

These are the conclusions of 15 aeronautical experts from the United Aircraft Corporation and the Massachusetts Institute of Technology, who have just completed a comprehensive study of the trend of transport airplane development. Their results are reported by Prof. Jerome C. Hunsaker, head of M. I. T.'s department of mechanical engineering, in charge of aeronautics, and George J. Mead, chief engineer of the United Aircraft Company.

Tomorrow's airplane, they emphasize, is not a dream for the distant future or even a theory of what is coming within a few decades. It is rather an airplane that could be designed today of proved components for tomorrow's use.

Has Greater Size

Nor is it in any sense a radical departure from the designs of air transports now in service. Tomorrow's airplane differs from them chiefly in its greater size and range, the use of four rather than two engines, its increased streamlining and higher speed, the greater comfort which it affords its passengers. Basically, they declare, these improvements are not fundamental alterations but rather refinements of today's transport.

Take the fuselage, for example. The most desirable shape, it has been found, is the fish-shaped form used by airships. For the airplane this optimum form must be modified somewhat to give the pilot a clear view and to afford sufficient support at the extreme stern for control surfaces. In cross-section the fuselage is almost a perfect circle.

The wings of tomorrow's airplane are somewhat smaller than those now in use with corresponding gains in steadiness of flight and passenger comfort. They retain, however, one highly efficient feature already in use, the trailing edge flap which permits low speed for take-off and landing, and high speed for cruising.

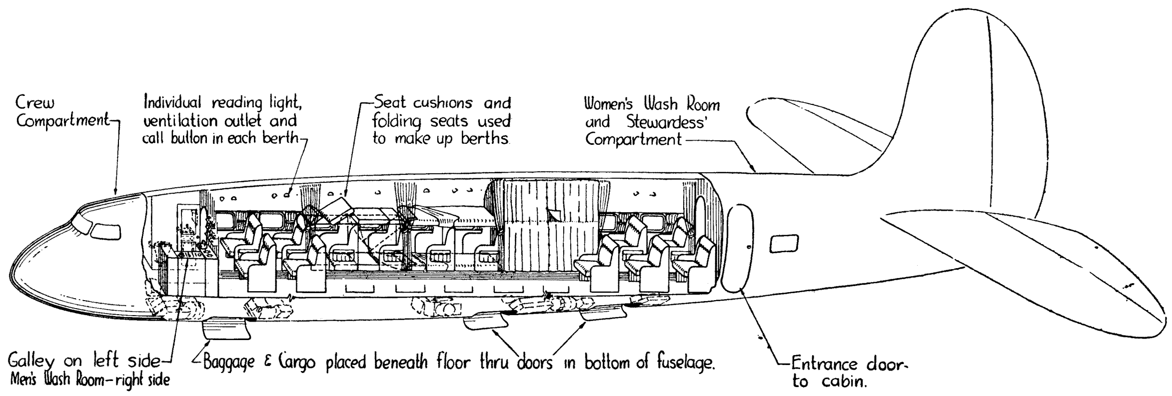
Four Engines Used

The power plant for tomorrow's airplane would have four engines since, if one fails, there will still be 75 per cent of the total power available instead of the 50 per cent available in the present standard twin-engine machine. Tomorrow's plane needs only 60 per cent of its rated power to keep to its schedule. It would be able to do so even if one engine failed completely under this arrangement.

More than four engines, it was found, would not provide a comparable increase in safety and therefore would not justify the additional complication in this size of plane. An uneven number of engines is undesirable because balance demands that one be placed in the nose of the fuselage to the detriment of pilot vision and passenger comfort. Fourteen-cylinder radial engines of an existing type, normally rated at 900 horsepower, are probably best suited for tomorrow's airplane because of their small size and weight and the large amount of surplus power readily available.

DETAILS

This drawing of the 20-ton transport plane of the future shows the interior arrangements.



TOMORROW'S PLANE

This photograph is of a model of the airplane of the future as forecast by aeronautical experts sounded out in a survey at the Massachusetts Institute of Technology.

Passenger and cargo accommodations are exceptionally large, the main cabin measuring 10 feet by 40 feet and being divided into 10 sections of two berths each, like those of a Pullman. The pilot's cab is at the forward end of the fuselage, followed by the men's dressing room and galley, and then the main cabin with the ladies' dressing room and passenger entrance just aft. The main cargo space is below the cabin floor and is filled from below through hatches which close flush with the fuselage.

225 Miles Per Hour

The result is an airplane of 20 tons gross weight of which more than six tons is so-called useful weight—crew, passengers, their baggage, fuel and oil and cargo—the last named estimated at about 1000 pounds. Its cruising speed of 225 miles per hour is nearly 50 miles faster than that of our modern transports, its non-stop range of 1250 miles is almost double that of today's transports, yet all at no increase in cost per unit of pay-load.

In their report the scientists also consider briefly the airplane of the future—one that might be in service in five or ten years, that would bring Europe within 24 hours of our shores. The propeller, the fuselage and tail will probably remain much the same, they declare. The engines will almost certainly be of the electric-ignition type now in use—not Diesels. The wings will be generally the same although smaller, due to more effective high lift devices.

With these improvements the airplane of the future should make the same speed as tomorrow's airplane with about 30 per cent less power. And the operating costs would be reduced about five cents per ton-mile as compared with tomorrow's airplane, under the same conditions of speed and cruising range. Safety will be as great and passenger comfort even greater. Transcontinental flights with intermediate stops will still probably be made at about 10,000 feet, although non-stop transoceanic ones may go to 25,000 feet. Higher cruising altitudes increase cost, and thus it is felt that the stratosphere as an avenue for transcontinental air traffic is not immediately commercially available.

Science News Letter, December 19, 1936

AVIATION-METEOROLOGY

Lake Behind Boulder Dam Will Make Smoother Flying

By PROF. CHARLES F. BROOKS, Director, Blue Hill Observatory, Harvard University.

AIRPLANE travelers over the Grand Canyon region are going to find smoother flying, now that Boulder Lake is backing up behind Boulder Dam.

Heretofore the air in that particular stretch has been notorious for its bumpiness. The bare rock walls of the canyon and the nearly bare dry lower slopes heat tremendously under sunshine. There are always some slopes that face the sun and on which the sun's rays fall perpendicularly. These get the hottest. Near by there are cliffs and slopes which are in the shadow. These may stay cool. The air in contact with the slopes becomes light near the sunned ones and dense by the shaded ones. The denser air pushes the lighter out of the canyon and this lighter air rises in columns or small masses here and there, giving sharp bumps to any passing airplanes.

Now fill the canyon with a lake. Over a large surface the temperature is uniform and the air, therefore, has no local differences in temperature. The sunned side of the canyon above the level of the lake is as a whole warmer than the lake. So the denser air immediately over the lake tends to move as a body toward this sunned wall.

Ideal for Flying

Higher up, of course, there is a flow of air from the heated slopes back over the lake. In fact, without such an overflow of expanded air in the first place there could not have been much movement of the lake air toward the shore, for it would have to have the extra weight of the air above to give it the necessary push.

Over the lake the air must be generally quiet· and sinking—ideal conditions for smooth flying.

That the large body of water now accumulating behind Boulder Dam will affect the climate of its immediate shores no one can deny, but how far will its influence extend? In the first place the lake will make the climate more temperate. With the relatively cool body of water present, the heating of the surrounding slopes will cause a tempering lake breeze outward from the lake by day. Such a tempering breeze cannot, however, be expected to extend beyond the valley. A general wind may blow the air farther, but under desert conditions the identity of the lake air would soon be indistinguishable.

Along with the relative coolness there may be expected an increase of moisture. The air would gain in mugginess what it lost in temperature. However, the air is so dry in the first place that the contribution of the lake locally could not produce enough vapor to make a really steamy atmosphere.

Can the vapor from the new lake increase the rainfall? Possibly it can, but if so it is not likely to be enough to be distinguishable by present methods of observation. When the Colorado River broke through its banks in 1906 and formed the Salton Sea, an increase in rainfall was looked for but none was found. The air of the desert is normally so dry that the small contribution that even a large lake can make to the passing wind cannot be enough to produce shower clouds.