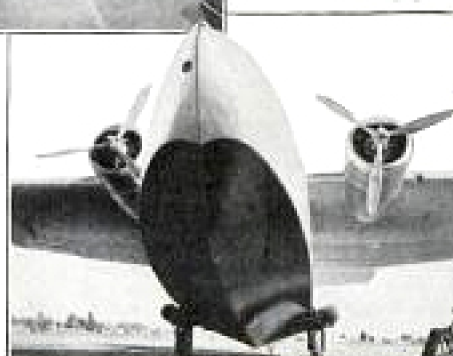
YOUR HOME ON WHEELS

# POPULAR MECHANICS
## MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

# Huge Flying Boat Tested for Ocean Service



*Three views of latest flying boat intended for transoceanic service. Top, from above the ship. Note the twin engines, either of which can keep the craft in the air. Center, interior showing luxurious seats. Bottom, head-on view, showing details of the boat-like hull. Note the three-blade propellers and position of the engines*

Intended for transoceanic service, a thirty-two passenger flying boat is being tested on the west coast. It weighs fourteen tons fully loaded, including five tons of fuel, and has two 1,000-horsepower air-cooled engines that give it a top speed of 185 miles per hour at 8,000 feet. Carrying twenty passengers, mail and luggage, the giant ship has a cruising radius of 2,500 miles. Pilot, co-pilot, navigator, radio operator and stewardess operate the boat. Equipment includes automatic pilot, two-way radio and directional beam receiver, anchors and sea gear. Water-tight bulkheads make up the underwater portion of the hull and the tail group is elevated above the water to prevent submersion during takeoffs. Retractable wing pontoons can be folded into the wings when the ship is in the air. The passenger cabin has eight compartments seating four persons each. The fuselage is air conditioned and sound insulated. Seventy feet long and with a wing spread of ninety-five feet, the flying boat can be kept in the air with only one of its two engines running.

# FUTURE TITANS

ALL ashore that's going ashore! The ship flies in five minutes!"

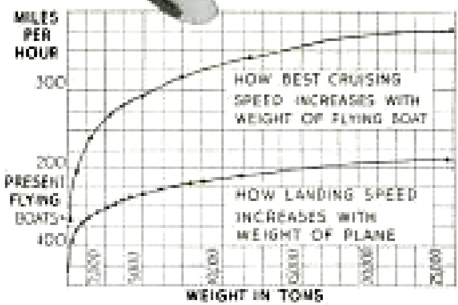
From your porthole four decks above the water you watch the last of the 500 passengers come aboard the plane. Sea doors clang shut, lines are cast off, and the captain's pouch containing last-minute mail is drawn up from the wharf. A faint throb indicates that the engineers in the wing are speeding up the engines.

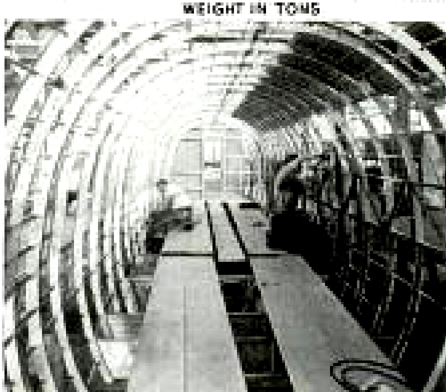
A small policing plane dashes out to sea and returns, its powerful green "all clear" light signaling that the take-off course is clear. Then the monster liner gets under way. Spray beats against the portholes as the boat plows along to attain its take-off speed of 170 miles per hour. In two and a half minutes the 1,500-ton titan lifts itself out of the water and the navigating officer is methodically setting a course for London, eleven hours away.

It sounds fantastic, but engineers think that you will be buying tickets for a one-day ride to Europe in such a giant within twenty years. The fare will be about as little as you pay now for a middle-class cabin.

Recently Schuyler Kleinhans, flying boat designer for a leading aircraft firm, assembled on graphs a technical picture of the flying boats of the future. He knew that flying boats are doubling in size about every five years and he wanted to find out what practical limits there might be to their growth.

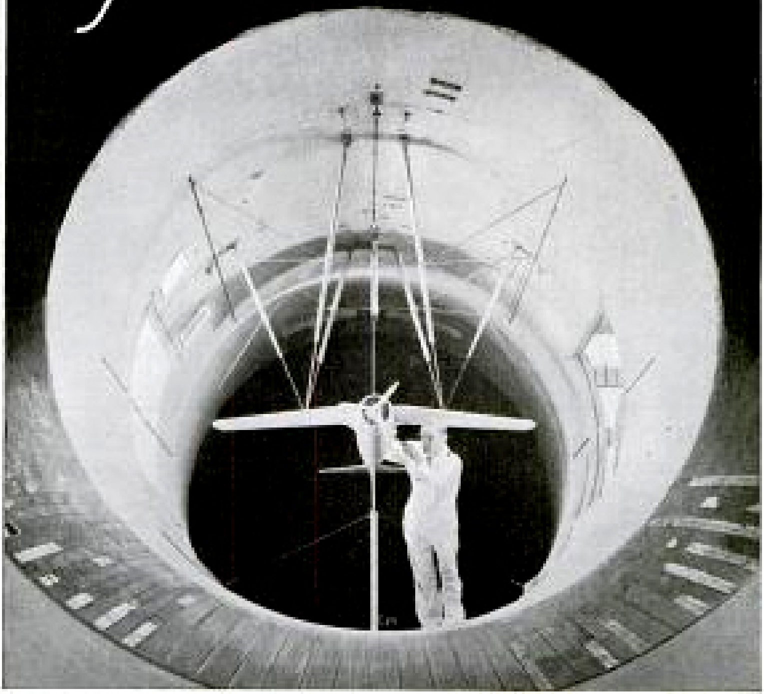
His conclusions are startling. Using accepted aeronautical laws, he



*Top, changing shape of wing fillet with modeling clay for wind-tunnel test of large air liner. Center, how cruising and landing speed increase with weight. Bottom, assembling fuselage of modern air liner*

# *of the* SKIES

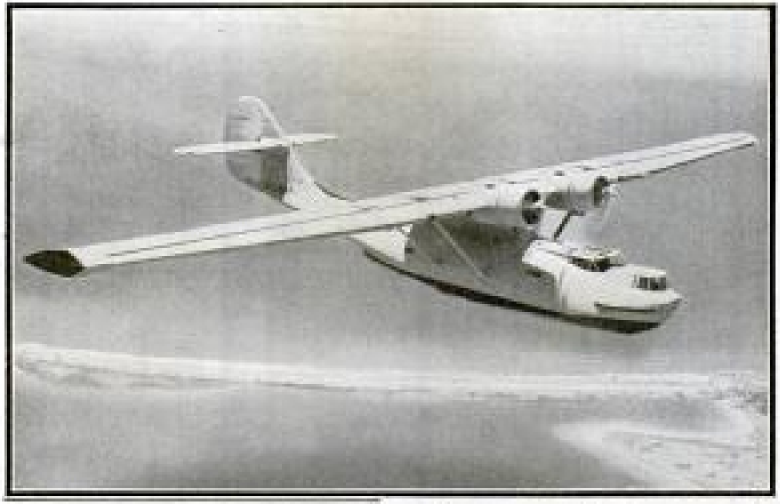


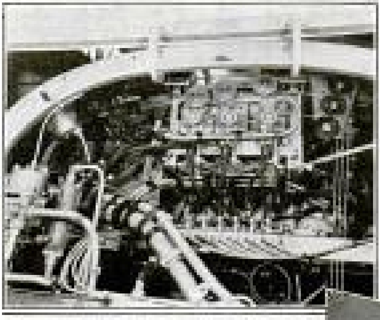
*Designer testing model of new air liner in wind tunnel. Here he finds proof that his design is airworthy or he discovers that changes must be made at various points on the model*

found that huge flying boats are not only possible but will be more efficient than the ones we have now, even without considering probable improvements in materials and engineering technic. To give a concrete picture of the future flying boat he assembled data on a type sixty times heavier than our present airplanes.

This 1,500-ton colossus of the air would weigh about the same as a modern destroyer. Its 200,000-horsepower plant is approximately the same as that of the "Queen Mary" or the U. S. S. "Saratoga." The hull would be 375 feet long and the monoplane wing would be 550 feet long. The wing would be sixteen feet high, leaving plenty of room inside for engines and engineers. The boat would have a cruising speed of 300 miles per hour at 10,000 feet altitude and it would need a run of nearly five miles to get into the air. The hull would be of modified "V" design to help absorb the landing shock and the boat would need three-quarters of a mile in which to land. The cost would be about $20,000,000, about half the price of the "Queen Mary."

The tail alone would weigh more than a modern transport. Kleinhans figures that the tail group would weigh forty-five tons. The wing would weigh 165 tons, the hull, which would have to be strong

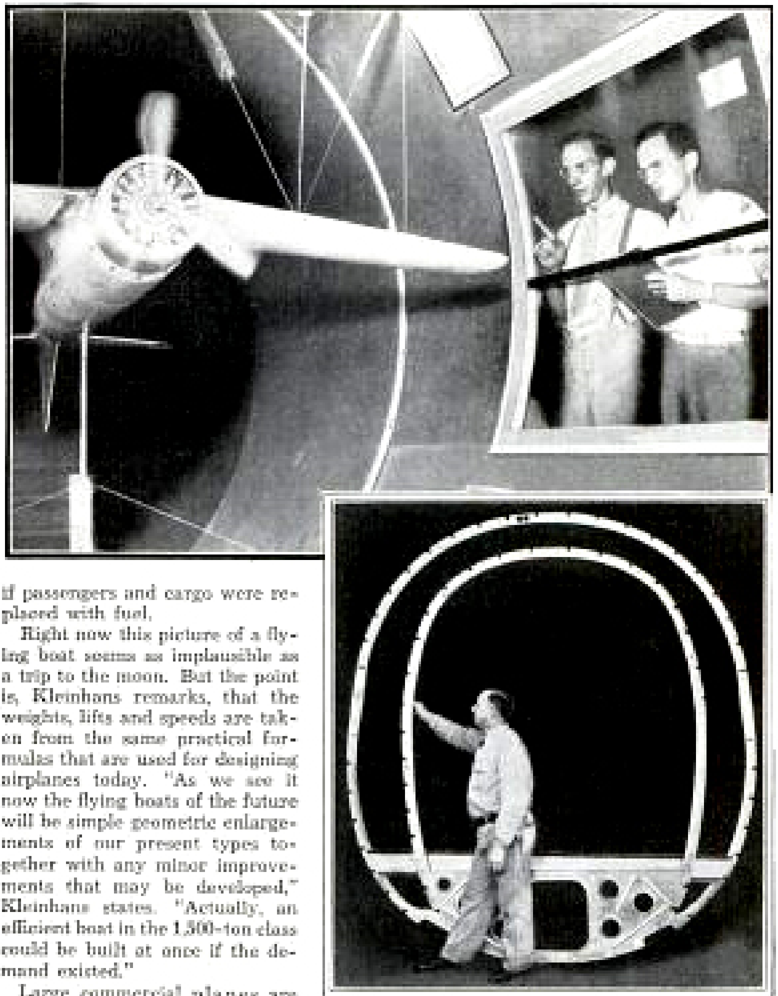




enough to smash through seas at 170 miles per hour, 150 tons, the power plant, 300 tons, and fixed equipment such as interior furnishings, another ninety tons. This places the total empty weight of the boat at 750 tons and allows a useful load of the same weight, of which about a third, on a long ocean crossing, would be pay load.

Fuel and oil for one trip amount to 500 tons, and twelve and one-half tons are allotted for the crew. It would take 100 people to operate the boat and take care of the passengers and the crew could live on board permanently. Passengers and their luggage are estimated at sixty-seven and one-half tons, leaving 170 tons available as cargo, including mail and express matter. With a full load the boat would have a cruising radius of 4,800 miles, enough to cross the Atlantic non-stop with a very comfortable reserve. The boat would be able to fly 7,000 miles non-stop

*Top, big navy flying boat. Center, wiring system of latest air liner. Bottom, loose strings on wing flutter when model reaches stalling angle in wind tunnel*



*Top, engineers studying model plane being tested in wind tunnel. Note spinning propeller which is electrically driven. Bottom, how planes grow—a comparison of old transport cabin frame with that of new Douglas sleeper transport*

if passengers and cargo were replaced with fuel.

Right now this picture of a flying boat seems as implausible as a trip to the moon. But the point is, Kleinhans remarks, that the weights, lifts and speeds are taken from the same practical formulas that are used for designing airplanes today. "As we see it now the flying boats of the future will be simple geometric enlargements of our present types together with any minor improvements that may be developed," Kleinhans states. "Actually, an efficient boat in the 1,500-ton class could be built at once if the demand existed."

Large commercial planes are faster than small ones. This is explained in one basic formula. Doubling the size of a plane multiplies its resistance four times and its weight eight times. To carry this weight, eight times as much power is required but since the resistance is only increased four times, the plane can fly faster. Doubling the size results in an increased speed of twenty-six to thirty per cent.

(Continued to page 118A)

# Future Titans of the Skies

(Continued from page 888)

Instead of being assembled in factories the flying boats would have to be constructed in shipyards or "planeyards." The hulls would be launched like any other kind of ship. Flying bases adjacent to the open ocean would be necessary because it might take half as long to taxi at legal speed down the length of New York harbor as it would to fly the rest of the way to Europe.

The type of power plant that would be used will depend upon the outcome of the unceasing competition between designers of gasoline engines, Diesels, and steam. Right now gasoline engines have the edge in light weight per horsepower. In this theoretical liner three pounds per horsepower are allotted for engines, enough to permit heavier Diesels to be used, and even admitting steam as a strong contender. The Velox system of manufacturing steam eliminates the heavy boilers and many engineers think that steam will be the most practical source of power for heavy airplanes.

Engineers generally agree that the big boats will have four propellers, each operated by a 50,000-horsepower engine unit. The big airplanes will theoretically cruise at seventy per cent of full power, and by dividing the power into four packages, this division permits total failure of one engine unit without crippling the ship.

Figuring out the propellers for the super air liner brought a real surprise. They must be five-bladed, it was concluded, and sixty feet in diameter. They will revolve at only 200 revolutions per minute at cruising speed. This seems a dangerously low speed but it is tip speed that counts instead of revolutions per minute, and with such long blades the tip speeds will be more than enough. The propellers will need to be mounted on hollow shafts twenty inches in diameter and will cost about $1,000,000. A large part of this amount would go for preliminary research.

These days no designer merely hopes that his new plane will fly. He knows that it will. Formulas, backed up by wind-tunnel tests of models, give him an accurate idea of a plane's capabilities even before the raw materials are ordered. The latest wind-tunnel test is to use a model equipped with an electrically driven propeller so that the actual effect of the slip stream may be measured. Another test is to fasten short pieces of string to the wings. When the strings begin to flutter in the wind tunnel, observers know that the stalling angle of the wing has been reached.

Much of the success of the flying boats will depend upon the hot-wire anemometer, a small piece of hot wire used instead of smoke to measure the flow of air around wind-tunnel models. The electrically heated wire, placed near some part of the model, loses temperature according to the speed of the wind that flows past it, and these temperature changes in turn affect the conductivity of the wire. This allows electrical fluctuations to be translated directly into terms that show the efficiency of the model's shape.

Will the future giants of the air pay their way? Yes, the flying-boat designers declare. Not only that, but they should show higher profits than the large surface ships. Comparing the 1,500-ton flying boat with the "Queen Mary," Kleinhans points out that in two weeks of operation the plane would make five round trips while the surface ship accomplishes one round trip. Yet each could transport the same number of passengers in that time. On such a schedule the flying boat would be operated for 110 hours against 200 hours for the "Queen Mary." Capital charges for retiring the initial cost would be half as much, crew and food costs would be much less, while wharfage, ticket selling, and other fixed charges would be about the same. Fuel bills would compare closely.

Kleinhans estimates that on a schedule of two round trips per week in the Atlantic service, carrying an average of sixty per cent passenger capacity, the flying boat should show a net profit of $3,000,000 at the end of five years. This amount would be left after deductions for capital amortization, interest, and all other expenses, and would be based on a charge of about $300 per round-trip ticket. The safe life of a flying boat is longer than five years, hence profits would be at a higher rate during the additional time that the boat is in commission.