

iciency and involve a responsibility for human life and safety."

Tests after flights will tell how the aviator has stood the strain of service. Repeated tests on the aviator would show when he is becoming incapacitated for service through age or some other cause.

The instrument used was developed

from one devised by Drs. Ferree and Rand during the World War and used for testing army aviators. The test involves a measurement of the speed of vision, the speed of use of the muscles of the eyes in the perfect coordination needed for the clear seeing of a small detail, and the speed of accommodation.

Science News Letter, March 12, 1938

AVIATION

New Planes Will be Double The Size of Today's Largest

One New Airliner Type, Costing \$1,500,000 to Develop,
Will Carry 42 Passengers at Speed of 200 Miles an Hour

AN INFANT aviation industry's wild-est dreams of ten years ago are coming to life today in two airplane factories on the Pacific coast, where two land transport planes dwarfing all other landplanes ever built in the United States are rapidly nearing completion.

Today's biggest land transports weigh 24,000 pounds loaded. Tomorrow's—in the shape of the Boeing and Douglas ships now nearing the moment when test pilots will take them off the ground—will weigh 42,000 and 65,000 pounds respectively.

Remarkable for sheer size, the planes will also incorporate novel aeronautical features which will set them apart from the herd of today's planes.

Douglas' 42-passenger giant will have a wingspread of 138 feet. It will stand 24 feet, nearly three stories, off the ground. Sleeping 28 overnight passengers, the ship will be manned by a crew of five. Its engines will develop 5,600 horsepower for the take-off. Tests

will be run with a series of four Pratt and Whitney Twin Hornet engines and later with Wright engines. Ninety-seven feet long, the plane far eclipses in size anything but the largest clipper ships either recently completed or still under construction.

Boeing's 307, which will haul 33 passengers by day and 25 by night under the tutelage of a four-man crew, will weigh 42,000 tons when complete. Seventeen feet high when standing on its landing gear, the Boeing job will have a wingspan of 107 feet and an overall length of 74 feet. Four Wright Cyclone engines will develop 4,400 horsepower.

Douglas' new airliner represents the combined resources of five major airlines and of the company which built the DC-3, most popular skyliner in America. One and a half million dollars will have been spent on its development by the time tests are complete and the first plane is turned over to the United Air Lines, its eventual owners.

United will not be able to use the ship, however, under the terms of the construction agreement, until Transcontinental and Western Air, American Airlines, Pan American and North American Aviation, Inc., the other four cooperating parties, have also received planes.

Boeing's ship is noted for its advanced streamlined design, adapted for high altitude flying. A number of the Boeing planes have already been ordered by TWA and by Pan-American. Sealed cabins will maintain an air pressure equivalent to that found at 8,000 feet while the plane cruises at an altitude of 20,000 to 25,000 feet over the bad weather below.

Douglas' liner will also be adapted for substratosphere flying, although this was not included in original plans.

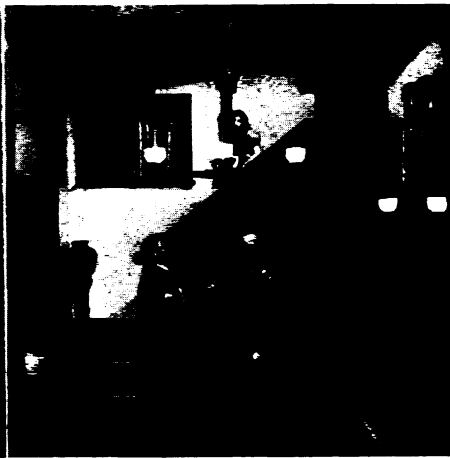
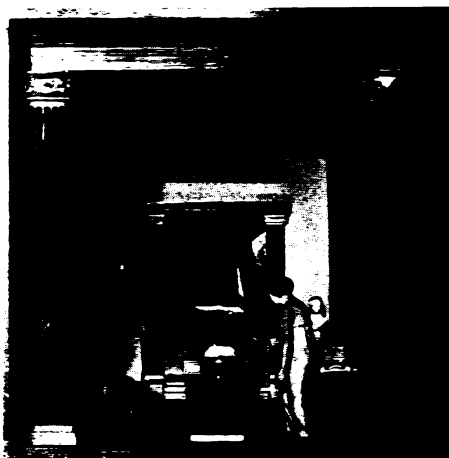
Both ships will cruise at a speed of slightly less than 200 miles an hour and will land at speeds in the neighborhood of 65 miles an hour. They are intended for through runs on the transcontinental lanes rather than for local service, for many smaller airports will not be able to accommodate them.

Two striking features mark the DC-4. It will be the first large plane to be equipped with a tricycle landing gear, the third wheel being under the nose. As a result the ship will be in a horizontal position when standing on the ground. It will also be able to land in a smaller space and under less favorable wind circumstances. A second feature will be the triple rudder.

A separate 110 volt power supply on

THREE LAMPS

Three of the series of models in the Buffalo Museum of Science showing the evolution of the arts of lighting and warming dwellings. They might appropriately be titled the Age of Aristotle, the Age of Shakespeare, and the Age of Pasteur.



the Douglas plane will replace the 12-volt generators of past airliners. The change to such a power source, foreshadowed for commercial ships by its adoption on the Navy's new big bombers, is dictated by the increasing complexity of new instruments designed both for safety and to meet the passenger's comfort demands.

Science News Letter, March 12, 1938

VOLCANOLOGY—PHOTOGRAPHY

Extinct Cinder Cone Makes Striking Aerial Photograph

See Front Cover

RISING high above the New Mexico plains, a cinder cone, with its surrounding lava flows, attests to the rency of volcanic activity in the area where plateau and mountains are not far apart. Caught from the air during a Department of Agriculture survey, this photograph, taken with the camera pointing straight down into the crater, shows details never visible to an observer at ground level. The white spiral line leading from the lower center to the crater rim is a road.

Science News Letter, March 12, 1938

ETHNOLOGY

Too Hard or Too Soft—Life Sinks to Savagery

DO YOU ever wonder why you are civilized? And why millions of benighted savages still live Stone Age lives?

The answer is shown to the civilized public, vividly, in two new Halls of Man at the Buffalo Museum of Science.

Dr. Carlos E. Cummings, director of the museum, blames living conditions for the backwardness of our Stone Age contemporaries on earth. If conditions are extremely easy or extremely hard, mankind does not struggle upward.

The two new scientific exhibits which offer lessons in civilization are known as the Knox Hall of Primitive Races and the Knox Hall of Civilization. In miniature scenes modeled from everyday life, the halls drive home their lesson of primitive life, from poles to tropics, no more advanced in art, or invention than Stone Age man was thousands of years ago on earth; and in contrast the progress of civilized man, as he mastered writing, learned secrets of metals, devised comfortable transportation for himself, improved fruit and vegetables, and invented mechanical devices for the evolution of a machine age.

Science News Letter, March 12, 1938

AVIATION

Ultra-Short-Wave Beacons May Guide Future Aircraft

AMERICAN aircraft of the not-too-distant future may be riding static-free, low-power radio beacons broadcast on the hitherto unexplored ultra-short wavebands, promising experiments reported to the Bureau of Air Commerce by engineers of its Radio Development Section indicate.

Static, cut down but not conquered by recently-designed loop antennae for radio beacon frequencies now in use, disappears entirely from range broadcasts on ultra-high frequencies.

Low-powered ultra-short wave equipment of the type necessary for guiding the nation's air traffic would cost approximately one-fifth as much to install as does present-day equipment, J. C. Hromada, one of the reporting engineers, estimates.

Tests have been conducted at Indianapolis airport with both 63 megacycle (five meter waves) and 125 megacycle (two and a half meters) frequencies studied. An ultra-short wave receiver was adapted for airplane use in order to make flight checks. Present radio ranges sending guiding signals operate on the 200-400 kilocycle band (1,000 meters).

Multiple Coursing Dangers

The problem of multiple courses, one of the knottiest facing the men working with the present type of range broadcast, does not exist in the shorter waves, A. E. Harrison, one of the bureau's radio development engineers, declares. Multiple coursing is the splitting of the radio range over rough terrain, giving rise to more than one "course" a plane might follow. Multiple coursing has been held indirectly to blame in a number of airplane crashes in the past.

A major source of the economy of the ultra-short wave range, Mr. Harrison pointed out, is the fact that the expensive 125-foot towers, of which five are required for each station, necessary to carry the antennas used today, can be replaced in ultra-short wave range broadcasting by wooden poles not more than 50 feet high. Furthermore not nearly so much power is necessary. Use of ultra-high frequencies will not materially affect the size or weight of the

transmitter and receiver carried aboard the plane, it was stated.

Ultra-short waves do not travel beyond the horizon, thus limiting their usefulness for ordinary broadcasting. However, since the range broadcast is to a point in the sky and not to a point on the ground, the horizon limit is not a serious matter.

Two more experimental ultra-short wave transmitters are contemplated, it was learned. One is to be installed at Los Angeles and the other at Salt Lake City for further study.

Much Scrapping Necessary

Should the Air Commerce Bureau decide to shift from its present frequencies to the ultra-short waves, virtually every piece of radio range equipment would have to be scrapped. One estimate of the amount involved is \$25,000,000. However, that sum might be regained through improved service and greater economy of installation and operation of the new apparatus.

Development work was begun early last year, Mr. Hromada reveals. The 63-megacycle transmitter used in the tests was originally developed for the experimental weather-reporting radioteletype circuit operated by the Bureau between Baltimore and Washington. Experiments begun at Silver Hill experimental radio station were transferred to Indianapolis because of the interference of two 125-foot steel towers installed at Silver Hill. The 63-megacycle transmitter has been installed at Pittsburgh and is now awaiting flight checking.

Airport traffic control tests with a 125-megacycle transmitter have also been carried out at Indianapolis. The experiments, reported by Mr. Hromada and W. E. Jackson, also proved encouraging. Freedom from static and from interference by nearby airport transmitters was marked, they declare. Two airplanes were used in the research.

Science News Letter, March 12, 1938

Bow-legs and cross-eyes were common among the Mayan Indians of Yucatan, because of their customs of caring for their children, Bishop Diego de Landa discovered in the sixteenth century.