Speed 1934 Keynote in Aviation

Stream Lining Now Adapted to Huge Air Liners

By Wayne Thomis

THE STORY behind the building of the astonishing new transport airplanes put into service on airlines of the United States this year is a romance of the drawing board, the laboratory, the wind tunnel, and the machine shop.

It is a tale of technological achievements in three fields, the metallurgical, the aerodynamic, and that of the internal combustion engine. Coupled with these advances was the application of an old principle, "simplicate and add more lightness," propounded by the early builders and designers of the 1906 to 1910 era.

The new airplanes, all of them of the low-wing monoplane type, with retractible landing gear, constitute the first real departure from the pattern adopted during the world war and modified to greater or less degree during succeeding years. They represent the conjunction of thirty years practical flying experience with scientific discoveries as new as tomorrow morning's newspaper.

During and after the war of 1914-1918, designers advanced the speed of airplanes from 45 miles an hour, achieved by the 1911, 1912, and 1913 pusher types, to 150 miles an hour. But all aircraft immediately after the war was inherently war material. Tremendous strength to stand violent maneuver, and—comparatively—high horsepower to give speed regardless of the clumsiness of line, were demanded

"Simplication"

By 1930, designers in the Boeing factory at Seattle, Wash., and in the Lockheed factory at Los Angeles, and in other plants around the country began to see how the wire braced biplanes with fixed landing gear, and heavy struts, could be "simplicated." They turned to their drawing boards to produce high-performance transport planes.

Meanwhile, of course, they kept their eyes on the racing airplanes of their day, particularly the Snyder cup racers which were the finest products of the finest designers in all Europe and America. And they noted that the trend among the racers was toward the low wing monoplane design.

In them the type of control developed in the Curtiss pusher of 1911, in which Lincoln Beachey flew to heights of fame, was joined to the strength and simplicity of the army's low-wing pursuit ship, itself a modification of the low-wing racers built with special success during the years 1930 to 1933 by the late James R. Wedell, whose Wedell-Williams racing ship now holds the world's land plane speed record of 305.33 miles an hour.

The experience gained by the British and Italian Snyder cup racer builders in balancing aileron controls and in constructing fixed stabilizers was also utilized. The same troubles with stabilizers developed at 200 miles an hour which beset Italy's Macchi racing seaplane in which Warrant Officer Francesco Agello last summer set a world's speed mark of 440 miles an hour.

Autogiro Secrets

From the experience of the autogiro builders the propeller makers learned new secrets about blade efficiency. Tests in the wind tunnels disclosed that the blades pitched to one "bite" were most efficient in dragging an airplane off an airport but at another "bite" were most efficient at level cruising speed. Still another change gave the greatest efficiency at top speed flying.

Machinists then invented a method of changing the pitch of propellers while the blades are whirling in mid-air. Both the Hamilton-Standard company and the Smith company manufacture these propellers, and their invention has been hailed as the greatest aeronautical advance of 1933. The propellers also play an important part in making possible the new high performances.

As typical of the design of all three of the new airliners an aviation expert chose the Douglas which is the standard plane used on TWA, operators of a transcontinental airline. The ship is all metal, low-wing monoplane type, with landing gear which retracts into the nacelles of the twin engines. The wings have a span of 85 feet, and are tapered as to cord and section. It is powered by two Wright Cyclone engines developing 735 horsepower.

Extraordinarily strong, the wings are of cellular multi-web construction, and both the spars and covering is of a new alloy 24S. The fuselage is of monocoque type, high enough to allow a passenger to stand upright, and fitted with comfortable seats, adjustible to several angles, and sound proofed and air conditioned.

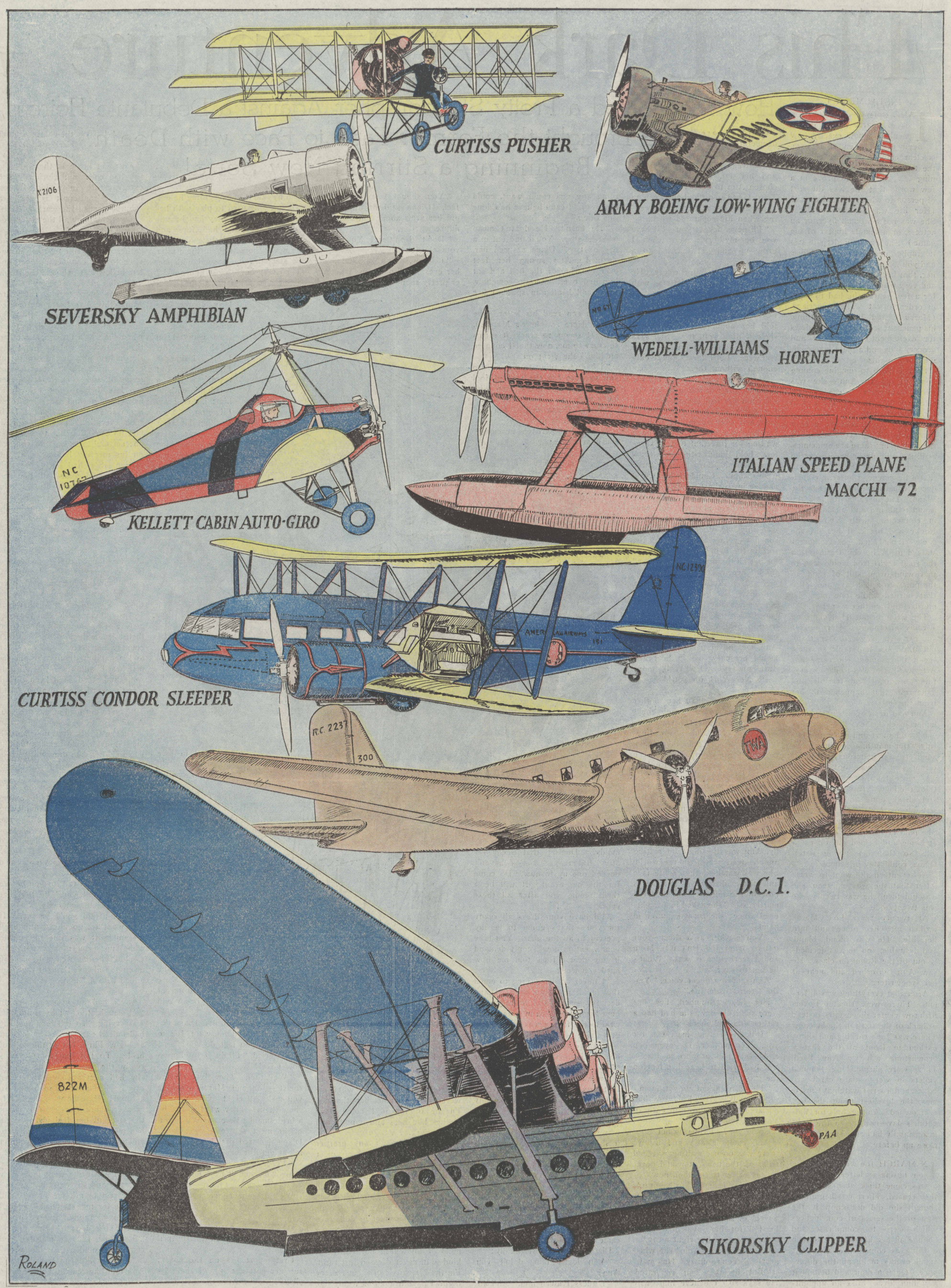
As to performance, with either engine switched off the ship can take off and climb to an altitude of 9,000 feet. It has flown from the west to the east coast in 13 hours and 2 minutes, and once flew 1,200 miles non-stop at an average speed of 199.4 miles per hour.

Perhaps the most important development in regard to passenger comfort was the introduction of the sleeping car plane several months ago. These "Pullmans of the air," built by the Curtiss-Wright factory at St. Louis, are Curtiss Condor ships. The fuselage is 49 feet long and the two wing spans are 82 feet for the upper wing and 74 feet for the lower. The interior bears a close resemblance to a standard railroad sleeping car. There are six compartments which can be made up into upper and lower berths. The berths are 6 feet 1 inch in length. In each berth is a clothing hammock, an air control for warm or cool air, and a reading light. The sleeper planes were first put in service on the American Airways lines.

The Boeing 247 now in use on United Air Lines has a top speed of more than 210 miles an hour but cruises at 186 with new adjustable pitch propellers and geared engines. It carries 10 passengers on two Pratt & Whitney Wasp engines of 525 horsepower. It is virtually a smaller edition of the Douglas. The Electra, now used by half a dozen smaller airlines, among them Northwest Airways, also carries 10 passengers but cruises at 201 m. p. h. and has a top speed of 221 m. p. h. on two Wasp Junior engines of 420 horsepower each.

Within the month Igor Sikorsky completed his newest flying boat, a giant plane powered with four Pratt & Whitney Hornet engines of 750 horsepower each. Carrying 30 passengers and 500 pounds of express, and mail, the Sikorsky has a top speed of 195 miles per hour. It cruises at 160 miles per hour. This plane is of extremely simple construction, having the four motors set into a single high wing which is braced to the boat fuselage. It is 85 feet long with a span of nearly 100 feet.

One of the newest of the smaller transport planes built since results of the laboratory and wind tunnel tests became available to designers is the Seversky SEV-3, a high speed amphibian plane. It is a low wing monoplane with seaplane floats into which wheels for use in landing on solid earth can be retracted. The ship seats three persons but can be modified for five It has a top speed as an amphibian of 185 miles an hour.



The scale drawings allow a comparison between the 1911 Curtiss pusher type airplane and the newest types of racing, military, and transport aircraft. Very evident in the Boeing army pursuit ship, the Seversky amphibian, and the Douglas transport plane, is the influence of the design used in the Macchi seaplane racer and the Wedell-Williams land racing plane. The Sikorsky flying boat—largest American transport plane—is a separate solution to design problems. Of more conventional line is the Curtiss Condor sleeper plane.