

# Development of the Transports

by ROBERT H. RANKIN

The rapid development of the commercial airline transport plane is a mighty interesting story which has been well handled by the author. The engineering genius expended in the design of commercial craft stands unequalled by any other branch of engineering.

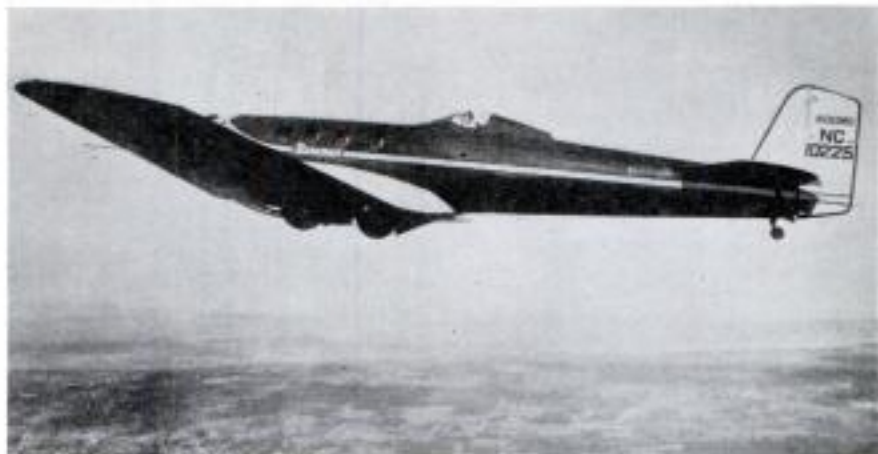
**I**T has been more than thirty years since the Wrights gave the first practical airplane to the world. Since that time, more than 37,000 planes and at least 53,000 airplane engines have been produced.

No art, science or industry has progressed as rapidly as the aviation industry. Commerce, the pulse of our modern civilization, has demanded speed and aviation is the sole answer to that demand.

The story of aviation's progress is mirrored to a very great extent by the development of commercial air transportation. Of course, the World War was responsible for the first great expansion in aviation but, with the end of that conflict, there was a sharp recession brought about. This recession or "slump" was checked by a few manufacturers and operators who, with a faith in the possibilities of the airplane as a factor of transportation, began the development of what is today commercial aviation.

Up until the year 1926 there was little or no development in the field of commercial aviation and most of the planes flying on the then existing commercial routes were powered with war surplus engines. Little attention was paid to the comfort and convenience of the air traveler and every time a person wished to make a trip by air he had to squeeze himself into a cumbersome flying suit, perhaps buckle on a parachute and, then wait until the plane's engine was started and warmed up.

The majority of the flying fields were in poor condition and almost any level cow pasture was dignified with the name of airport. In short, commercial aviation in 1926 was, for the most part, an experiment. In this year there were some 19 commercial operators, the most of them being small, private enterprises.



And here is the Boeing Monomail, the outstanding sensation of 1921. This is the forerunner of the present Boeing 247-D employed on the United Air Lines and elsewhere. The Monomail was the first successful smoothskin ever built.

In 1927, there was a general expansion of the aviation industry, and commercial aviation began to slowly emerge from the experimental stage. Regularly scheduled routes became a reality and airline operators began to feel the need of improved flying equipment. By the end of the year there were some 15,128 miles of airways in this country, two-thirds of which were equipped for night flying. Late in the year, feeder lines were being developed to connect with the main routes.

In spite of this expansion, it was not until the following year that any forward step was made in the design of planes for commercial use. Early in 1928, the first step was made when Boeing introduced its model 40-B4 on the Chicago-San Francisco division of the Boeing Air Transport Route. This ship, a development of the earlier model 40, was a bi-plane type. Welded steel tubing was used

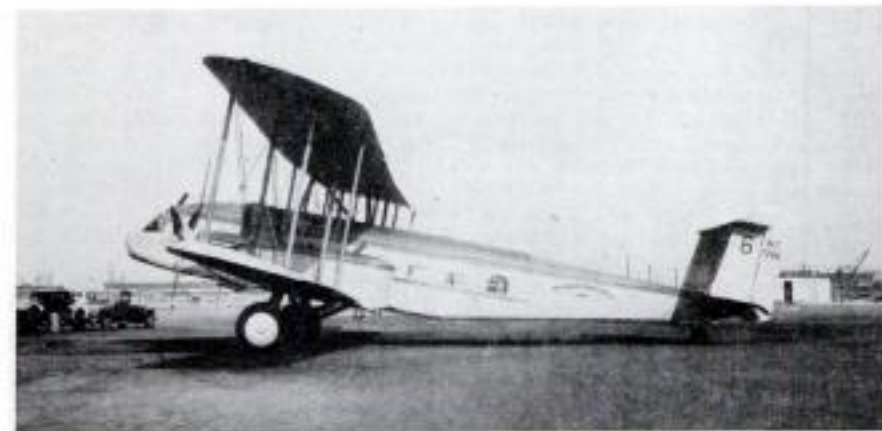
in the fuselage construction, while the wings were built up with spruce spars and ribs, the entire structure being fabric covered. The plane was fitted with a cross-axle type landing gear. It had accommodations for four passengers, and powered with a 525 h.p. Pratt & Whitney Hornet it showed a top speed of 135 m.p.h.

During the year 1929, the safety and comfort of the passenger was given serious consideration for perhaps the first time. Chairs were studied and changed to the end that the air traveler might ride with more ease. The artist was consulted with the result that cabin interiors became the last word in interior decoration.

The science of the radio engineer and the weather bureau expert were brought into play to make safe flying a regular factor on the various systems. Standard equipment on the larger planes included reclining seats, lavatories with provisions for hot and cold water, forced ventilation and heating, insulated and sound-proofed cabins, large windows fitted with non-shatterable glass, and dome and ceiling lights.

During this time the Keystone Patrician was placed in service, this craft was the largest built during the year. It carried 18 passengers in addition to two pilots and had a wing spread of 90 feet. Weighing 15,000 pounds fully loaded, the plane was powered with three motors and had a flying range of some six hours.

Then, Tony Fokker offered the F-10, a fourteen passenger, tri-motor job and the F-32, a thirty-two passenger ship, powered with four P & W Hornets mounted in tandem. This craft took the place of the Keystone Patrician as the largest plane in this country. In addition



The original Curtiss Condor transport plane, the forerunner of the Curtiss Condors now employed by the American Air Lines and Eastern Air Lines.

to these two planes, Fokker was also producing his smaller, single engine Universal and Super-Universal jobs. These craft employed the usual Fokker construction with laminated plywood wings and fuselage built up of fabric covered welded steel tubing. Glenn Curtiss at this time brought out the twenty place Condor powered with two geared Curtiss Conqueror engines. This ship was the forerunner of the Curtiss "flying Pullmans" used by the American Airways. The Boeing concern now placed their fourteen passenger model 80-A on their airways, while in the field of the smaller transport, Guiseppa Bellanca was producing an efficient cabin monoplane job.

It should be mentioned here that no attempt is made by the author to list all the different makes and types of transports built. Such mention would fill a good sized volume. Only the most outstanding makes and models are mentioned in this article.

During this same year, the New York, Rio, and Buenos Aires Air Line inaugurated a passenger service between the Americas using twenty place Consolidated Commodore flying boats, and Pan American extended their service, using Sikorsky S-38's.

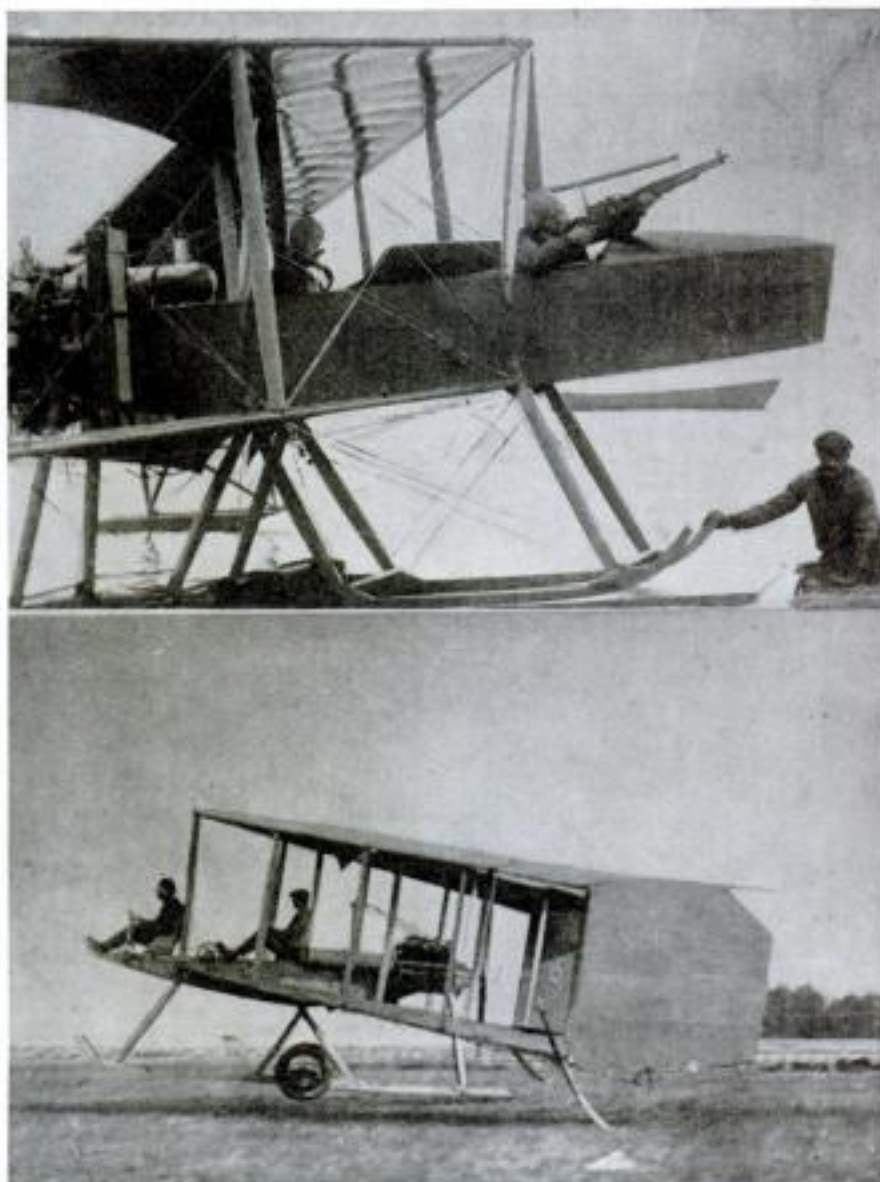
The S-38 was one of the first practical amphibians developed and it was the first of the now famous Sikorsky line of amphibians. Fitted with two 400 h.p. Pratt & Whitney Wasps, the craft carried twelve passengers at a high speed of some 125 m.p.h. With the S-38 as the nucleus of their equipment, Pan American started their service between North, South, and Central America.

The year 1930 saw an extension of air service over the entire United States and the various countries in South America. Few new types of transports were brought out during this period, but many changes were made in various ways to the designs employed in the existing models with the result that in general, transport design showed a marked improvement. Special mention must be made of the Ford all-metal planes at this time. These ships which were built in a series of different models of both single engine and tri-motor types, were put into service on many of the nation's leading air ways. So well were these "tin geese" designed and built that it is only recently that they have given way to modern ships.

In 1931 probably the most outstanding ship built was the Boeing Monomail. This craft carried five passengers and more than 500 pounds of cargo. It was powered with a Pratt & Whitney Hornet and it made a top speed of around 140 m.p.h. and it is historically important as being the first successful smooth metal skin commercial plane ever built. It was also the first commercial job to be fitted with a retractable landing gear and it was the forerunner of the Boeing 247-D transport and the Boeing 299 giant bomber. This year also saw the improvement of the various models offered by Fokker, Bellanca, Ford, Curtiss, and Sikorsky.

(Concluded on page 379)

## The Burgess-Dunne Auto-Stable Plane



ABOVE. The Burgess-Dunne seaplane with a 130 h.p. Salmson engine delivered to the U. S. Army in 1915. The standard landing gear is attached to the top of the hull. BELOW. A Burgess-Dunne taking off. Note the position of the pilot on the extreme front wing apex.

ONCE upon a time, inventors and designers made really serious attempts at producing safe stable planes—believe it or not. Instead of seeing how many h.p. they could tuck away in the nose of the plane, they devoted a lot of time to the problems of stability and safety.

Prominent among the early self-stable planes was the English Dunne Arrow, later to be known in this country as the Burgess-Dunne Arrowhead. This plane was of the "inherently stable" type with its surfaces so arranged that full compensation for rolling, diving and yawing was built into the ship without the assistance of any automatic dooflickers or delicate instruments.

In the first place, there was a tremendous amount of sweepback so that the planform was that of an arrow with an apex angle of about 90-degrees. This gave the required fore-and-aft stability.

The angle of incidence decreased to zero at about the center of the wing, becoming strongly negative at the tips somewhat after the zanonian leaf style. Tremendous vertical curtains at the rear compensated for yaw so that the whole affair was highly stable against any ordinary atmospheric disturbances.

But, as so frequently happened, the ship proved too stable for comfort. It was stable to the point of "bullheadedness" so that it strongly resisted and resented any effort of the pilot to guide it. In short, it was so "stiff" on the controls that it fought the pilot.

Loss of maneuverability and speed are two of the most serious charges that we can bring against the inherently stable plane as we now know it, but these are secondary faults that are subsidiary to stability and safety in flight, at least as far as privately owned planes are concerned.

