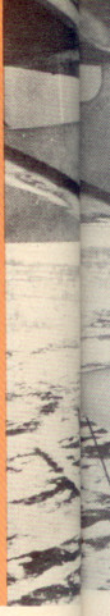


The author as he appeared in the late 1920's, standing beside his Burnelli UB-20, a 24-passenger monoplane. Original caption on this photo revealed "The airwheels . . . are the largest in the world. They are of the Musselman type and sustain the plane perfectly for all purposes on less than 12 pounds of pressure." These tires, invented by Burnelli, led to development of the automobile balloon tire

Birth Of The Executive Plane

Burnelli CB-16, first multi-engine aircraft built specifically for business use, was completed in 1928. Here is the story of that forerunner of today's luxurious planes as told by its designer and builder

The executive airplane owner and operator has contributed much to the technical and commercial advancement of the transport airplane and well in advance of the establishment of passenger airline operations.

Following World War I, with the start of the barnstorming era that covered the country with pasture airfields for stunt and passenger-carrying activity, the executive, or personal service airplane, came into use. It required improved performance and appointments with more advanced equipment and cost.

Among the earliest executive plane operators was Dr. John Outland, of Kansas City, Mo., director and head surgeon of a group of hospitals located throughout Missouri and Kansas. He was required to make frequent trips over the two-state area, accompanied by his nurse. To cover the circuit by motor car, with the dirt roads of that period, absorbed much time and energy.

I was associated at that time, in 1920, with the Nebraska Aircraft Corporation, of Lincoln, Neb., as chief engineer and superintendent. It was there, incidentally, that Charles A. Lindbergh started his flying career and Matty Laird gathered the material for starting the manufacture of his *Swallow* airplane with an order from oilman Jake Moellendeck, which launched the commercial air migration to Wichita, Kan. This was followed by Cessna, Stearman, Travelair, Beech, Boeing, and others.

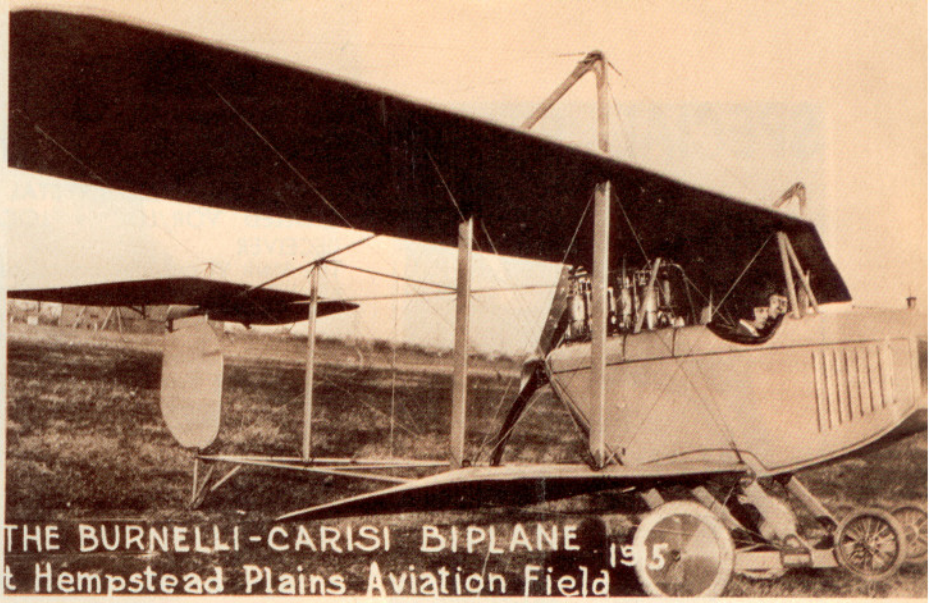
We were visited by Dr. Outland and the noted pilot, Tex LaGrone, who voiced an interest in purchasing a specially outfitted plane to meet their requirements and specifications. Tex had ascertained that there were pasture fields available, suitable for takeoff and landings at the towns to be visited; however, despite the short takeoff distance of the Hispano-Suiza powered Lincoln Standard, a higher powered Model E engine with special accessories was specified.

The airplane, the potential buyers stipulated, was to be finished in white, with more comfortable unholstery, improved entrance means, and long, shrouded exhaust manifolds for noise reduction and heating. A large special compartment was to be provided in the aft section for such clothing, medical and surgical equipment as might be required.

With flight tests satisfactory, delivery was made at nearly twice the cost of the barnstorming planes that were then being sold. The doctor, with Pilot LaGrone, covered the hospital circuit regularly in a fraction of the time formerly required and with more pleasant travel conditions. Due to damage, however, it was necessary to outfit another plane for the same purpose about six months later.

Despite unprepared fields and unregulated flying conditions, airframe

by V.J. BURNELLI



An earlier successful airplane designed by the author was this Burnelli-Carisi biplane, shown at Hempstead Plains, N.Y., Aviation Field in 1915

flight damage for the hundred Lincoln Standards operating was small. The main causes of damage, as with the doctor's plane, were frequent Midwestern twisters, which because of the light wing-loading of that period, made the problem of tiedown an important safety consideration.

Because of this problem, the hospital plane made an unscheduled takeoff and landed upside down in a corn field, with almost total airframe damage.

With second plane prepared on the double, the hospital tours continued with most satisfactory results.

Following Dr. Outland, other special planes were prepared and sold to ranch owners, oil companies, sportsmen. This brought beneficial income to the post-World War I aviation industry, which had been almost abandoned due to military airplane curtailment.

Executive aircraft designs were, of course, confined to small single-engine types and for short-range operation.

It was with the aviation stimulation of the Lindbergh boom that the private airplane paved the way for more advanced commercial design requirements.

A review of the record will indicate that the first multi-engine airplane specifically designed and built for executive ownership and operation was the Burnelli CB-16, as designed and built during 1928 on order from banker Paul W. Chapman. It set an advanced trend for multi-engine airplane performance and appointments.

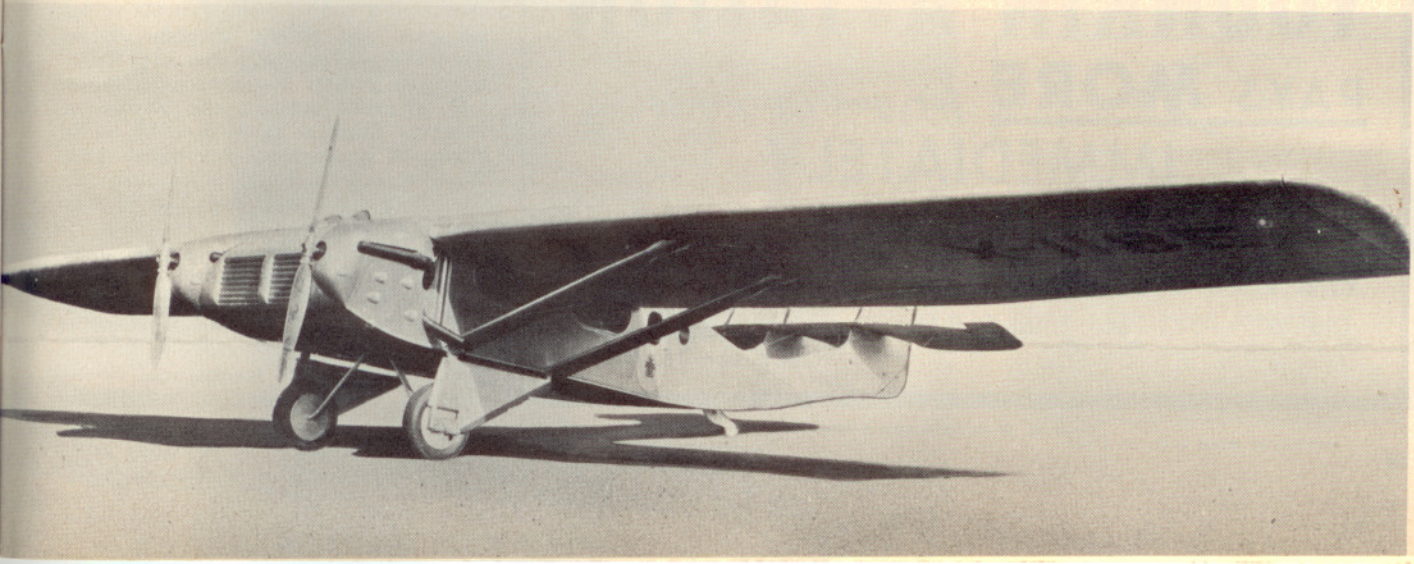
Ordered by contract after obtaining preliminary design proposals and cost estimates from the few builders of that time, the Burnelli design was selected because it incorporated certain advanced features that appealed to the progressive thinking of Mr. Chapman. Among these was the first all-metal twin-engine monoplane of "lifting body" design, providing inherent structural and safety advantages.

This was combined with the first retractable landing gear to be installed on a multi-engine airplane for drag reduction, particularly to improve single-engine flight performance. The gear was accessible in flight for minor adjustments or emergency release.

The order was obtained during May 1928. Design and construction were completed in December of that year at the Aeromarine plant at Keyport, N.J., where space and tools had been rented.

As delivered for test flight, the airplane provided for the following dimensions and performance: span 90 feet; length 56 feet; height 12 feet, 6 inches; lifting surface 920 square feet; weight, empty, 11,400 pounds; gross weight, 17,400 pounds; power, two Curtiss Conqueror engines, 625 h.p. each; cruising speed, 140 m.p.h.; rate of climb, 800 f.p.m.; single-engine climb (landing gear retracted), 300 f.p.m.;

First multi-engine plane built specifically for executive use was the Burnelli CB-16, completed in December 1928 for a prominent banker. Revolutionary new features offered in this aircraft were retractable landing gear, high lift wing flaps, and single-engine capability



landing speed, 62 m.p.h.; ceiling, 20,000 feet; duration, 12 hours.

Aside from demonstrating advanced performance qualities, the CB-16 pioneered advanced cabin accommodations for that period. The floor area, 12 feet by 18 feet, provided space for installation of 10 swivel chairs and a large center lounge. Sound-proofing was accomplished through the cooperation of the Sperry Company with special quality tapestry and upholstery installed by Sloan & Company.

Air conditioning means, in advance of modern pressurization, were developed for ventilation and cabin heating control, and a large center searchlight was installed for night flying—a rarity at that time. The alcove entrance section was of Circassian walnut plywood finish. Special washroom facilities had running water. A kitchenette of stainless steel with hot plate and refrigerator was installed, with a radio compartment in the center.

With our luxury bird completed on a progress-payment basis, the cost at that point totalled $230,000. About $90,000 was for the design and engineering work, and the balance for shop construction. It was accepted for delivery, and tests were to be made at the purchaser's risk.

We were instructed to move the plane by barge to Newark Airport, which was just being built. A two-way cinder runway was available. Our airplane was to be the first new design tested from that pioneer commercial airport.

With assembly completed, arrangements were made for the flight-test program, with Lt. Leigh Wade, of Army 'round-the-world flight fame, at the controls. Jimmy Doolittle, who was based at Mitchel Field, Long Island was a test collaborator with Wade.

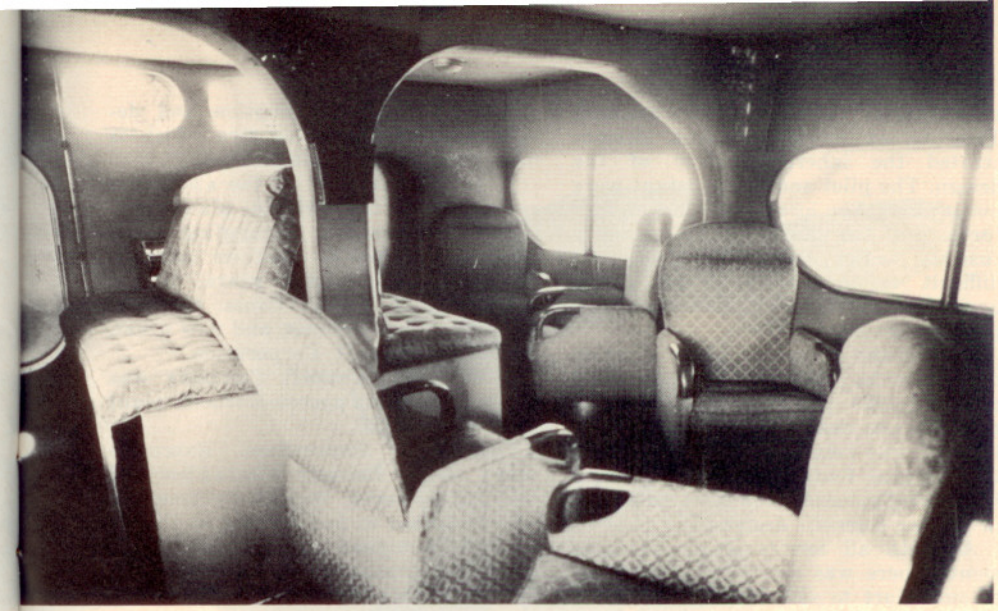
The test flight was made on a cold morning during Christmas week. Doolittle had flown from Mitchel Field with a parachute for Wade, but Wade did not use it. Instead, he took along an assistant for the emergency release of the retractable landing gear in the event the retracting apparatus of sprockets and cable did not work going down.

After about 40 minutes of checkout, Wade came down. He was ready to start performance tests the following day.

On Christmas Eve, Mr. Chapman chartered a bus to bring friends to see his new and unique airplane. Some wanted a ride in the plane, and Wade, who was a most accommodating pilot, took a group around the Statue of Liberty. Then a rush for the cabin began. A line formed for more rides. Wade was kept flying until dusk. He made four trips, carrying over 50 holiday passengers.

The new Civil Aeronautics Administration was of no restraining influence at that time. As a precaution, however, the emergency man was kept on a standby basis to release the landing gear in case of an emergency.

After some months of completing



The Burnelli CB-16 executive aircraft featured this plush interior—six swivel chairs and a lounge. It also boasted a completely equipped kitchenette and washroom facilities and was built at a total cost of $230,000

performance tests and demonstrations at Newark Airport and Curtiss Field, Long Island, the airplane was flown to Bolling Field, Washington, D. C. While there, demonstrations of the retractable landing-gear feature were made for the military. Tests were made also of what was then considered the first proof of single-engine climb capability with a twin-engine plane, to meet what was to be specified in later years by the CAA for single-engine climb performance in the transport category.

It had been calculated that the horse power saved by eliminating landing-gear drag would provide for single-engine climb performance of 300 f.p.m. with a power loading of 12 pounds per horsepower, or 24 pounds, single-engine.

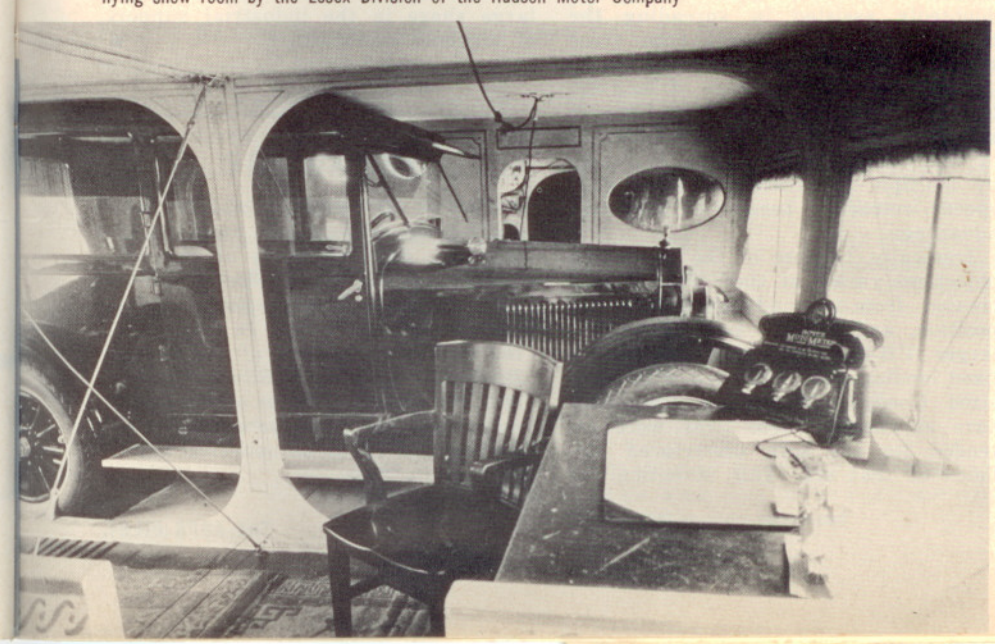
Pilot Wade later demonstrated this value thoroughly when one engine failed with full passenger load, on takeoff from Bolling Field. He did not have the benefit of controllable pitch or feathering propellers, which now are essential to meet transport-category power-safety performance.

With one engine dead, Wade climbed out of Bolling in the direction of the U. S. Capitol building, made a large circle and returned to the field at an altitude of about 1,000 feet.

Many important persons made their first flight in that airplane during its period of operation. Its career ended in 1929, after Mr. Chapman loaned the aircraft for a demonstration of the Cabot Adams aerial recovery device, designed for picking up airmail from the S.S. Leviathan, 300 miles at sea.

During airfield tests, piloted by Commander George Pond, USN, maintenance work on the contro system resulted in the crossing of the aileron drive cables. On takeoff from the Keyport, N.J., plant, the plane assumed a

In 1924, the Burnelli RB-2 was recognized as the world's first air freighter. It was demonstrated as a flying show room by the Essex Division of the Hudson Motor Company



near-vertical position and crashed. This, to an amazing extent, demonstrated the inherent safety of the design. The pilot and his assistant were not injured. The location of the engines forward of the pilots, and the stronger fuselage section, saved their lives. It is difficult to imagine a more severe ground contact from a more awkward piloting position.

During the period of great aviation developments, before the financial crash of 1929, much attention was directed to our design development. Main interest was related to the retractable landing-gear feature, since the "lifting body" configuration had been employed in earlier Burnelli designs.

As with all new aviation advancements, there was doubt and resistance to our effort to sell the advantages of our "retractile" landing gear, as it was then called. It was considered just another gadget to add more maintenance work and demands on the pilot's attention; just another "something to forget." This objection, somewhat by the military and definitely by officials of a newly organized air carrier, created doubt.

While the concept of retracting the landing gear was old, first having been disclosed in the Penoud patent of France (issued in 1876), later patents, including mine, applied to installation and mechanical operating means. The idea had been obvious in relation to the flight of birds. However, only a few specially designed single-engine racing planes had applied this means for drag reduction with higher-speed performance.

The first racing design with landing gear retraction was the Dayton-Wright entry for the Gordon Bennett race in France, in he early 1920's. It was flown by the veteran Wright brothers' pilot, Howard Rinehart.

James V. Martin, who was considered a pioneer in this effort, used it on his small single-engine design, the Martin *Kitten*, built for the Navy. Following that, the Mummert racing entry in the Pulitzer Trophy race, flown by Bert Acosta, embodied that feature. Acosta did as predicted; he forgot to lower the gear and made a belly landing. Publicity-given to this mishap throughout the flying fraternity undoubtedly assisted in spreading the belief that pilot, or maintenance, error would increase the operational hazard.

It is true that the value of landing-gear drag reduction was not of major importance at the low flight velocities of that time. Parasite drag increases by multiple progression. With higher speeds, retraction became of far more advantage.

Ironically, because of the doubt and objections raised at that time, we retreated from our advanced technical position, and for our next plane, the larger UB-20, the design provided a fixed landing gear, equipped with oversized Goodyear-Musselman low pressure airwheels. These tires were intended for the soft, unsurfaced airfields of that era. This invention for aircraft led to the adoption and development of the ballon tire which is now standard for automobiles.

A further example of the assistance rendered by the private plane purchaser in enabling struggling commercial aviation to meet its payrolls during the depression years, is the enterprise of Robert Gross, who acquired the then defunct, and now great, Lockheed Aircraft Corporation.

His Viking Aircraft Company was located at the Uppercu-Burnelli plant at Keyport, N.J.

Gross had competition. Executive plane owner Bernarr Macfadden had his high-powered Wright Cyclone *Altair* Lockheed at our factory so that it could be equipped and tanked for the overnight transatlantic flight of Lou Reichers. This flight terminated in the emergency ditching of the plane in the Irish Sea, off Queenstown.

Reichers was familiar with the Lockheed corporate situation. He tried to get Macfadden to make the $32,000-plane-purchase price available for bidding on the assets, and to interest us in participating in the prospective deal. However, the depression ruled that out.

Gross left for the Pacific Coast, took over the Lockheed Corporation, and became a great industrialist. Reichers later served as chief of the engineering section of the Air Transport Command during World War II.

Roger W. Kahn then ordered the *Electra*, the first multi-engine Lockheed design, also its first airplane of all-metal construction, from Gross. [This is not the current *Electra*.—Ed.] Their subsequent Model 14 was an enlargement of the *Electra* design, and its purchase by Howard Hughes for his record round-the-world flight caused the newly developed Lockheed product to be available and thoroughly proven when World War II started in Europe.

In summary, the original and advanced aircraft design development, based on the financial support from early private plane purchasers and operators, contributed greatly to the refinement and availability of air transport equipment that brought about the present world-wide commercial and military air transportation systems.

The executive private owner and operator continue to contribute their large share in the industrial support of airplane manufacture. ●

THE AUTHOR

Vincent J. Burnelli, pioneer aircraft designer, engineer, builder and inventor, fathered many of the advancements that have helped aviation development progress to the precision science that it is today. In this story the author, a member of the Early Birds now residing in Silver Spring, Md., reminisces over one of his great moments—the manufacture of the Burnelli CB 16, an aeronautical milepost of its time.