



The Curtiss Tanager. This and all photos--The Daniel Guggenheim Fund for the Promotion of Aeronautics, Inc.

Safe Aircraft Competition, 1929

By FREDERIC HOWARD

On April 20, 1927 a privately endowed foundation, The Daniel Guggenheim Fund for the Promotion of Aeronautics, announced an "International Safe Aircraft Competition". The announcement failed to create much of a stir because the aircraft industry and the public at the moment were very much preoccupied with the more dramatic trans-Atlantic competition among a number of groups each striving to be first to fly non-stop from New York to Paris. A Mr. Raymond Orteig had, a few years earlier, offered a prize of \$25,000 for the first to accomplish this spectacular flight and a rival "Competition" for something as tame as a "Safe Aircraft" no doubt seemed trivial by comparison.

Exactly 30 days after the Guggenheim announcement the Lindbergh flight occurred and in the following month there developed something of a mania for long distance, over-water flying: Chamberlin and Levine; Hegenberger and Maitland; Byrd, Balchen, Acosta and Noville; Bronte and Smith; Goebel and Davis; Brock and Schlee; Haldeman and Ruth Elder; Coste and LeBrix--they followed each other in rapid succession across the 1927 headlines and all within a short, five months period. The press and the public became fascinated by the drama and daring of these hazardous and often foolhardy flights--the pattern set by Lindbergh seemed to everyone the soundest course to fame and fortune. So it developed that, although the first prize in the Safe Aircraft Competition endowed by The Daniel Guggenheim Fund was put at \$100,000 with total awards amounting to exactly six times the Orteig prize won by Lindbergh, there was still no rush to participate, and for over two years the staff of the Safe Aircraft Competition simply waited. It had entries on paper but no airplanes to test. It was not until mid-August 1929, 10 weeks before the announced final date of the Competition, that the first airplane was presented at Mitchel Field, New York, where, according to the contest rules, the evaluation of each entry was to take place. As a result, the period for competitive testing

was extended to January 1, 1930 but, notwithstanding this and other inducements, the response of the aircraft industry to the Competition was to prove disappointing to the sponsors.

The purpose of the Competition as announced in 1927 was "to achieve a real advance in the safety of flying ...without sacrificing the good, practical qualities of the present day aircraft". In other words, aeronautical freaks were not particularly wanted but rather conventional aircraft with improved aerodynamic characteristics which would contribute more to safety than the typical aircraft designs of the time.

The Competition was divided into two parts, the first of which was termed a Qualifying Test. In this, certain design specifications and a minimum flight performance had to be met. Each qualifying aircraft was then entitled to move on to the Safety Tests. A point score system was devised whereby each entry was awarded points on a sliding scale for bettering the minimum requirements set up for each separate test in the two parts of the Competition.

From a total of 27 initial entries--21 from U.S. industry, five from Great Britain and one from Italy--only 15 concerns actually presented machines at Mitchel Field to be evaluated for the \$150,000 available in awards. Three of these 15 airplanes were withdrawn untested and two crashed before they could be tested. Of the remaining 10 aircraft, seven were disqualified almost immediately when they were unable to meet the first test--the maximum speed requirement of 110 mph. This left three entries and one of these, the Handley-Page, might justifiably have been disqualified since it clearly did not meet a minor "accommodation requirement." (The cockpits in the Handley-Page were so designed that parachutes could not be worn.) And one of the two other machines, the Command-Aire, was simply a stock model 5-C-3 production aircraft which had been entered clearly for the publicity value. It had no features of any type that



The Handley-Page which placed second to the Curtiss Tanager in the 1929 International Safe Aircraft Competition.

might enable it to compete in the Safety Tests of the Competition. Neither the sole remaining aircraft--the ultimate winner, the Curtiss Tanager--nor the English entry from Handley-Page, which for the sake of having an "International Competition" had been forgiven its "accommodation" flaw, could fulfill all of the Safety Tests as originally devised by the Competition's observers and technical staff (including Prof. Alexander Klemin, Otto Lunde and F.K. Teichman, all of NYU, and Prof. William G. Brown of MIT). It was therefore thought advisable to revise slightly the few tests that were most troublesome and, as a result, the Tanager was judged to have met every requirement and the Handley-Page was enabled to fulfill all but two tests.

The two requirements which the Handley-Page was not able to meet are representative of the kind of Safety Tests devised by the Competition's staff. One of the two required that the airplane maintain a minimum gliding speed of 38 mph for less than three minutes with all power switched off; the other specified that the aircraft must, without recourse to what was termed "trick flying" (presumably slipping or fishtailing), glide in over a 35 foot obstruction and land coming to a complete stop within 300 feet of the base of the obstruction. The Handley-Page, with a minimum gliding speed of 39-40 mph, unfortunately did not have a landing gear sturdy enough to permit it to be put onto the ground without any flare-out. As a result of the brief floating the machine did before touch-down, its landing run stretched slightly more than the 300 feet allowed. The difference between the Handley-Page and the Curtiss in these tests was small indeed, the superiority of the Tanager being mainly decided by its slower glide.

All landing and take-off performances in the Competition were corrected to eliminate any benefit from the wind. For example, the average take-off run of the Handley-Page was less than 200 feet, the wind velocity being about 12 mph during the testing. An arbitrary but fair formula was derived to compensate for the advantage of the wind so that the calculated take-off run of the airplane, assuming no wind, worked out at 290 feet. It was this figure, not the actual distance, which had to be less than the maximum of 300 feet permitted for take-off. The same procedure was followed in every landing and take-off test conducted on both the Tanager and the Handley-Page.

It is unfortunate that in 1928 and 1929 the U. S.

aircraft industry was not in a position to cooperate more fully in the contest The Daniel Guggenheim Fund arranged. The Lindbergh flight had of course given the industry a welcome shot in the arm and the number of concerns producing airplanes in the U. S. had mushroomed from the handful of the pre-Lindbergh era to a total of 83 (possibly more) by the end of 1929. Approved Type Certificates for some 280 designs had been issued by the Aeronautics Branch of the Department of Commerce. However, with the exception of a few large, well-established concerns such as the Curtiss Aeroplane and Motor Co., the U. S. aircraft industry was simply a collection of small companies operating with limited facilities or inadequate capital. Few of these companies could afford to use their engineering staff to design or their plant capacity to build a machine to meet the extremely difficult requirements of the Safe Aircraft Competition. And these requirements were by anyone's standards tough indeed.

To the aircraft industry of 1929 each separate requirement did not seem particularly difficult. But the combination of requirements did appear almost impossible to achieve in one airplane. For example, a qualifying speed of 110 mph was certainly not unreasonable--scores of production aircraft could surpass this figure. However, when this was combined with the minimum flying speed requirement of 35 mph in level controlled flight, it began to get difficult, for no production aircraft (even including the autogiro) had this particular range in 1929. To compound the problem, a number of related requirements were thrown in for good measure--the airplane was to be tested, not with a minimum load, but carrying a payload (including an observer supplied by the Competition) of five pounds for each horsepower. For most machines of the period this was almost equivalent to specifying that the aircraft was to be tested under gross load condition. The aircraft, so loaded, was to take-off within 300 feet and then clear a 35 foot obstacle located 500 feet from the starting point. And it was expected to do even better in landing. As mentioned before, it was required to land over a 35 foot obstacle within 300 feet of the base of this obstacle. This is the same as calling for a landing on a regulation football field without benefit of any wind and over a 35 foot wall erected on the field's goal line!

Other specific Safety Tests are worth mentioning

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briefly. One of them demanded that the airplane "shall be able to glide with all power switched off so that the angle between the flight path and the horizontal is not less than 16 degrees. During this test the airspeed shall not exceed 45 mph." This requirement was subsequently changed to "12 degrees" when neither the Tanager nor the Handley-Page could quite meet it. Under General Stability, it was required that "the aircraft be capable of flying at any airspeed from 45 mph to 110 mph and at any throttle opening of the engine with all controls left free for a period of not less than five minutes in gusty air." Another stability test required that "if the elevator control is pulled in toward its maximum extent at the moment of switching off (the engine) and held in that position, the aircraft will...not get into any violent or dangerous maneuvers and will descend on a steep glide path at a speed not exceeding 40 mph." (Emphasis, author)

Just to be sure that nothing had been overlooked in the low-speed, controllability area, the Competition devised a Maneuverability requirement which was indeed a gem. Here is what was specified:

"A square plot, 500 feet by 500 feet, will be marked off and shall be considered as surrounded by an obstruction 25 feet high along its entire boundary. The pilot shall take-off in any manner he judges best, and climb either above the square plot or outside of it, provided he passes above the imaginary boundary construction. The engine may be switched off at any time (presumably by the official observer on board the aircraft) and the pilot shall land the aircraft within the square plot without passing through the imaginary boundary obstruction," (Emphasis, author)

Both the Handley-Page and the Tanager were nimble enough to pass this test, not once, but on several different occasions. (Now--after 35 years of aeronautical progress how many of our contemporary aircraft can meet tests of this sort?)

To discourage entry of aircraft specifically designed to fulfill only one or two of the separate safety tests and thereby win a cash award while sidestepping the basic purpose of the Competition, it was specified that to qualify for any of the awards, the aircraft had to pass every one of the Safety Tests. Only the Tanager was able to do this.

In the light of today's airplanes it may seem strange that this Safe Aircraft Competition attached such importance to low speed controllability and short field performance: these are the very characteristics conspicuously missing in the modern conventional airplane. The elimination of these attributes has been the necessary price paid to attain the speed, range and altitude capabilities now considered indispensable. But in the 1920s aircraft accidents occurred chiefly from forced landings due to engine trouble or precautionary emergency landings due to weather or navigational error or similar causes. With weather forecasting unreliable, navigational aids limited and airports sparse and inadequate, it was reasonable for the professional staff (who designed the tests) to look for the answer in aircraft that might be flown with greater safety under the actual conditions prevailing. So the emphasis was put on the desirability of getting the airplane back down on the ground under control and at a speed which, at worst, would probably let the pilot and passengers "walk away from it". The Guggenheim Fund for the Promotion of Aeronautics was established to promote aeronautical education, aeronautical science and commercial aviation. Devising a Safety Competition which stressed the importance of aircraft design in minimizing the existing flight hazards was definitely in line with the purposes of the Fund.

Under the specifications laid down only seven of the 15 airplanes brought to Mitchel Field for testing could be regarded as designed for the Competition. These machines were the Curtiss Tanager, the Handley-Page, the

Schroeder-Wentworth, the Heracilio Alfaro, the Cunningham-Hall, the Taylor and the McDonnell. Here is a brief account of these machines and how they fared.

The Schroeder-Wentworth was the first effort of Mercury Aircraft, Inc., the then new name for the long-established Aerial Service Corp. Designed by Harvey Mumment and flown by Major "Shorty" Schroeder, this odd design featured almost 60 feet of variable camber wing. Unfortunately, it crashed while on a preliminary flight and had to be withdrawn. The Schroeder-Wentworth was the only entry with a variable pitch propeller. It employed a Schroeder design in which the pitch was actuated by the prop blades themselves as the engine speed was varied. The machine was powered by a 150 hp Comet radial and grossed 2490 pounds with 480 sq. feet of wing.

The Alfaro, Warner Scarab powered and built in Cleveland, failed to qualify, its maximum speed being 108.6 mph. It featured skewed ailerons (similar to those found in 1931 on the Waco Fs), a type of wing flaps anticipating the much later Fowler design, and an interconnected spoiler-aileron system all of which could not be tested fully because lateral control at slow speed was dangerously deficient. The Alfaro was two place and had conventional steel tube fuselage and tail, and fabric-covered wooden wings.

The Cunningham-Hall entry incorporated a camber-increasing, flapped and slotted low wing with ailerons mounted on a 14" chord, M-6 sectioned "upper wing". It proved itself something of a "dog", failing to meet the speed requirement by some 16 mph and reportedly taking an unreasonably long ground run before becoming airborne. This machine was a composite, its fuselage being from a production model Fairchild KR 21.

The McDonnell entry was a low wing machine, probably the most modern in appearance of any of these 1929 aircraft, with an unusually wide tread landing gear, the shock struts of which had an 18" travel. It crashed during an early flight and could not be repaired in time for the Competition. Seventy percent of the span of the McDonnell was flapped, the other 30% being ailerons. These were balanced and differential in action, having 25° up travel; only 11° down travel. The power was a Warner 110, and the structure was conventional steel tube and fabric.

The Taylor machine, a variable incidence, high-wing monoplane, was disqualified on the speed requirement being slightly too slow in maximum speed and considerably too fast in minimum speed. The variable incidence feature proved to have no effect whatsoever on the indicated stalling speed: the airplane stalled at the same speed (45.5 mph) regardless of the incidence setting of the wing.

The Curtiss and the Handley-Page aircraft, both products of long-established companies, had almost identical performances and their point scores in the judging were within 5% of each other. A comparison of their performances is summarized here:

Category of Test	Curtiss Tanager	Handley- Page
Maximum Speed (mph)	111.6	112.4
Rate of Climb at 1000 Ft. (Fpm)	700	730
Minimum Horizontal Speed (mph)	30.6	33.4
Minimum Gliding Speed (power off)	37.1	39.7
Landing Run	90'	82'
Landing Run Over Obstruction	293'	320'
Take-Off Run	295'	290'
Take-Off Run Over 35' Obstacle	500'	440'
Flattest Glide	6°	7.2°
Steepest Glide (Under 45 mph)	13.2°	12.8°
TOTAL POINTS AWARDED	22.9	21.9

The remaining aircraft entered were either standard production models participating mainly for the advertising value, or production types modified with flaps or slots with the hope that in this way they might conform



Command-Aire, Inc. entered their 170 hp Curtiss Challenger powered Model 5-C-3, a three-place, open cockpit biplane. A fine aircraft by 1929 standards, it simply had no features whatsoever to meet the Competition's low speed requirements. However, it performed better than the other production models entered. It passed the first two qualifying tests recording a maximum speed of 114.8 mph (the fastest speed attained by any entry, incidentally) and a rate of climb of 900 feet per minute (the best rate of climb recorded in the Competition).



The Taylor C-2 was another entrant and was the grandfather of the E-2 Cub with twice the horsepower and some eight degrees of variable incidence. These features did not help, however, and the airplane was found to be too fast at low speed and too slow at top speed to qualify for the Competition. It did prove that variable incidence was not a very practical idea. Like the Fleet and Brunner-Winkle entries at Mitchel Field, the Taylor C-2 used the 5 cylinder, Kinner K-5 radial engine of 90 hp.



Mercury Aircraft Corp. entered the Schroeder-Wentworth variable camber monoplane but withdrew following a crash in a preliminary flight. While being flown by Major "Shorty" Schroeder at a low altitude, the aileron control malfunctioned and the plane spiraled into the ground. The wing of the aircraft was divided chordwise into three sections in order to achieve a considerable camber variation. Like the more photogenic McDonnell, it might have given the Tanager a run for the money although it had never been flown before coming to Mitchel Field for the Competition.

to the slow flight and short field performance specifications. Unaltered production models included a Bourdon (later Viking) Kitty-Hawk, a Brunner Winkle Bird and the Command-Air 5-C-3. The latter, after passing high speed/climb tests, proved to be 33% too fast in the minimum speed requirement and was disqualified. Modified production models included a Fleet Model 2 and an entry called the Ford-Leigh. This airplane was a Brunner Winkle Bird fitted with a Kirkham Products OX-5 developing 115 hp, and it mounted a small, fixed, slot-like auxiliary airfoil above the upper wing.

Although few of the designs or arrangements featured in the Competition ever went into production (the economic collapse of the 1930s having something to do with that), the value of the Competition to aeronautical science is unquestioned. The effectiveness and usefulness of wing flaps and slots was proven clearly for the

first time, and the limitations and disadvantages of variable camber, variable incidence or fixed slots was definitely established. And who knows--maybe somebody in our day will yet discover that a two or three place conventional airplane with a speed range of 30 to 110 mph and the agility to operate safely from a football field is not such a bad idea after all. If it could be done in 1929, we might still be able to do it.

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