

LANGLEY SUB-LIBRARY

TECHNICAL MEMORANDUMS
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

CASE FILE
COPY

No. 233

NIEUPORT-ASTRA PARACHUTE CONTEST.

By J. Philippe.

From "L'Aérophile," July 1-15, 1923.

NATIONAL LIBRARY
LANGLEY AERONAUTICAL LABORATORY
Langley Field, Va.

October, 1923.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

TECHNICAL MEMORANDUM NO, 233.

NIEUPOORT-ASTRA PARACHUTE CONTEST.*

By J. Philippe.

The parachute contest, instituted by the Nieuport-Astra Company, has just ended. The object of this contest was to obtain a parachute of light weight and small bulk, suitable for airplanes. In addition to the proper factor of safety, it had to possess aerodynamic properties (quickness of opening, stress required for opening, descending speed) clearly defined by the regulations.

The prize was to be awarded to the contestant who, after satisfactorily passing the elimination tests, obtained the largest number of points determined as follows:

1. Elements of safety:

Two points for each ten kilograms of stress below 300 kg (661.39 lb) required for opening;

Three points per unit factor of safety above 10 and up to 25;

A number of points between 0 and 30 to be awarded by the jury, on the quality and finish of construction.

2. Facilities for installing on airplanes:

One point for each 50 cm³ (3.05 cu.in.) below 25000 cm³ (1525.58 cu.in.) not including the attaching harness but including all other accessories;

* From "L'Aerophile," July 1-15, 1923, pp. 198-200.

Two points for each 50 g (1.76 oz) below 7 kg (15.43 lb) not including harness but including all other accessories;

A premium of 40 points for every parachute capable of functioning without being attached to the airplane;

A number of points, determined by the jury, on the convenience of the aviator's equipment and its installation on board.

3. Three points per tenth of second of average speed of opening below three seconds, the parachute being dropped from a balloon.

4. Twenty-five points for each 10 cm (.328 ft) per second of descending speed below 5.5 m (18.04 ft).

5. A premium of 200 points, if the parachute was made of cotton or linen;

A premium of 20 points, if the fabric of the parachute (silk, cotton or linen) was woven in France or in a French colony or protectorate, on condition that the inventor furnishes the proof.

6. A number of points between 0 and 20, determined by jury, on the behavior of the parachute in the air (stability and damping of oscillations).

7. A number of points between 0 and 30, determined by jury, on the ability of the aviator to vary the speed of descent. These points will only be awarded in case the parachutist gives, on the eighth descent from a balloon, a practical demonstration in person at the expense of the inventor.

Seven parachutes were entered:

Blanquier Parachute.- Of cotton with a spherical top of 45 m² (484.37 sq.ft) provided with 20 suspension cords and a circular band, called the "Garnerin," to facilitate the entrance of air.

Cormier Parachute.- Of cotton with a spherical top of 40 m² (430.55 sq.ft), provided with 16 suspension cords. The disposition of the cords in sheaths inside the containing bag, designed to prevent tangling, is one of the chief characteristics of this parachute. It is folded accordeon-fashion.

Froidure Parachute.- A square flat silk parachute of 62 m² (667.36 sq.ft) provided with 9 suspension cords, attached to the corners, the middle of each side and the center of the square. An auxiliary parachute facilitates the opening of the parachute, which has no hole in the center.

Ors Parachute.- Spherical cotton top with 16 suspension cords. The opening of the parachute is assured by a series of willow hoops fastened together and forming a sort of chimney inside the parachute.

Robert Parachute.- A flat cotton parachute with 8 suspension cords, each subdividing into 3, attached to the edge of the fabric. Accordeon folded.

S.E.C.A.T. Parachute.- Spherical cotton parachute with 22 marginal suspension cords and a central cord. Accordeon folded.

Tinsonier Parachute.- Flat cotton parachute of 50 sq.m. with 16 suspension cords.

Elimination Tests.- All the parachutes conformed to the conditions of volume (less than 25000 cm³)-(1525.58 cu.in.), of weight (less than 7 kg (15.43 lb)), of surface area (over 30 m² - 322.9 sq.ft) and of strength of fabric (over 300 kg - 661.39 lb to the meter - (3.28 ft)).

Three did not satisfy the condition of the strength of the suspension cords, the required minimum being 3000 kg (6613.9 lb). These were the Blanquier, 2680 kg (5908.4 lb); Froidure, 1800 kg (3968.3 lb); Ors, 2600 kg (5732 lb).

Owing to the small number of contestants, it was nevertheless decided to submit all the parachutes to flight tests.

Descents from Balloons.- These tests were made at Saint Cyr with the aid of the first aerostation regiment.

Mannekins of rubberized fabric, filled with sand and weighing 80 kg (176.37 lb) were used. Attached to the basket of the balloon and provided with parachutes, they were dropped from altitudes varying between 300 (984.25) and 500 m (1640.42 ft). In another balloon, ascending to the same altitude as the first, there was an observer provided with a Debie moving-picture camera for recording the beginning of the descent and thus measuring exactly the time consumed in unfolding.

The time was also found with a stop-watch by an official timer of the Aero Club of France, who was stationed on the ground.

The mean descending speed, thus obtained, was slightly above the landing speed (the only important consideration) by reason of

the time consumed in opening, during which the parachute fell freely a distance of 30 (98.4) to 100 meters (328.08 feet). For this reason, a more exact method was adopted. A weight was attached to the mannekin by a 70-meter (22.97 ft) cord. Then the time elapsed between the impacts of the weight and the mannekin with the ground gave the mean speed. A slight error, due to the curving of the cord under the action of the wind, precluded the employment of this method in a high wind. In the latter case, it was only necessary to subtract from the total height of descent the space traversed before the parachute opened. This distance could be determined with sufficient accuracy for most of the parachutes.

The parachutes were attached to the mannekins by cords two meters (6.56 ft) long. Since the time of opening of the parachute was counted from the time of opening of the containing bag, it was necessary to subtract, from the total time elapsed after the release of the mannekin, the time required to straighten out this cord, which was about 0.7 second.

Under these conditions, the following results were obtained:

Parachute	Mean speed of descent		Opening time	
			Minimum	Maximum
	m. p. s.	ft/sec.		
Blanquier	5.6	18.37	3.9 sec.	4.8 sec.
Cormier	5.3	17.39	2.3	3.6
Froidure	4.8	15.75	1.9	2.7
Ors	4.6	15.09	2.3	3.9
Robert	5.8	19.03	3.2	4.6
S.E.C.A.T.	6.2	20.34	4.5	4.8

The Tinsonnier parachute was eliminated, because it did not open on its first descent.

It is seen from the above table that only the parachutes Froidure and Cormier satisfied the opening conditions.

The instability of the Froidure, Cormier and Blanquier caused landing speeds clearly in excess of the mean descending speeds. The maximum landing speeds are given below:

	m.p.s.	ft/sec.
Blanquier	6.1	20.01
Cormier	7.3	23.95
Froidure	6.8	22.31
Ors	4.6	15.09
Robert	5.8	19.03
S.E.C.A.T.	6.2	20.34

Under these conditions only the Ors would be acceptable. This parachute is likewise the only one which realized the stipulated increase in the descending speed. Miss Collin was able to increase the descending speed about 0.3 m.p.s. (.984 ft/sec) by pulling on one of the suspension cords. This increase, however, is of no special importance.

The harnesses presented little of interest. Most of them were lacking in solidity or comfort and others were too clumsy.

Descents from Airplanes.- These were made at Villacoublay from two Breguet biplanes and a Potez "limousine" specially fitted for the purpose.

These tests showed the defectiveness of some of the parachute bags, which opened prematurely in a violent wind (Froidure), and the need of careful folding and fastening.

The maximum stresses were measured by the Brinnell ball test. It is known that the stresses must not exceed four to five times

the weight of the parachutist, under penalty of being dangerous. A maximum of 300 kg (661.39 lb) was stipulated in the regulations. The following results were obtained:

	kg.	lb.
Blanquier	315	694.46
Cormier	475	1047.19
Froidure	560	1234.59
Ors	295	650.36
Robert	255	562.18
S.E.C.A.T.	100	220.46

The descending speeds and rapidity of opening were found practically the same as in the descents from balloons.

Factors of Safety.- In the Froidure the fabric was especially stressed only at the moment of opening. The opening was very rapid and the fabric tore during one descent, showing the factor to be below unity.

The attachments of the suspending cords proved to be the weak points of the Blanquier, Cormier, Ors and S.E.C.A.T., bringing the safety factors down to:

2 for the Blanquier,
4 for the Cormier,
2.75 for the Ors,
5.25 for the S.E.C.A.T.

The above four were therefore lacking in strength.

The Robert was the strongest and the most carefully constructed, the suspension cords being continued to the apex. The whole had a safety factor of 13.35.

Conclusion.- No parachute fulfilled all the conditions of the contest. The jury, in recognition of the good qualities of cer-

tain parachutes, decided to return the entry fees to all the contestants and to award three prizes to the best parachutes, by way of encouragement:

10000 francs to the Ors,
3000 francs to the Robert
2000 francs to the S.E.C.A.T.

The money not awarded will be retained for prizes at a second contest between the seven contestants in the first.

The results of this contest show considerable progress in the development of aviation parachutes and it is probable that further improvements in the present parachutes will be made by the contestants.

The production of an excellent parachute constitutes, however, only a small part of the real problem. For many years there have been several types of good parachutes, but not one has yet been adapted to any standard airplane. The parachutes, which will result from the second contest of 1923, will have less bulk combined with greater certainty of functioning. Nevertheless, the problem of adaptation to airplanes, as well as facility of operation, is still far from being solved. It would, therefore, be helpful to inaugurate a contest between airplane constructors for the production of civil and military airplanes equipped with the best existing types of parachutes. Here lie the real difficulties to be overcome.

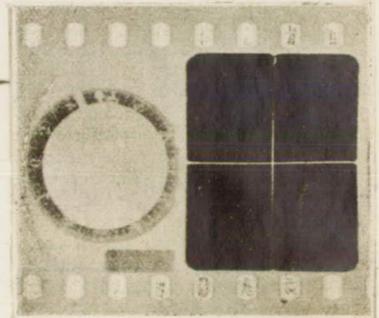


The Froidure descending. Note the small parachute above, which facilitates the opening.



Installation of the moving picture camera in the basket of another balloon for recording the time of opening.

Fragment of moving-picture film showing method of recording the simultaneous photography of a watch and of the parachute, the latter appearing in dark space.



Ascending of a balloon with two mannekins provided with parachutes.



Descent of Miss Collin with the Ors Parachute