THE EFFICIENCY OF MODERN AEROPLANES.

WITH FULL DATA COLLECTED AT THE RHEIMS AVIATION MEET.

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AFTER the splendid success of the great aviation week at Rheims, it would seem superfluous to proclaim before the world the undeniable progress made by aviation during the last few months, and now that the general public has realized the interest in mechanical flight, we can look to the near transformation into a flourishing industry of what heretofore has been chiefly experiment in the interest of sport.

The conclusions to be drawn from the Rheims meet may be summarized and expressed in figures, thus:

Pilot's importance, 60 per cent; motor's importance, 30 per cent; importance of the machine itself, 10 per cent.

By this we mean that if, at the present time, any rationally studied apparatus is more or less apt to fly, the motors for aviation purposes are yet very precarious and that there is not one from which the same quality of performance can be expected three times in succession.

We mean also that an apparatus that has produced marvelous results in the hands of a certain pilot is, for the time being, condemned to fail or to become useless in the hands of ten other operators.

The present-day pilot must, in fact, know his machine as well as the constructor and the designer themselves know it; he must, in some sort, be capable of establishing again, by reasoning and scientific means, not by routine or from memory, the data concerning it; besides, he must be a good mechanic, in order to get out of present-day motors all they can yield; and lastly, he has to be a good air navigator, knowing how to watch the movements and variations of his machine, and to feel it by instinct, so to speak.

We may be attributing to the pilot an extraordinary importance; but we do not, however, exaggerate when we state that from him the builders have principally to expect the daily improvements that will enable amateurs gradually to learn how to manage an aeroplane, just as they manage now a 50-horse-power automobile.

But there is another lesson to be learned from the Rheims meet, for this is the first time that we have come into possession of serious information, enabling us to make a comparative study of the different types of aeroplanes, on essentially different trials, such as endurance, speed, and weight carrying. At Rheims these tests were respectively the Grand Prix de Champagne, Bennett Cup race and speed prize; and the passenger-carrying prize.

In order to render comparisons easier we will make use of the expression: "Coefficient of utilization of an aeroplane." (*Revue de l'Association Générale Automobile*, Jan., 1909.)

In practice, what is asked, and specially what will be asked of an aeroplane, is to carry the maximum useful load with the minimum dead weight, at the highest speed, and with the minimum of propelling power (in other words, of expenditure of energy).

If therefore we call—
 P_u = the useful load (pilot and passengers or merchandise);
 P_t = the total weight (including the useful load, the machine complete with supplies of gasoline, oil, and water necessary to perform a given journey);
 V = the velocity (in kilometers per hour or in meters per second);
 M = the effective driving horse-power
—we have for the coefficient of utilization:

U = Pu / Pt x V / M

Let us now study the results obtained by the different types of aeroplanes in the three great kinds of trials to which they were submitted at Rheims:

I.—Grand Prize of Champagne.—In this test of endurance each contestant started with the maximum quantity of fuel that he thought should be carried. The only useful load in this instance was therefore the pilot himself.

We have collected in the following table the data necessary to calculate the coefficient of utilization.

The Wright biplanes, which were operated by the two Wright pilots, Count de Lambert and Mons. Paul Tissandier, rank first from the point of view of useful load carried. This is not surprising, considering its very low resistance to advance and the excellent efficiency insured by its two relatively slowly-revolving propellers.

It is also worthy of notice that these two machines, similar in every respect, have developed the same speed when operated by two different pilots.

The two "Antoinette" monoplanes, both piloted by Mons. Hubert Latham, come next. The proportion of useful load to total weight with these monoplanes is one-third less than with the Wright biplanes. This is due to the "Antoinette's" motor having a greater weight per horse-power than the Wright, 4.7 kilogrammes (10.36 pounds), instead of 3.6 kilogrammes (7.93 pounds); also to the single propeller, turning at 1,100 r.p.m., which gives only 265 pounds pull and seems to work under some disadvantage, by comparison with more slowly-revolving propellers; lastly, to the fact that the position of this propeller in front of the plane diminishes the lift, while the stationary horizontal and vertical fins forming a tail absorb a certain amount of power, which is compensated for, nevertheless, by a greater stability in flying.

that of the pilot; the supplies of gasoline, oil, and water had been reduced to the strict minimum for The "Blériot XI." of the cross-channel type (machine these two flights, 20 and 30 kilometers (12.4 and 18.6 miles) respectively.

No. 23 at Rheims), came in a good first, and that was not at all surprising, because: 1st. It was made for one person. 2nd. It was a monoplane having very little head resistance. 3rd. Its dead weight was very small. 4th. Its motor was small and light.

Curtiss's aeroplane followed closely; its total weight was nearly the same, but its head resistance was a little greater, and its higher speed required greater driving power.

Nevertheless, it must be noted that these two machines, made expressly for speed and for only one pas-

TABLE A.—GRAND PRIZE OF CHAMPAGNE.

Rheims Classification.	Make Aeroplane and Motor.	Pilot.	Useful Load, P_u		Weight of Aeroplane with Motor and Supplies.		Gasoline, Oil, Water.		Total Weight, P_t		Speed in Kilometers per Hour, V		Effective Driving Power, M	Practical Coefficient of Utilization, $U = \frac{P_u}{P_t} \times \frac{V}{M}$
			Kgs.	Lbs.	Kgs.	Lbs.	Kgs.	Lbs.	Kgs.	Lbs.	Kilms.	Mls.	H. P.	
I.	H. Farman (Gnome motor).	H. Farman.....	70	154.3	420	925.9	60	132.2	550	1212.5	58.4	36.3	35	0.2123
II.	Antoinette (Antoinette motor).	H. Latham.....	70	154.3	390	859.8	65	143.3	525	1157.4	67.0	41.6	40	0.2233
III.	Voisin (Gnome motor).	L. Paulhan.....	70	154.3	420	925.9	65	143.3	555	1223.6	49.1	30.5	35	0.1765
IV.	Wright (Wright motor).	Comte de Lambert.....	70	154.3	771.6 + 66.1 350 + 30 (2)		50	110.2	500	1102.3	62.1	38.6	27	0.3220
V.	Antoinette (Antoinette motor).	H. Latham	70	154.3	390	859.8	65	143.3	525	1157.4	67.8	42.1	40	0.2260
VI.	Wright (Wright motor).	P. Tissandier.....	70	154.3	771.6 + 66.1 350 + 30 (2)		50	110.2	500	1102.3	62.3	38.7	27	0.3230

¹ We take for pilots, in a general way, a uniform weight of 70 kilos (154.3 lbs.); the small differences that in reality appear are not being sufficient to alter the conclusions.

² To the true weight of the Wright machines we add here 30 kilos (66.1 lbs.); the Wright machines were indeed the only ones at Rheims that could not rise by themselves. A wheel attachment may be easily adapted to them, not exceeding this maximum weight of 30 kilos (66.1 lbs.), and hence our comparison with the other machines remains in full force.

TABLE B.—BENNETT CUP RACE.

Rheims Classification.	Make Aeroplane and Motor.	Pilot.	Useful Load, P_u		Weight of Aeroplane with Motor and Supplies.		Gasoline, Oil, Water.		Total Weight, P_t		Speed in Kilometers per Hour, V		Effective Driving Power, M	Coefficient of Practical Utilization, $U = \frac{P_u}{P_t} \times \frac{V}{M}$
			Kgs.	Lbs.	Kgs.	Lbs.	Kgs.	Lbs.	Kgs.	Lbs.	Kilms.	Mls.	H. P.	
I.	G. H. Curtiss (Curtiss motor).	G. H. Curtiss.....	70	154.3	230	507.1	15	33.1	315	716.5	75.7	47.0	35	0.4806
II.	Blériot XII (E. N. V. motor).	L. Blériot.....	70	154.3	520	1146.4	25	55.1	615	1355.8	75.3	46.8	50	0.1714
III.	Antoinette (Antoinette motor).	H. Latham.....	70	154.3	390	859.8	25	55.1	485	1069.2	68.4	42.5	40	0.2468
IV.	Wright (Wright motor).	E. Lefebvre.....	70	154.3	771.6 + 66.1 350 + 30		20	44.1	470	1036.2	57.7	35.9	27	0.3182
French Eliminatory.	Wright (Wright motor).	P. Tissandier.....	70	154.3	771.6 + 66.1 350 + 30		20	44.1	470	1036.2	62.8	39.0	27	0.3464
	Voisin (Gnome motor).	L. Paulhan.....	70	154.3	420	925.9	15	33.1	505	1113.3	55.2	34.3	35	0.2019
	H. Farman (Vivinus motor).	R. Sommer.....	70	154.3	470	1036.2	20	44.1	560	1234.6	51.3	31.7	35	0.1832

TABLE C.—SPEED PRIZE.

Rheims Classification.	Make Aeroplane and Motor.	Pilot.	Useful Load, P_u		Weight of Aeroplane with Motor and Supplies.		Gasoline, Oil, Water.		Total Weight, P_t		Speed in Kilometers per Hour, V		Effective Driving Power, M	Coefficient of Practical Utilization, $U = \frac{P_u}{P_t} \times \frac{V}{M}$
			Kgs.	Lbs.	Kgs.	Lbs.	Kgs.	Lbs.	Kgs.	Lbs.	Kilms.	Mls.	H. P.	
I.	G. H. Curtiss (Curtiss motor).	G. H. Curtiss.....	70	154.3	230	507.1	20	44.1	320	705.5	75.0	46.6	35	0.4687
II.	Antoinette (Antoinette motor).	H. Latham.....	70	154.3	390	859.8	30	66.1	490	1080.3	68.9	42.8	40	0.2461
III.	Wright (Wright motor).	P. Tissandier	70	154.3	771.6 + 66.1 350 + 30		20	44.1	470	1036.2	62.1	38.6	27	0.3425
IV.	Wright (Wright motor).	Comte de Lambert.....	70	154.3	771.6 + 66.1 350 + 30		20	44.1	470	1036.2	62.0	38.5	27	0.3420
V.	Wright (Wright motor).	E. Lefebvre.....	70	154.3	771.6 + 66.1 350 + 30		20	44.1	470	1036.2	61.95	38.5	27	0.3417
VI.	Blériot XI. (Anzani motor).	L. Blériot.....	70	154.3	230	507.1	10	22.1	310	683.4	59.6	37.0	25	0.5383
VII.	H. Farman (Vivinus motor).	R. Sommer.....	70	154.3	470	1036.2	25	55.1	565	1245.6	57.6	35.8	35	0.2038
VIII.	Voisin (Gnome motor).	L. Paulhan..	70	154.3	420	925.9	15	33.1	505	1113.3	54.8	34.0	25	0.2170

Mons. Henry Farman's biplane follows very closely the "Antoinette" monoplane; its head resistance is greater, but it makes up partly for this defect by the use of a very light revolving-cylinder, air-cooled motor (the "Gnome").

Mons. Paulhan's Voisin biplane comes last; its very great head resistance is the price it pays for its automatic stability and great dead weight.

II.—Bennett Cup Race and Speed Prize.—In these two speed tests the only useful load carried was again

senger, are separated only, from the point of view of practical utilization, by the inherent difference in their system of construction (biplane against monoplane).

After these two machines come the Wrights; the regularity of their useful effect is remarkable, for this type of machine, made for length of flight or for passengers, could not be expected to take first place in tests of pure speed. Their coefficients of utilization, with different pilots, are remarkably close to each other; the only apparent anomaly is in the case of

Lefebvre in the Bennett Cup race, but that is due to poor adjustment of his machine, which was never good at any time during the meeting, but which proved to be worse on the cup day; bad balancing of this machine cost him the loss of 3 to 4 miles an hour of speed.

The "Antoinette" comes after the Wright, in the same proportion as for the Grand Prize of Champagne (one-third less utilization).

Mons. Paulhan's Voisin biplane owes to its light motor the advantage gained over Mons. Royer Sommer's Farman, which was handicapped by the weight of its 35-horse-power 8-cylinder water-cooled Vivinus motor.

The "Blériot XII" (No. 22) came in a good last, but that is hardly surprising, if its dead weight and driving power are compared with those of the other machines.

NATURAL GAS.

NATURAL gas is being supplied over wider areas, and it comes as both an ally and a competitor of electric lighting. This dual position relates to both the central station and to the isolated plant, for natural gas may displace the lamps or operate the engines of either a public or private electric system, under same conditions.

As a lighting agent at the open flame natural gas has no value, but in incandescent-mantle burners it has even greater illuminating power than good manufactured gas. It is thus only in so far as mantle burners are adapted that natural gas competes with the electric light, and the most important point of such competition for central stations is probably in street lighting.

TABLE D.—PASSENGER-CARRYING PRIZE.

Rheims Classification.	Make Aeroplane and Motor.	Pilot.	Passengers.		Total Useful Load, P_u	Aeroplane Motor and Supplies.		Gasoline, Oil, Water.		Total Weight, P_t	Speed in Kilometers per Hour. V		Effective Driving Power, M	Coefficient of Utilization. $U = \frac{P_u}{P_t} \times \frac{V}{M}$
			Number.	Weight.		Kgs.	Lbs.	Kgs.	Lbs.		Kgs.	Lbs.		
I.	{ H. Farman (Gnome motor). }	H. Farman..	2	Kgs. Lbs. 130 286.6	Kgs. Lbs. 200 440.9	Kgs. Lbs. 420 925.9	15 33.1	Kgs. Lbs. 635 1399.9	56.3 35.0	H. P. 35			0.5066	
II.	{ H. Farman (Gnome motor). }	H. Farman..	1	65 143.3	135 297.6	420 925.9	15 33.1	570 1256.6	60.7 37.3	35			0.4107	
III.	{ Wright (Wright motor). }	E. Lefebvre.	1	65 143.3	135 297.6	$\left. \begin{matrix} 771.6 + 66.1 \\ 350 + 30 \end{matrix} \right\}$	20 44.1	535 1179.5	52.8 32.5	27			0.4934	
At Rheims.	{ Blériot XII. (E. N. V. motor). }	L. Blériot..	1	65 143.3	135 297.6	520 1146.4	25 55.1	680 1499.1	70 43.5	50			0.2779	
	{ Blériot XII. (E. N. V. motor). }	L. Blériot..	2	130 286.6	200 440.9	520 1146.4	25 55.1	745 1642.4	about 65 40.4	50			0.3489	
	{ Wright (Wright motor). }	W. Wright.	1	110 242.5	180 396.5	350 771.6	20 44.1	550 1212.5	about 53 31.2	27	$\frac{180}{550} \times \frac{30}{27} =$		0.5354	

*In order to account here for the 30 kilos (66.1 lbs.) weight of a wheel system attached to the Wright machine, we deduct this 30 kilos (66.1 lbs.) from the useful weight carried, for we do not know whether the apparatus would have risen with a total weight of 580 kilos (1278.7 lbs.) instead of 550 kilos (1212.6 lbs.).

III.—Passenger-Carrying Prize.—In Table D we have added to the official Rheims results those of the "Blériot XII" at Douai and at Rheims before its destruction, and those obtained by Wilbur Wright at the Auvours field.

As for carrying passengers, Farman's biplane with two passengers on board has almost as high a coefficient of utilization as the Wright biplane (at Rheims and Auvours), with only one passenger. There is, therefore, an advantage in favor of the Wrights' aeroplanes.

Finally, the "Blériot XII," for the same reason that we have previously given, is well behind. Its great head resistance, due to the defective disposition of the radiators, motor, and passengers, also contributes in great measure to this unsatisfactory result.

What is to be concluded from these different observations?

First of all, that at next year's meeting it will become indispensable to organize the three kinds of tests, namely: Endurance, speed, and passenger-carrying.

Consequently, builders will have to present two entirely different types: one for pure speed, the other for stability and passengers.

In short, we can even at the present time adopt for the practical utilization of existing machines, such as we have defined it at the beginning, the following classification:

High-speed aeroplanes for one person only: "Blériot XI" and Curtiss.

Aeroplanes for carrying dead weight or passengers: Wright, Farman, Antoinette, Voisin.—L'Aerophile.

It has previously been pointed out that mantle burners with all their supposed advantages have been able to displace the open flame of manufactured gas to only a slight extent among ordinary consumers, and it may well be doubted whether natural gas can do much more in this direction. An illustration of the preference of the public for a gas that carries its own illuminating power may be noted at Buffalo, where some 600,000,000 feet of eighteen-candle artificial gas is annually sold at one dollar per thousand, though natural gas retails at thirty-two cents.

In factories and stores and on streets, however, there is some competition between natural gas and electric light, but this can often be offset by the use of gas as a source of power for electrical supply. The owner of a factory that will either operate an isolated electric plant or use natural gas for lighting finds the cost less and the service better if natural gas is burned in an engine instead of in mantles.

With mantle burners that consume only three-and-one-half cubic feet of natural gas each per hour, the volume required by eight burners will give a kilowatt-hour if used to drive a small gas engine and dynamo, and with this kilowatt-hour twenty tungsten lamps of forty candle-power each may be operated.

A central station that must compete with natural gas for lighting and power will often find itself armed for the conflict by using this gas under boilers or in engines. Though subject to some variation, the heating power of natural gas may be taken at 900 British thermal units per cubic foot, or 900,000 units per thousand cubic feet, which is approximately one-and-one-half times the heating power of ordinary manufactured

gas. If a ton of 2,000 pounds of steam coal be taken to have 24,000,000 British thermal units, 26,600 feet of natural gas should make more steam than this coal, for the gas can be burned under boilers with a higher efficiency.

Even better results may be had if gas engines are used to drive the electric generators, for it would not be unreasonable to expect an efficiency of thirteen per cent, including friction losses, under reasonable conditions of load. This should give twelve per cent of the heat energy of the natural gas in the form of electric current at the dynamo terminals, or, say, thirty-one kilowatt-hours per thousand feet of the natural gas used in engines. In other words, a combined gas engine and dynamo should deliver $900,000 \times 0.12 = 108,000$ heat units per thousand feet of natural gas consumed, and 108,000 divided by 3,412, the number of equivalent heat units per kilowatt-hour, gives thirty-one kilowatt-hours per thousand feet of gas.

In the wide area between Pennsylvania and Oklahoma where natural gas is sold the rates to small consumers range from about fifteen to fifty cents per thousand feet, while the rates to factories and other large users are often as low as three, five, eight, or ten cents per thousand feet. With thirty-one kilowatt-hours per thousand feet of natural gas at the rate of three cents, the fuel cost amounts to less than one-tenth cent per kilowatt-hour, and even at the rate of ten cents per thousand feet the cost of gas is no more than one-third cent per kilowatt-hour, where gas engines are used. On the basis of the above conclusion that 26,600 cubic feet of natural gas will more than equal 2,000 pounds of steam coal under boilers, the cost of this gas to replace the short ton of coal is \$0.798 at the rate of three cents, and \$2.66 at ten cents per thousand feet.

Where a central station is operating with a steam plant and coal for fuel, it may or may not be advisable to install gas engines for use with natural gas, according to the price of the gas and the prospect of a permanent supply. Even if the cost of natural gas used under boilers nearly equals that of coal, the saving of labor in the fire room and the ability to instantly increase or decrease the gas heat may warrant its introduction.

Of course, an electric station has a legal right to as low a rate for natural gas as any other consumer of a like amount, even though there is competition in lighting.—Electrical Review and Western Electrician.

THE VACUUM BOTTLE.

WHY will the liquid in a vacuum bottle, or in any other vessel, remain cold three times as long as the same liquid will remain hot?

Power and the Engineer says the reason why can best be explained by a water analogy. First, perhaps, a little study of relative temperature is necessary.

If, on a hot day, with the mercury at 92 deg. F., a freezing liquid (32 deg. F.) be put into a vessel, the liquid's temperature must rise 60 deg. in order to reach the temperature of the surrounding atmosphere. If, on the other hand, a boiling liquid (212 deg. F.) be placed in a vessel with the outside temperature at the freezing point (32 deg. F.), the liquid's temperature must drop 180 deg. to reach the atmospheric temperature. Thus a hot liquid on a cold day has three times the difference in temperature between itself and the surrounding air, that a cold liquid has on a hot day.

And now comes the application of the water comparison. As every engineer knows, or should know, the pressure of water varies directly as the "head." Thus the pressure of a three-foot column is three times as great as that of a one-foot column. Heat acts the same way. The difference of 180 deg. exerts three times the pressure, or tendency to change, that a temperature difference of 60 deg. does. Thus the 180-degree change will take place in one-third the time required for the 60-degree change.

It may also be well to remember that cold is merely an absence of heat. Thus when a body becomes cooler, the heat is leaving it, and when it becomes warmer heat is entering it. Also, under equal conditions, heat will enter or leave a body at identically the same rate of speed.

The rapid progress of aviation has caused attention to be drawn from a new direction to the dangers of atmospheric electricity. In an article in the *Elektrotechnische Zeitschrift* Mr. L. Zehnder discusses the danger to balloons and aeroplanes of electrical disturbances, and the methods of avoiding disastrous effects. He points out that the electrical conditions of the air are subject to great variations during thunderstorms and that the atmospheric charges may change suddenly in sign. In clear weather an ordinary balloon without metal parts is not exposed to any danger so long as it floats in the air; but in the modern dirigibles much of the framework consists of conducting materials, which add to the danger. Also a balloon may be charged with electricity and a spark produced when contact with the ground is made, setting fire to the gas.

CHARACTERISTICS OF THE PRINCIPAL AEROPLANES.

	Voisin.		Farman.		Wright.		Curtiss.		Antoinette.		Blériot, N. 12.	Blériot, No. 11.	Santos Dumont.	
Weight complete, without pilot..	Kgs. 430	Lbs. 948	Kgs. 400	Lbs. 882	Kgs. 400	Lbs. 882	Kgs. 250	Lbs. 551	Kgs. 450	Lbs. 992	Kgs. 400	Lbs. 882	Kgs. 220	Lbs. 485
Surface of the planes.....	Sq. ft. 40	Sq. ft. 431	Sq. ft. 40	Sq. ft. 431	Sq. ft. 50	Sq. ft. 538	Sq. ft. 20	Sq. ft. 215	Sq. ft. 34	Sq. ft. 366	Sq. ft. 22	Sq. ft. 237	Sq. ft. 15	Sq. ft. 161
Spread.....	Mts. 10	Mts. 32.8	Mts. 10	Mts. 32.8	Mts. 12.50	Mts. 41.61	Mts. 7.90	Mts. 25.6	Mts. 14.80	Mts. 45.6	Mts. 10	Mts. 32.8	Mts. 8	Mts. 26.2
Width of plane.....	Mts. 2	Mts. 6.56	Mts. 2	Mts. 6.56	Mts. 2	Mts. 6.56	Mts. 1.40	Mts. 4.59	Mts. 3	Mts. 9.84	Mts. 2.20	Mts. 7.21	Mts. 2	Mts. 6.56
Surface of horizontal rudder.....	Sq. ft. 4	Sq. ft. 43.1	Sq. ft. 4	Sq. ft. 43.1	Sq. ft. 8	Sq. ft. 86.1	Sq. ft. 4.50	Sq. ft. 45.5	Sq. ft. 1	Sq. ft. 10.8	Sq. ft. 2.50	Sq. ft. 26.9	Sq. ft. 1.30	Sq. ft. 14.0
Lateral stability.....	Automatic.	Wing Tips.	Wing Tips.	Wing Tips.	Wing Tips.	Wing Tips.	Balancing.	Wing Tips.	Wing Tips.	Wing Tips.	Wing Tips.	Wing Tips.	Wing Tips.	Wing Tips.
Surface aft fins.....	Sq. ft. 9	Sq. ft. 96.9	Sq. ft. 8	Sq. ft. 86.1	Sq. ft. 8	Sq. ft. 86.1	Sq. ft. 2.50	Sq. ft. 26.9	Sq. ft. 4.50	Sq. ft. 45.5	Sq. ft. 2	Sq. ft. 21.5	Sq. ft. 1.50	Sq. ft. 16.1
Total length of the machine.....	Mts. 10.50	Mts. 34.4	Mts. 14	Mts. 45.9	Mts. 9	Mts. 29.5	Mts. 8	Mts. 26.2	Mts. 10.20	Mts. 33.5	Mts. 10	Mts. 32.8	Mts. 8	Mts. 26.2
Propeller.....	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.	Wood.
Propeller, pitch of.....	Mts. 2.30	Mts. 7.5	Mts. 1.40	Mts. 4.6	Mts. 1.40	Mts. 4.6	Mts. 1.40	Mts. 4.6	Mts. 1.40	Mts. 4.6	Mts. 1.40	Mts. 4.6	Mts. 1.40	Mts. 4.6
Propeller, number revolutions of.....	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Horse power of motor.....	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.	Gnome.
Number of cylinders.....	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Bore.....	Mm. 110	Mm. 4.33	Mm. 110	Mm. 4.33	Mm. 110	Mm. 4.33	Mm. 110	Mm. 4.33	Mm. 110	Mm. 4.33	Mm. 110	Mm. 4.33	Mm. 110	Mm. 4.33
Stroke.....	Mm. 120	Mm. 4.72	Mm. 120	Mm. 4.72	Mm. 100	Mm. 3.94	Mm. 100	Mm. 3.94	Mm. 105	Mm. 4.13	Mm. 110	Mm. 4.33	Mm. 130	Mm. 5.12
Number of revolutions.....	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Cooling.....	Air.	Air.	Air.	Air.	Air.	Air.	Air.	Air.	Air.	Air.	Air.	Air.	Air.	Air.
Speed in kilometers (Rheims results).....	Kms. 56	Mls. 34.8	Kms. 66	Mls. 41	Kms. 70	Mls. 43.5	Kms. 78	Mls. 48.5	Kms. 71	Mls. 44.1	Kms. 79	Mls. 49.1	Kms. 55	Mls. 34.2