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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

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DEFINITION OF TERMS USED IN CONNECTION WITH  
COMMERCIAL AIRCRAFT ENGINES.

By Martinot Lagarde.

From "Premier Congres International de la Navigation Aerienne,"  
Paris, November, 1921, Vol. IV.

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DEFINITION OF TERMS USED IN CONNECTION WITH  
COMMERCIAL AIRCRAFT ENGINES.\*

By Martinot Lagarde.

For the purpose of facilitating international relations, I wish to emphasize the importance of the standardization of certain terms and definitions relating to the use of engines on airplanes.

1. Power unit: HP = 75 kg/m/sec.

2. Weight of engine:

a) Weight of engine empty: Weight of engine with its essential accessories, forming an integral part of the engine, such as the carburetor, magneto, water and oil pumps, and propeller hub, but without water or oil.

b) Weight of engine in running order: weight of engine empty plus water for cooling the cylinders and just enough oil for running.

c) Weight of engine group for n hours of flight: weight of engine in running order plus weight of accessories peculiar to each airplane (radiators and water, exhaust pipe, bolts or other attachment devices, propeller, gages and controls, fuel feed devices, gasoline and oil tanks, oil radiators, etc., with fuel for trip at the indicated engine power for altitudes below 100 meters;

3. Power definitions: Every power designation must include the period of time it can be maintained on the ground, together with the corresponding revolution speed. For the sake of simplic-

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\* From "Premier Congres International de la Navigation Aerienne," Paris, November, 1921, Vol. IV, pp. 502-3.

ity, I suggest the following power designations:

a) Brake horsepower: number used to designate HP of engine and which can be maintained on the ground, on the test bench, for at least half an hour at a time, at the maximum allowable revolution speed. The indicated power may equal the maximum power, though normally it is equal to about 0.9 of the latter. This power is ordinarily employed in calculation, modified, if necessary, in order to allow for differences of altitude, of supercharging, under-feeding or over-feeding.

b) Maximum power: This is the greatest power the engine can give on the ground, even for a very short time (2 minutes) at the maximum revolution speed.

c) Normal power: The power the engine can furnish on the ground for at least 4.5 hours, at a revolution speed generally lower than the maximum.

4. Test characteristics: A test can be officially approved only for the length of time it is continued without interruption. In summing up the individual trials of an endurance test, only the non-stop trials of over two hours are counted. The engine must be tested on the bench, under conditions as nearly as possible like those of airplane flight, as regards the temperatures of the water and oil.

5. Definition of fuel: The fuel is defined by its source, its distillation curve, its density and the density of the last twentieth of the distillate. The rapidity of the process should be indicated.

6. Definition of lubricant: The oil is defined by its nature or its viscosity:  $15^{\circ}$  -  $50^{\circ}$  and  $100^{\circ}\text{C}$ , accompanied by the description of the apparatus employed. It would be well to standardize the definition of the gelatinous state, at which the oil can no longer be used as a lubricant, and other principal characteristics of identification.

7. Definition of metals (steels in particular): Any steel should be defined by its characteristics (obtained simultaneously by a systematic thermic treatment) of tensile strength, limit of elasticity, expansion and resilience. The resilience figure should be accompanied by the description of the machine employed and the sample used.

Endeavors to improve the engines, by improving the quality of the steel, are of prime importance. Standardization of the methods of testing metals and of the temperatures for gaging is desirable.

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