ADOPTION NOTICE

SAE-J690, "Certificates of Maximum Net Horsepower for Motor Trucks and Truck Tractors," was adopted on October 3, 1994, for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: WR-ALC/TILBA, 255 Second Street, Robins AFB, GA 31098-1637. DoD activities may obtain copies of this standard from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. The private sector and other Government agencies may purchase copies from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

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Air Force - 84

FSC 2320

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other value over the airstream velocity range of the tunnel. Once the Reynolds number effects have been determined, the remainder of the test program should be performed at a Reynolds number above which the force and moment coefficients are essentially constant for the yaw angles investigated. A maximum test velocity of 300 ft/s (92 m/s) should not be exceeded in order to avoid compressibility effects.

7.5 Engine-Cooling Airflow Effects—The effect of engine-cooling airflow rate on drag should be investigated by conducting tests at the two extreme airflow rates of zero and maximum airflow in addition to that used for the base line test. Zero airflow is defined as that achieved by blocking the entrance to the model's engine compartment, and maximum airflow is defined as that established by removing all restrictions to the airflow at the radiator location. The model's engine should remain in place for all tests. Tests should be made over the entire range of yaw angles. If extensive model modifications are made, it is recommended that the effect of engine-cooling airflow rate be reinvestigated. Where passive means cannot be used to simulate the cooling airflow (as with some buses) consideration should be given to the use of active means.

7.6 Wind Tunnel Data Corrections—A correction to the drag coefficient for a longitudinal pressure gradient (horizontal buoyancy) should be made if the correction exceeds 1% of the measured drag coefficient. *ed.* The application of a correction to account for the effects of the model solid and wake blockage is optional. The form of any correction used must be specified as required in paragraph 7.9.

7.7 Flow Visualization—It is useful, but not necessary, to monitor the model flow field with an indicator such as smoke, tufts, or an oil film. This permits a rough correlation with known full scale flow details.

7.8 Surface Pressures—Surface pressure measurements may assist in determining the local effects of vehicle modifications and in assessing the contribution of certain parts of a vehicle to total drag. Care should be taken that pressures are averaged over a sufficient period of time to assure data repeatability.

7.9 Data Presentation—Sufficient background data should be presented to completely define the wind tunnel and ground simulation, test flow field, and the model's geometry. The following minimum data are required:

Test facility dimensions.
Ground board location and dimensions.
Model location on ground board.
Model dimensions as shown (include true projected frontal area if available) in Fig. 3.
Photographs of model configurations.
Photographs of model installed in wind tunnel.
Description of model modifications.
Description of engine cooling flow simulation.
Results of Reynolds number test.
Results of engine cooling flow test.
All dimensional data used for data reduction.
Flow calibration items required in paragraph 7.1.
ed. Data correction items used, paragraph 7.6.

All model test data should be presented in tabular form, and as much as is practical, or necessary, in graphical form. Should a blockage correction be used, the correction must be defined and the increments or factors applied must be presented.

APPENDIX I

A vehicle's wind-averaged drag coefficient can be evaluated using the annual mean wind speed in the United States, assuming that the wind *ed.* will approach the vehicle with equal probability from any direction. The wind-averaged drag coefficient is defined by:

$$\overline{C}_D(V_T) = \frac{\overline{D}(V_T)}{\frac{1}{2}\rho V_T^2 A} \qquad (6.10.1)$$

The value of $\overline{C}_D(V_T)$ can be approximated as follows:

$$\overline{C}_D(V_T) = \frac{1}{6}\sum_{j=1}^{6} M(j)C_D(j) \qquad (6.10.2)\ ed.$$

Where:

$$M(I) = 1 + \left(\frac{V_W}{V_T}\right)^2 + 2\left(\frac{V_W}{V_T}\right)\cos\phi(j) \qquad (6.10.3)\ ed.$$

$$\phi(j) = (j \times 30\ \text{deg}) - 15\ \text{deg}$$

$$C_D(j) = C_D\psi(j)$$

$$\psi(j) = \tan^{-1}\left[\frac{(V_W/V_T)\sin\phi j}{1 + (V_W/V_T)\cos\phi j}\right] \qquad (6.10.6)\ ed.$$

where ψ is defined in Fig. 1.

If this technique is used, the value of V_W recommended for use in computing the wind-averaged drag coefficient and representative of the average winds for trucks and buses is 7 mph. Using this mean wind speed value, the following table is provided to facilitate a computation of $\overline{C}_D(V_T)$ at vehicle speeds of 30 mph (48.3 km/h) and 55 mph (88.5 km/h).

WIND-AVERAGED DRAG COEFFICIENT COMPUTATION CHART *ed.*

	$V_T = 30$ mph (48.3 km/h)		$V_T = 55$ mph (88.5 km/h)	
I	ψ(I)(deg)	M(I)	ψ(I)(deg)	M(I)
1	2.8	1.505	1.7	1.262
2	8.1	1.384	4.7	1.196
3	12.0	1.175	6.8	1.082
4	13.5	0.934	7.2	0.950
5	11.2	0.724	5.6	0.836
6	4.5	0.604	2.2	0.770

The values of $\psi(j)$ given in the table above are all positive. If the $C_D(\psi)$ characteristic is not symmetrical about $\psi = 0$ deg, the value of $C_D(j)$ to be used in the computation of $\overline{C}_D(V_T)$ is the average of the C_D values at plus and minus $\psi(j)$. If the value of $C_D(V_T)$ is reported, the value of the mean wind speed and the vehicle speed used in its computation must be stated.

CERTIFICATES OF MAXIMUM NET HORSEPOWER FOR MOTOR TRUCKS AND TRUCK TRACTORS—SAE J690

SAE Standard

Report of Motorcoach and Motor Truck Division approved January 1941. Editorial change by Truck and Bus Technical Committee May 1964. Reaffirmed without change February 1965.

[In the report of the SAE Motor Truck Rating Committee on Ability Ratings published in the January 1940 issue of the SAE Journal, it was recommended that pounds per certified net brake horsepower delivered to the clutch or its equivalent be used as the index of the potential ability of a motor truck or combination. This report defined the term "certified net brake horsepower" in detail and recommended that certain data be provided to

CERTIFICATE OF MAXIMUM NET HORSEPOWER

This is to certify that the truck identified as follows:
(truck tractor)

MAKE.....
MODEL.....
ENGINE MAKE.....
ENGINE MODEL.....

is in proper operating condition and adjustment, has a maximum net brake horsepower not less than..... **at**..... **rpm, after deducting power losses due to power-absorbing accessories checked on supporting data sheet on the back of this certificate.**

(Signed).....
(Title).....
(Firm).....

Sworn to and subscribed before me this.....**day of**....., **19**....
L. S.
.....
Notary Public (County) (State)
My Commission expires.....

FIG. 1—CERTIFICATION FOR GASOLINE AND DIESEL ENGINES—FRONT OF FORM

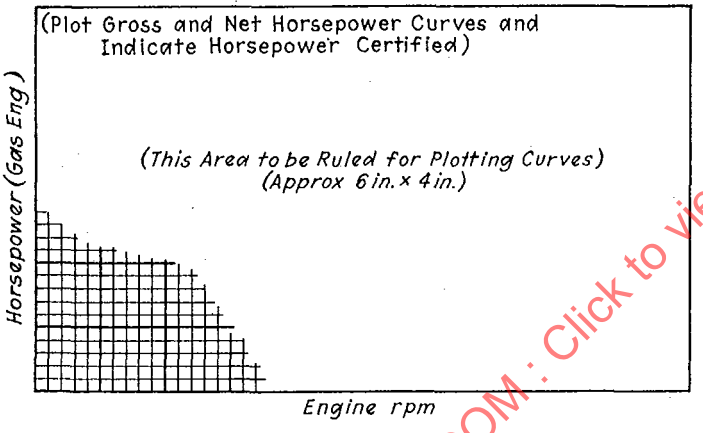

FIG. 2—PERFORMANCE DATA SHEET FOR GASOLINE ENGINES—BACK OF FORM

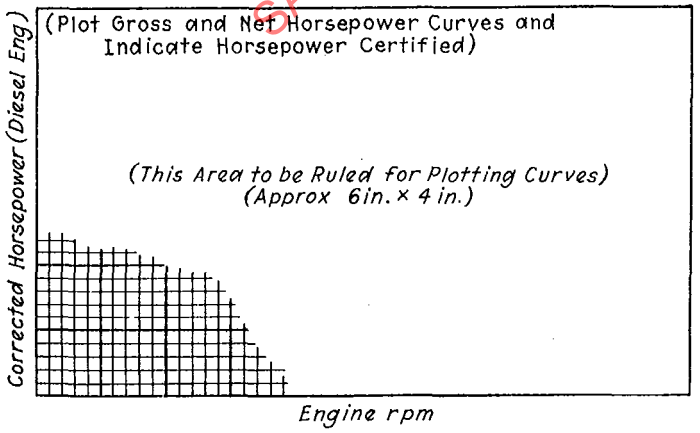

FIG. 3—PERFORMANCE DATA SHEET FOR DIESEL ENGINES—BACK OF FORM

support the certification. The accompanying forms provide a method for the presentation of the data specified.]

Gasoline Engine

Gross Horsepower is the brake horsepower determined under conditions as defined hereinafter by dynamometer test of the stripped engine—that is, the brake horsepower of the engine with only those accessories and attachments necessary to the functioning of the engine during this test.

Net Horsepower is the brake horsepower delivered to the clutch, or its equivalent, with all accessories and attachments functioning (including exhaust pipe, muffler, and tail pipe) which are standard or regular equipment on the engine as installed in the particular chassis model. The manufacturer may determine the net horsepower by subtracting accessory power consumption from the gross brake horsepower or by direct test with accessories installed and functioning.

Horsepower shall be determined under conditions and in accordance with procedure prescribed by SAE J816.

DESCRIPTION OF ENGINE AND EQUIPMENT

1. Engine make.....
2. Engine model.....
3. No. of cylinders .....
4. Bore ..... in., stroke..... in.
5. Piston displacement.....cu in.
6. Compression ratio.....
7. Inlet valve clear dia[1] ..... in.
8. Inlet valve lift[1] ..... in.
9. Exhaust valve clear dia[1] ..... in.
10. Exhaust valve lift[1] ..... in.
11. Inlet valve opens[1].....
12. Inlet valve closes[1].....
13. Exhaust valve opens[1].....
14. Exhaust valve closes[1].....
15. Max spark advance[1]..... deg
retard..... deg

[1] If not poppet type, explain below.

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POWER ABSORBING ACCESSORIES, EQUIPMENT, AND ATTACHMENTS

In column A, check items which were functioning when gross horsepower was determined. In column B, check all additional items which were functioning when net horsepower was determined. List and check any additional items. For items not used, write "None".

	A	B		A	B
1. Oil pump[1]			10. Air filter		
2. Water pump[2]			11. Governor		
3. Fan[1]			12. Generator		
4. Exhaust pipe[1]			13. Vacuum pump		
5. Muffler[1]			14. Compressor		
6. Trail pipe			15.		
7. Fuel pump			16.		
8. Ignition distributor[3]			17.		
9. Magneto[3]					

[1] Required.
[2] Required if watercooled.
[3] Either or both.

Fuel used in brake horsepower tests is to have octane rating equivalent to that of currently available "regular price" gasolines.

Diesel Engine

Gross Horsepower is the brake horsepower determined under conditions as defined hereinafter by dynamometer test of the stripped engine—that is, the brake horsepower of the engine with only those accessories and attachments necessary to the functioning of the engine during this test.

Net Horsepower is the brake horsepower delivered to the clutch, or its equivalent, with all accessories and attachments functioning (including exhaust pipe, muffler, and tail pipe) which are standard or regular equipment on the engine as installed in the particular chassis model. The manufacturer may determine the net horsepower by subtracting accessory power consumption from the gross brake horsepower or by direct test with accessories installed and functioning.