

## OFFICIAL VS. REAL-WORLD ROAD-LOAD PARAMETERS IN EU VEHICLE EFFICIENCY TESTING

On average, real-world fuel consumption and CO<sub>2</sub> emissions of new European passenger cars exceeded official vehicle type-approval values by approximately 40 percent in 2014. About one-third of this gap can be explained by vehicle manufacturers systematically exploiting technical tolerances and imprecise definitions in the procedures specified for the coastdown tests that provide crucial data used to set up the lab equipment for type-approval tests. A new study by the ICCT illuminates the effects.

### BACKGROUND

» Type-approval tests are conducted in a laboratory setting with the vehicle mounted on a chassis dynamometer—essentially, a pair of rollers—that permits it to simulate driving over a specified course without actually moving. The dynamometer also simulates the inertia of the vehicle (its resistance to

changes in speed) when operated on a road, as well as the effects of friction (from tires) and aerodynamic resistance during on-road operation. Collectively, the forces of inertia, friction, and aerodynamic resistance are referred to as “road load,” and the values required to set up a dynamometer to simulate them, called road-load coefficients, are determined outside the laboratory via tests during which the vehicle is driven and then coasted numerous times on a specially designed test track—hence the term coastdown test.

» During coastdown testing, a vehicle is brought to a certain speed on the test track (for example, 130 km/h), then taken out of gear and placed in neutral. The vehicle slowly loses speed due to aerodynamic and rolling resistances. The coastdown time is recorded at a number of reference speeds, along with data on environmental conditions and other factors.

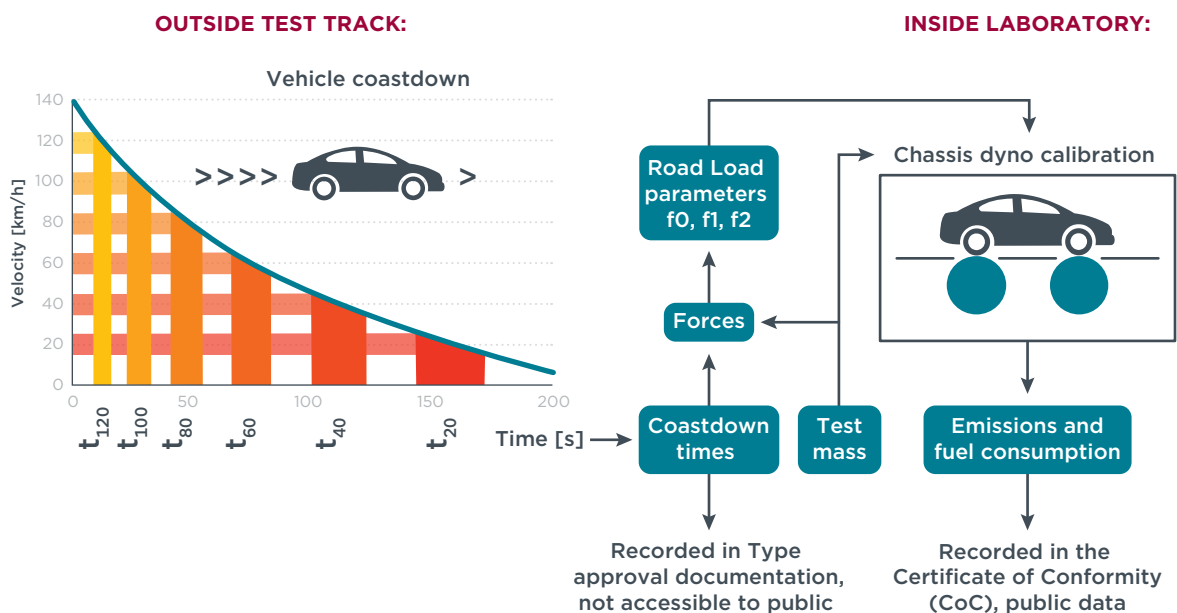


Figure 1. Schematic illustration of the road load determination procedure in the EU.

Using the recorded speed and other data, and the mass of the vehicle, resistance forces can be calculated for each reference speed.

- » Road-load coefficients have a significant influence on the official fuel consumption and CO<sub>2</sub> emissions values obtained through type-approval testing, because energy is required—that is, fuel must be burned—to overcome road load. If the coefficients used to set up the chassis dynamometer cause it to simulate too little road load during a type-approval test, the vehicle will consume an artificially low amount of fuel for the test, and emit less CO<sub>2</sub>. As coastdown testing is rarely repeated during the production cycle of a vehicle model, the initial coastdown values have a lasting impact.
- » In contrast to the U.S., in the EU coastdown test results are not public information. The coastdown time intervals are recorded in the type-approval documents of the vehicle but are—like all coastdown test results—treated as confidential business information and therefore private.

## STUDY METHODOLOGY

- » Realistic road-load data for 29 in-use passenger car models were obtained from four independent vehicle test laboratories across Europe. For 19 of the 29, these real-world road loads were compared to official road loads obtained from the French and German type-approval agencies. Four other Member State type-approval agencies (Italy, Luxembourg,

Spain, and the United Kingdom) declined to provide official road-load values, citing confidentiality grounds, or did not respond to the data request at all.

- » For vehicle models that are also sold in the U.S., the official road-load data used in U.S. certification testing of those vehicles were also gathered and compared with the European real-world road-load data.

## KEY FINDINGS

- » Real-world road load was found to be higher than the official road load for all 19 vehicles—that is, the actual road load was greater than what was simulated during EU type-approval tests on those vehicles. The resulting impact on CO<sub>2</sub> emissions and fuel consumption varied between 0.7% and 14.5%.
- » On average, official CO<sub>2</sub> emission figures were 7.2% lower than actual on-road emissions because of the inaccurate official road-load coefficients used for type-approval testing. That figure is nearly one-third of the average gap between official and real-world CO<sub>2</sub> values for new cars in 2010. (The vehicle models analyzed in this study were model year 2009–2012 vehicles, hence the comparison to the 2010 values rather than 2014.)
- » The average impact on CO<sub>2</sub> emissions and fuel consumption of differences between the official U.S. road-load coefficients and the real-world data was significantly lower, at only 1.8%.

**Table 1.** Approached EU type-approval authorities and their reactions

Country	Authority	Number of evaluated vehicles falling within the authority's remit		Provided official coastdown data?
		Whole vehicle TA	Emissions TA	
Germany	Kraftfahrtbundesamt (KBA), Flensburg	12	7	YES
France	Centre National de Reception des Vehicules (DRIRE), Montlhery	5	5	YES (data provided by UTAC)
Great Britain	Vehicle Certification Agency, Bristol	4	5	NO, declined
Italy	Ministero della Infrastrutture e dei Trasporti, Roma	5	5	NO, declined
Luxembourg	Société Nationale de Certification et d'Homologation (SNCH), Sandweiler	2	6	NO, no response
Spain	Ministerio de industria, turismo y comercio, Madrid	1	1	NO, no response

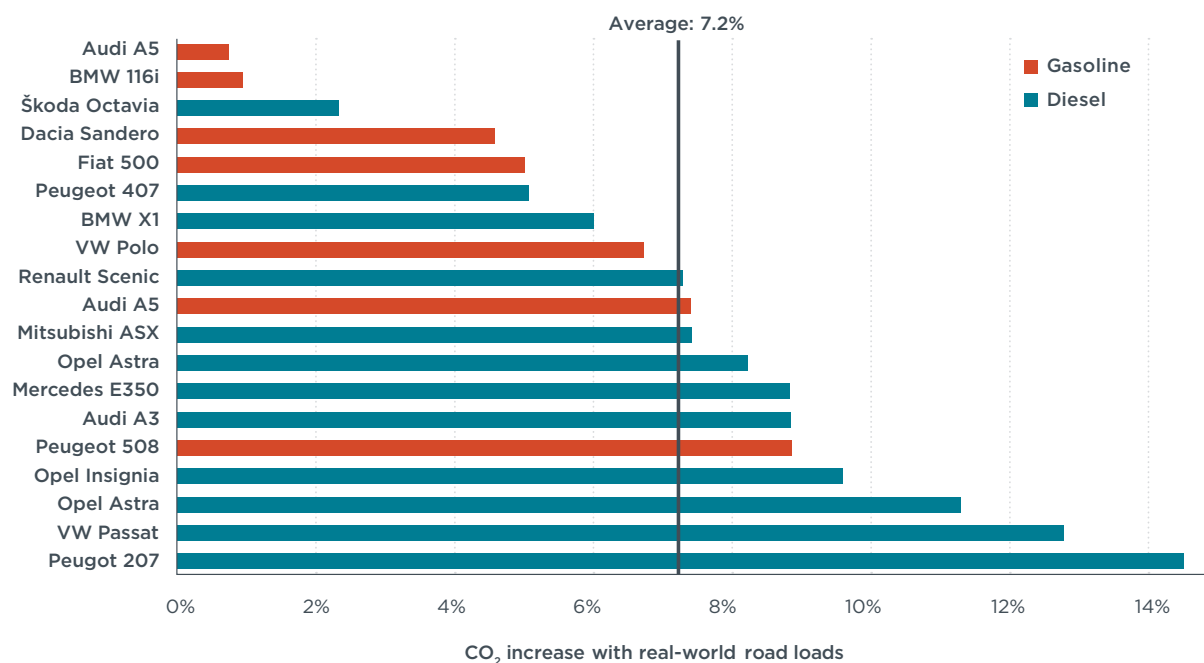


Figure 2. Increase of CO<sub>2</sub> emissions with real-world road loads compared to official loads.

## POLICY IMPLICATIONS

- » The Worldwide Harmonized Light Vehicles Test Procedure (WLTP), when it is introduced in the EU in 2017, will address many of the shortcomings in the coastdown test procedure. But the new test procedure may also leave open new options for optimizing vehicles towards the test procedure. Care should be taken to guard against that possibility.
- » Retesting of vehicles by the regulatory authorities, including coastdown testing, is a critical check on manufacturers. In the U.S., new vehicle models are subject to retesting by Environmental Protection Agency (EPA), which has imposed substantial fines on manufacturers in the past when that has revealed unrealistic road-load coefficients.

- » The U.S. EPA also releases all official road-load data to the public. Type approval road load data should similarly be made public in the EU to allow third parties to verify the accuracy of manufacturers' data.

## FURTHER READING

- » From Laboratory to Road: A 2015 update of official and "real-world" fuel consumption and CO<sub>2</sub> values for passenger cars in Europe. <http://www.theicct.org/laboratory-road-2015-update>
- » The future of vehicle testing: How to align regulatory requirements and customer expectations. <http://www.theicct.org/future-of-vehicle-testing>

## FURTHER INFORMATION

**Title:** The impact of official versus real-world road loads on CO<sub>2</sub> emissions and fuel consumption of European passenger cars

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