

250 Miles with a Made in the USA Supercar, the Tesla P85D

Panos D Prevedouros – Engineering professor, department chairman, car aficionado, and past SCCA racer with no place to race on Oahu—Dec. 3, 2015

The surprising acceleration of the Tesla S prompted Jay Leno to race his 700 HP Cobra two-seater against a grandmother driving a Tesla P85D in the opening segment of a recent episode of *Jay Leno's Garage* shown on NBC-SN. With minimal effort, the grandma handed Jay's Cobra a clear defeat. Jay retorted: "Horsepower wins sales, torque wins races." This is where electric motors reign supreme with their instant, large and constant torque. Torque is the actual force that turns the wheels and propels a vehicle forward.

Through a school fundraiser I got a weekend drive of a Tesla S. I asked if they had the 2015 top-of-the-line model available for the drive, the P85D, and they did! I kept the car for almost three days; offered rides to over a dozen wowed passengers, then loaded the family and completed a tour around the island... Honolulu, Mililani, Haleiwa, Kaneohe, Waimanalo, Hawaii Kai, and back to Honolulu.



How does the Tesla compare to other cars?

A fair comparison would pit the Tesla against the \$150,000 Maserati Quattroporte for size and luxury or a \$300,000 Ferrari FF for performance and luxury, but hardly anyone is familiar with those Italian exotics. Instead, I'd compare the Tesla S by with two popular cars that I and a lot of other people are familiar with, that also have elective drive: The BMW 335i in hybrid version, which is sold as the Active Hybrid 3, and the top selling sedan in the US, the Toyota Camry, in Hybrid and XLE trim.

	BMW 335i Hybrid	Tesla S P85D	Toyota Camry Hybrid XLE
Horsepower	335	691	200
Acceleration 0-60 mph	5.2	3.1	7.7
Quarter mile or 0-400 meters	13.5 @ 107.5 mph	11.6 @ 115.2 mph	15.7 @ 91.1 mph
Curb weight	3825	4647	3585
Interior volume, cu.ft.	96.0	120.0	102.7
Cargo space with all seats in place, cu.ft.	10.0	31.6	13.1
Length x Width in inches	182.2 x 71.3	196 x 77.3	190.9 x 71.7
Wheelbase	110.6	116.5	109.3
Turning circle, ft.	37.1	37.0	36.7

What stands out immediately from the sample numbers in the table is Tesla's huge horsepower, but its superiority in torque is even bigger. Torque is measured in pound-feet. The Camry has 170, the BMW doubles it with 332, and Tesla smashes it with 864!

Tesla's acceleration from 0 to 60 mph is almost instant and comes with minimal fuss and wheel spin compared to the growl and tire screech of the BMW. Fast cars cover the quarter mile in less than 15 seconds. Not surprisingly the 200 HP Camry is not really fast, nor was it ever designed to be. The BMW is properly fast but the Tesla has dragster capabilities.

Due to its large size and large size battery the Tesla is very heavy despite the fact that it does not have engine, cooling and exhaust systems. It does not have gearboxes and differentials either. But in P85D, the D stands for dual motor, one for each axle. In this comparison the Tesla is the only four wheel drive car. The BMW is rear wheel drive and the Camry is front wheel drive.

The Tesla is seven inches longer than the Camry, 14 inches longer than the BMW and about five inches wider than both of them. It is a large car and as a result is it very spacious with about 20% more passenger volume than the other two, and about triple the cargo space with all seats in place. Space-wise then, The Tesla is a lot of car. Despite that, it is just as maneuverable as the BMW and the Camry which makes it easy to handle in tight spots.

So, how good is it? Using qualitative descriptions such as unacceptable, very poor, poor, inadequate, adequate, good, very good, excellent and outstanding, I would rate the Tesla P85D as follows.

Strengths

The Tesla has catapult-like but very predictable and controllable acceleration. It's an outstanding performer that bypasses its top flight German piers such as BMW M6, Mercedes CLS63 AMG or Porsche Panamera and goes to compete directly with Italian supercars . (I have catapulted from an air carrier, and the P85D gives the same feeling in the first 3 seconds on full throttle and INSANE mode on an empty straight road.) The P85D surpasses the straight line performance of the \$300,000 Ferrari FF with a V12 engine!

The Tesla has an excellent adaptive cruise control that one can set it at a reasonably high speed such as 60 mph and forget it. If the car in front does 55, so does the Tesla. If the car in front slows to 5 or stops, so does the Tesla, and then as the car ahead begins to accelerate, so does the Tesla, smoothly. The driver can choose the distance to follow the car ahead in car lengths 2,3,4. For Honolulu 2 worked well for stop-and-go traffic and 3 worked well for busy but fluid conditions. At 4 car lengths or higher the Tesla follows too far behind the vehicle ahead, and motorists in adjacent lanes are likely to cut in the gap. As with all cars, touching the brake pedal takes the cruise control off.

The Tesla delivers outstanding cruising performance in terms of controlled ride, suspension comfort and cabin noise. In Sport setting, the handling is very responsive but also comfortable on Oahu's rough roads. The interior space is excellent, the visibility is good, and the climate controls are very good to excellent.

Charging the car in the garage is a simple plugging of a heavy cable to a standard outlet. A 60 mile charge requires 16 hours. Tesla does not recommend charging on a standard 110V house outlet. The owner should install a 240V outlet for effective overnight charging. While on the road, the car's navigation system can provide a list of nearby EV charging stations.

The car is 100% internet enabled and comes with an on screen browser. Simple inquiries are quick. Video streaming is very slow.

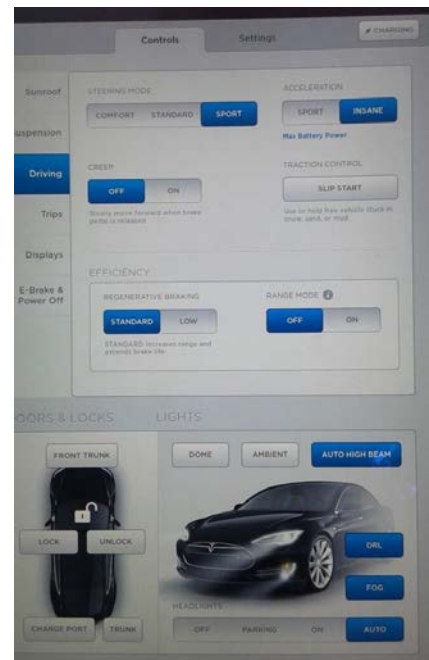


Weaknesses

Some features of this Tesla could be better. Its headlights are very good but inferior to the BMW's, and the wipers flutter at speeds over 50 mph. Honolulu's grainy and rutted pavements cause some buzzing in the cabin. I'm sure that the very low profile tires on the P85D have something to do with it. Regular Tesla S may experience less cabin buzzing on rough pavement.

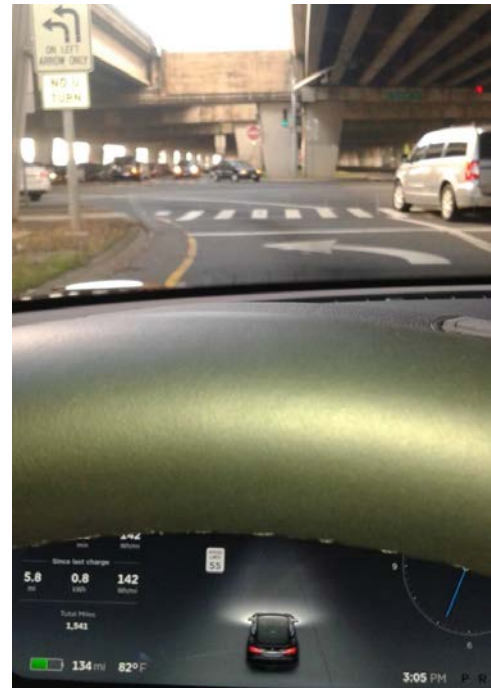
View in the rear through the car is limited and the rear window could use a wiper. This is a minor issue considering that it comes with a large video display via a rear view camera, but I prefer to glance at mirrors than look down at the monitor.

Almost all one click operations in other cars have been replaced by software selections on the large monitor that replaces the typical central console in other cars. Unlocking doors and setting fan



speeds was too odd for me to do via the touch monitor. The cup holder position on the high arm rest between the front seats is poor. It affected my driving and enjoyment of the car.

The automated speed limit recognition has an incorrect software override. At the airport viaduct (Nimitz Hwy.) the camera correctly identified the 35 mph limit and showed it in the instrument display, but almost instantly the control software replaced it with the 55 mph speed limit on the upper deck (H-1 Fwy.)—see photo. This mistake can affect the safe operation of the autopilot.



Finally, driving the Tesla takes a bit of getting used to it because it does not coast and it does not creep. Its gas pedal has a dual use: Press softly or hard to accelerate slow or fast; depress a little or a lot, to slow down a little or a lot. An attentive driver rarely needs to use the brake pedal because the regenerative part of the brakes slows the car effectively. In my first long drive I did not use the cruise control, and after 20 miles in Honolulu traffic, some muscles on my right leg became sore because the foot never got to rest. Also the Tesla does not creep; regular automatic cars let us creep into a parking spot. With the foot off the gas, the Tesla stays still. With a little gas it begins to creep into a stall, then as you approach the end of the stall you get a warning that you are about to hit something followed by a distance counter on the instrument display 20, 18, 16... inches from collision; very precise and helpful in my tight garage.

Everything in the Tesla is software controlled so both creep and coast modes can be selected. The first is useful but the latter stops the car from making electricity every time it slows down, so its range suffers. It is best to use the smart cruise control regularly, as I described above.

Costs

Given its performance, space and quality, the price of this Tesla is no surprise at \$100,000 but it can be configured with fewer options so that after the federal tax credit its cost can drop below \$90,000. This is a low cost for supercar performance but it is very pricy for most buyers.

Is it economical to run? It depends. There are regions in the US where the price of electricity is 5 cents per KWh. At those places, the price of fuel for the Tesla is practically free. Not so in Honolulu (and even worse in the rest of Hawaii) where electricity is pricy—see table; Honolulu's current price is 25 cents per KWh but it's been as high as 35 cents in the past two years. Currently Phoenix, AZ has the average US price of 12 cents per KWh. Running this Tesla there for 1,000 miles would cost a little over \$30!

There is a double high cost that comes with high performance: Poor fuel consumption and high tire wear. Having seen the condition of the tires in this demo Tesla with 1,600 miles on the odometer I am certain that they will not last past 6,000 miles. I suspect that the various fast accelerations in test drives

have a lot to do with the rapid wear. As a past owner of a supercharged car with similar tires as this P85D, I can attest to the fact that summer tires on high power cars rarely make it past the 10,000 mile mark. So with the cost of tires factored in as shown in my table, the Tesla is not cheap to operate, but it is probably a bargain compared to an Italian supercar with similar performance.

[Prices as of December 2015]	BMW 335i Hybrid	Tesla S P85D	Toyota Camry Hybrid XLE
Price	\$ 53,283	\$ 97,700	\$ 31,106
MPG or MPGe	26	90	37
Fuel cost in Honolulu, HI for 1,000 miles	\$ 92	\$ 73	\$ 56
Fuel cost in Phoenix, AZ for 1,000 miles	\$ 74	\$ 34	\$ 45
Tires	225/45R18	245/35R19 front 265/35R21 rear	P215/55R17
Set of 4 Michelin tires	\$ 1,220	\$ 1,840	\$ 940
	Pilot Super Sport	Pilot Sport PS2	Primacy MXV4
Tire life, miles	15,000	10,000	30,000
Tire cost for 1,000 miles	\$ 81	\$ 184	\$ 31
Fuel & tire cost for 10K mi/yr, Honolulu	\$ 1,733	\$ 2,568	\$ 874
Fuel & tire cost for 10K mi/yr, Phoenix	\$ 1,513	\$ 2,084	\$ 749

There are other maintenance items to consider. Obviously the BMW and the Camry have internal combustion engines that require oil, filter and belt changes costing roughly \$1,000 over ten years (maintenance is free over the first four years for the BMW). Because of their regenerative brakes, these three cars may require no brake pads over a ten year span; but this is less likely the case for the BMW and the Tesla if they are driven often to their performance potential. Suspension components should be good for 100K miles on the BMW and the Camry, but there are no long term data for Tesla's sophisticated air suspension. Tesla has no transmission. The BMW and the Camry will require at least one service for transmission and differential fluids in order to make it to 100K miles.

Sold! Not so fast...

Would I buy this exhilarating high-tech \$100,000 supercar? Well, as a sedan it is too big for my needs—but it has a top rating for safety. As a sports car it's not as nimble or racy as a car designed to be a sports car—but it can chase 12-cylinder Ferraris and humiliate most exotics. As a commuter car in Honolulu it is not economical—unless I had 30 instead of 12 solar panels on my roof. Its price is steep for a college professor—but doable for a university administrator.

People who can deduct expensive car leases or who can buy cars in the range of \$60,000 and above owe it to themselves to test drive a Tesla S and its more powerful variants. I will wait for the 75% scale version. I'd love a Tesla M, M for motor sport; 25% smaller, 25% lighter and 25% cheaper than the 85D or its 2016 sister, the P90D. Hopefully one of these days Elon Musk will read this and oblige me ...