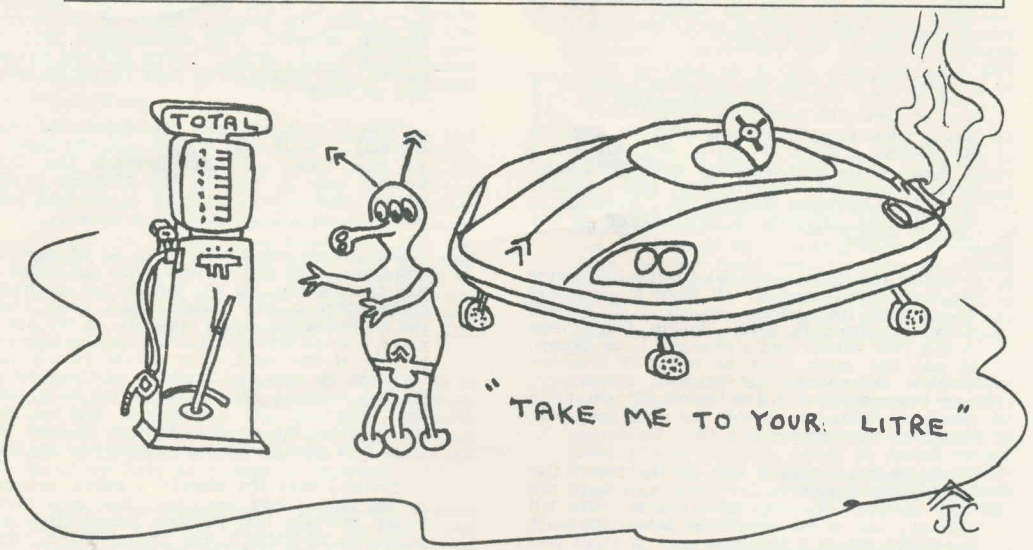
TAKE ME TO YOUR LITRE



Sometimes, like the Little Green Man (LGM) trying to chat-up a poker machine, or seeking directions from a petrol pump, I feel like I've landed on the wrong planet. Apart from every Monday morning, I also get the feeling from time-to-time when I mix metrics with motoring. Perhaps you do too? What we need is a few rough-and-ready but good enough, stick-in-the-mind factors. Let's see how we go.

DISTANCE AND SPEED: This is not bad since one km is very near to 5/8 (0.625) of a mile (the error is less than one percent). Thus you can say 50 miles = 80 km, 100 km = 62.5 miles and so on. A bit rougher, and you can say 1½ x miles = km or 2/3×km = miles. The same with speed: 40 mph is roughly 60 km/h (64), 100 km/h is roughly 67 mph (62.5) and so on.

DIMENSIONS: These overlap distance but I've decided to treat them separately. They could be a complete topic for another discussion. Now let's see. One inch = 2.54 cm or 25.4 mm (rough equivalent 25 cm (250 mm) ≅ 10 inches). Note: The proper thing to do is to always use millimetres (mm) - let's not worry too much, but in metric drawings (Citroën etc.), unspecified units will be mm. One thousandth (0.001) of an inch ("a thou") will be 0.0254 mm. Put another way, each "thou" is about 1/40 mm, or 1 mm ≅40 "thou".

MASS: This is not bad either since one Imperial ton is very close to one metric tonne (the error is less than two percent). A hundred weight (cwt) is roughly 50 kg (within two percent). A pound is just under half a kilogram (error ≅10 percent). A kilogram is almost exactly 2⅕ lb.

VOLUME: I seem always to remember that 1 gallon (Imperial) = 4.55 litres (L) - (say 5 litres to the gallon). Hence a 4 gallon can has become 20 L, and a 44 gallon drum 200 L. A 75 L petrol tank holds about 15 gallons and so on. Note: The capital (L) not the lower case (l) is now the proper abbreviation for litre.

Fortunately, in Australia, we have always (or for many years) been happy describing engine sizes in litres. The Americans however, have preferred to describe engines in cubic inches (in^3). There are roughly 60 (61.02) cubic inches to the litre. Hence an American 250 is just over 4L (4.1).

However, remember that the American gallon is smaller than the Imperial gallon. A cubic foot holds 6¼ Imperial gallons, while it holds roughly 7½ US gallons (7.48). The US gallon is just under 4 L (3.78). This is important when you are considering US fuel consumption reports - multiply their claimed mpg by 4.54/3.78 = 1.20 get the figure you expect, i.e. add on a fifth. Their 25 mpg is the same as our 30 mpg.

PRESSURE: Long experience has well and truly established pounds per square inch (psi) in the minds of most of us, and I think we'll get away with it for a bit longer. The corresponding metric unit is kilopascal (kPa) which has a value about 7 times bigger (6.895). Thus 30 psi is roughly 210 kPa. Pretty easy. Unfortunately, other metric pressure units have been used in the past, e.g. 1 kg per square cm = 14.2 psi.

FUEL CONSUMPTION: This is the most difficult to cope with I think, because we've gone from distance/volume (miles per gallon) to volume/distance (litres per 100 km). Thus, as your mpg goes up, your L/100 km goes down - i.e. there is a reciprocal relationship, and there is no single conversion factor. Of course one mpg is roughly 1/3 km/L (0.354), but no one talks in km per litre. I remember that 10L/100 km is roughly 30 mpg (28.3). Hence 20L/100 km will be 28.3/2 = 14.2 mpg and 5 L/100 km will be 28.3 x 2 = 56.6 mpg. What about reference points

the other way?

10 mpg = 28.3 L/100 km ↑ Thirsty
20 mpg = 14.2 L/100 km ↓
30 mpg = 9.4 L/100 km
40 mpg = 7.06L/100 km ↑ Frugal
50 mpg = 5.7 L/100 km ↓

One neat way is to remember that mpg x L/100 km always equals 282.5 (say 280). Hence, divide what you've got into 280 to get the other (try it - 7L/100 km → 40 mpg and so on).

Another way round the fuel consumption calculations is to carry the handy little slide rule called the Total Economy Convertor, free from Total Service Stations (remember: "Citroën préfére Total"). It does most of the conversions easily, e.g. feed in litres used and kilometres travelled, get out mpg or L/100 km. I note it has an error in the tabulated kPa → psi factor - it should be 0.14504, not 20.8854, but this error doesn't affect its normal operations.

POWER: I've always found this easy since one horsepower (hp) (Imperial) equals 746 watts which is very close to 750 watts or 3/4 kilowatt (kw). Hence to go from kw to hp, add 1/3. A motor developing 60 kw is the same as saying it is developing 80 hp (normally called brake horsepower (bhp) to distinguish it from rated (fiscal) horsepower). You might also care to remember that the watt ≡ joule/sec and that one hp = 550 ft. lb/sec - useful at times, e.g. checking my gas bill (measured in kilojoules) against my electricity bill (in kilowatt hours) shows that gas is about ¼ the price for the same heat!

Well, I don't know about you, but I think that has helped me a bit (after I've read it over a few more times!) And if that fails, take me to your litre, I'll have a complaint to make.

BILL GRAHAM.

P.S. I hope we can follow up with some notes on bolts, nuts and threads, and also on various power units - anyone care to take up the challenge?

P.P.S. The metric system of weights and measures was developed by the French Academy of Sciences and made compulsory in 1795. It was dropped by Napolean but was re-established in 1840, and by 1900, had been adopted by 40 nations. Metrication is voluntary in U.S., but is well advanced in G.M., while Caterpillar is said to be 100 % metric.

PFERDESTARKE?

While we're dealing with units to do with cars, perhaps we should say a bit more about power. James Watt invented the unit of the horsepower (33 000 foot-pounds per minute = 745.700 (say 746) watts) in 1782 when he was trying to sell his steam engines. He calculated that this was the rate at which an average horse could work. You will guess that there is, in addition to the British unit of horsepower (HP) above and the watt (W), a metric horsepower unit as well. Fortunately, the (British) horsepower unit is near enough for our purposes to equalling the metric horsepower unit (metric HP = 0.986 HP or 735.5 W). These are units of developed (real- or brake-) HP as measured under test conditions. The French choose to call the metric HP "cheval vapeur" (CV) - literally "steam horse", while the Germans choose to call it "Pferdestarke" (PS) - literally "horse power or horse strength". While there are different codes specifying how power is measured, we can say roughly 1 HP = 1 CV = 1 PS (!).

Rated horsepower was devised by the Royal Automobile Club (U.K.) for taxing purposes in 1921, based on no. cylinders X diameter squared (inches) on 2.5. Thus four cylinders of 78 mm diameter do equal 15.09 rated HP as in the Traction. Now there must be a French version of rated HP also, whereby they are able to call the Traction 11 CV (will it never end?). Fortunately, rated HP has little relation to engine performance, so let's forget it, OK ?