pumping losses and spark timing, the magnitude of the gains decreasing in the order given.

The author thus offers as a personal speculation of what is practically realizable over the next decade the following fuel consumption gains in European gasoline-powered cars.

(1) From engine design changes, 20%.
(2) From gasoline design changes, 5–10% according to driving conditions.
(3) From engine lubricant changes, about 3%.
(4) From transmission design changes, 5–10%.
(5) From transmission lubricant changes, about 3%.
(6) From design changes of a given vehicle (weight, drag, tyres, accessories), approximately 10%.
(7) From engine size and model mix changes, approximately 10%.
(8) From vehicle maintenance procedures, approximately 5%.

Since these different effects are largely independent of one another, the surprisingly high total emerges of about 50% potential improvement, which makes a very good target for the industry to aim at. It is not the first time that such an optimistic forward look has been taken. No less a person than Charles Kettering[25] when General Motors president in 1929 predicted '80 mile/gal by 1939'. Let us hope that, with the present depletion of oil reserves, the progress towards achieving the target will be faster in the coming decade than it was then.

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FUEL ECONOMY OF THE GASOLINE ENGINE

Fuel, Lubricant and Other Effects

Edited by

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A HALSTED PRESS BOOK

JOHN WILEY & SONS
New York

Plate 12.1 A modified 1947 Studebaker which achieved 149.95 mile/US gal in the 1949 Wood River competition

Plate 12.2 A modified 1959 Fiat 600 which achieved 244.35 mile/US gal in the 1968 Wood River competition

Plate 12.3 A modified 1959 Opel which achieved 376.59 mile/US gal in the 1973 Wood River competition

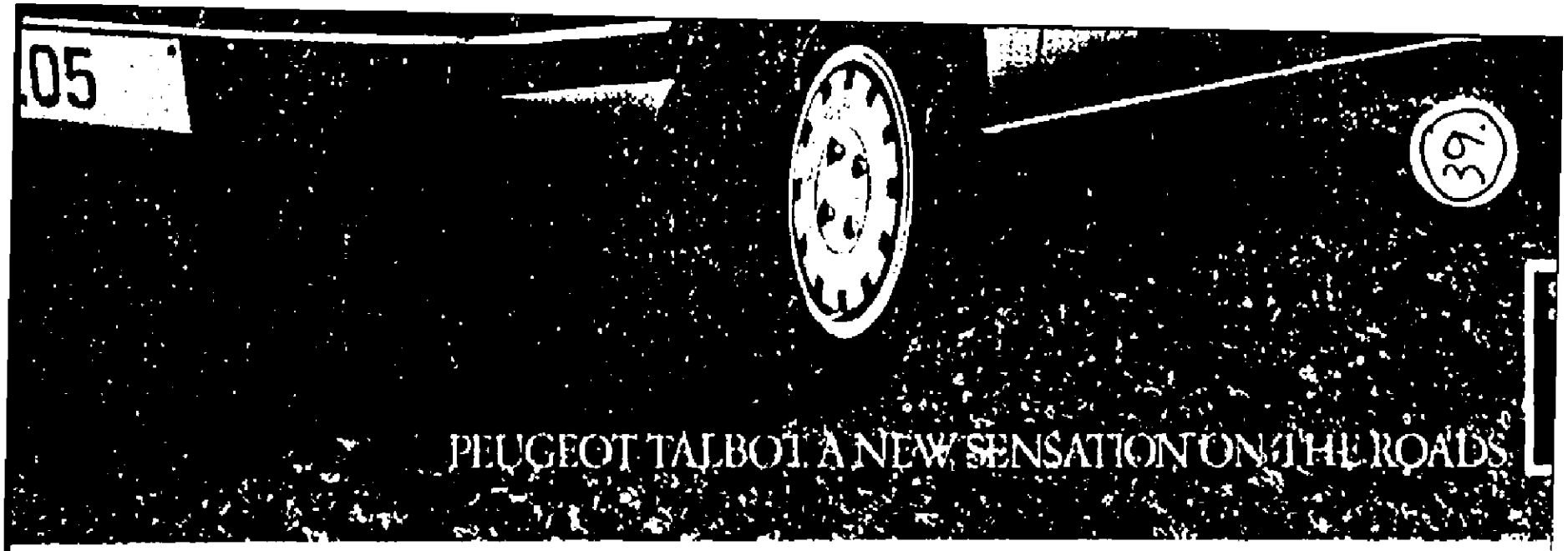
River class for slightly modified production cars. Driving style was not restricted, but the extent to which a normal production car could be tuned was limited to changes in carburation and ignition timing. The event was run on a closed airfield circuit with a minimum average speed of 30 mile/h (48 km/h) enforced. Awards for best miles per gallon and best ton miles per gallon (miles per gallon multiplied by vehicle weight) have been made. Small cars (Fiat 500s, Imps, Minis) have managed about 90 mile/gal (3.1 l/100 km) under these conditions, the current best being 96 mile/gal (2.94 l/100 km) by a Mini 1000 driven by B. D. Caddock. Larger cars, notably British Leyland 1800s, have given best ton miles per gallon results, 109.0 ton mile/gal having been achieved by I. C. H. Robinson. These impressive values were due more to the driving technique employed than to engine tuning.

In 1973 a competition for special vehicles was initiated. These vehicles were required only to be genuinely two-track vehicles and a classic three-wheel configuration has evolved[4]. Competition was over a 10 mile (16 km) course with a speed minimum of 10 mile/h (16 km/h) average enforced. In 1976 a special (see later) driven by B. W. Beattie achieved 1141 mile/gal (0.248 l/100 km)*.

12.3 Some Theory

How is it done? Marathoning is dominated by two considerations. Firstly the power needed to propel the vehicle must be kept to an absolute minimum, and secondly the engine and operating conditions must be chosen so that that power requirement is met with minimum fuel utilization.

*The understanding of this chapter is not greatly effected by the choice of units, and so traditional units, which are still used by most competitors, are preserved. Conversion constants to other systems can be found in the appendix.



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The following is from: http://www.timesonline.co.uk/article/0,,588-451038,00.html

October 20, 2002

The Sunday Times

Toyota smashes fuel economy record
by ray hutton

Tucked away on the Toyota stand you will find a cheeky little coupé that looks sporty but whose raison d'être is fuel economy, the lowest exhaust emissions and ease of recycling. The ES3 — the initials stand for Eco Spirit — achieves 104mpg in the official European fuel consumption tests, a record for a four-seat car.
Some months ago I drove this prototype and not only is it even more economical than the special "3 litre" (three litres of fuel for every 100km travelled, or 94mpg) versions of the Audi A2 and VW Lupo that sell in Germany, but the Toyota is more lively and responsive and would be very acceptable as an everyday car.

The ES3 has a 1.4 litre turbocharged diesel engine and CVT (continuously variable transmission). The engine cuts out when the car stops, automatically and instantly restarting when you touch the accelerator to move off again. Energy that would be lost from braking is used to charge the car's battery, and the body panels are made from biodegradable plastics. You will see more of these things in future Toyotas.