## A factor to measure travel efficiency–

# Energy cost in transportation

When buying a vehicle for transportation, both the private citizen and the business enterprise take the same economic factors into consideration. What is the capital cost involved, how expensive is the license and insurance, what are the maintenance costs, and what mileage per gallon of gasoline can be expected? When various modes of transportation are compared with these factors in mind, they can be arranged on a scale that reflects the total cost of each system. Air and sea travel, with high capital and maintenance costs are at the top of the column, with trains, buses, and automobiles in the intermediate levels and the inexpensive bicycle and motorcycle at the bottom.

While fuel consumption has always been important in the cost calculation, its significance has increased in the 1970's as a result of the rapidly diminishing supplies of hydrocarbon fuels. If, as seems likely, the availability of these fuels eventually becomes the deciding factor in choosing a system of transportation, then information on the energy cost of a vehicle will largely determine its economic viability.

At the National Research Council of Canada's Division of Mechanical Engineering, Dr. E.P. Cockshutt has utilized a method of comparing the existing systems of transportation on the basis of their efficiency in performing useful work. Using a parameter he calls the Energy Cost, Dr. Cockshutt has provided a very convenient way of putting the relative expenses of a wide variety of systems into perspective. Energy Cost is defined as the ratio of the energy content of the fuel used in transportation to the useful work done, ignoring the other factors that determine total cost. (He points out that transportation "work" [traditionally in ton-miles] is a slight misnomer, since the weight of the body normally acts at right angles to its motion; the energy cost, or rather its inverse, is hence a figure

**Fig. 1**

**Detailed Calculation of the Energy Cost of an Automobile. • Calcul détaillé du coût en énergie d'une automobile.**

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$$\text{Energy Cost} = \frac{0.75 \text{ (lb/gal)} \; 10 \text{ (livres/gal)} \times 19{,}000 \text{ (BTU/lb)} \; \text{(BTU/livres)} \times 778 \text{ (ft-lb/BTU)} \; \text{(livres-pieds/BTU)}}{20 \text{ (mi/gal)} \; \text{(miles/gal)} \times 5280 \text{ (ft/mi)} \; \text{(pieds/mile)} \times 200 \text{ (lb)} \; \text{(livres)}} = 5.5$$

$$\text{Coût en énergie}$$