## THE JEEP PROBLEM AND ITS GENERALIZATIONS

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The problem is formulated in the following way: an automobile has to cross a desert of $x$ kilometers' width; 1 liter of gasoline lasts for $c$ kilometers, the automobile cannot take more than $n$ liters. The car is allowed to return from any place to its point of departure, and to set up intermediate storage places for gasoline at any point on the road. It is required to define the minimum amount of gasoline needed to cross the desert.

There is another variant of the same problem. From some point $K$ automobiles are starting out, one of the cars must make $x$ km, the others have to return. All cars contain an equal amount of gasoline and their consumptions are the same. It is required to find the minimum number of cars needed. This formulation makes possible an easy solution of the problem. The necessary number of cars $k+1$ can be obtained from the following inequality:

$$nc\left(1+\tfrac{1}{3}+\tfrac{1}{5}+\ldots+\frac{1}{2k-1}\right)<x\leq nc\left(1+\tfrac{1}{3}+\tfrac{1}{5}+\ldots+\frac{1}{2k+1}\right).$$

The stops and the intermediate gasoline storage places should be arranged at points, spaced by the distances $nc, \frac{nc}{3}, \frac{nc}{5}, \ldots \frac{nc}{2k-1}$.

The problem is generalized by the introduction of additional conditions: the point of destination must be reached not by one but by several cars: a different loading capacity may be assumed for the various cars; the gasoline consumption may differ, dependence of the gasoline consumption on loading capacity may be introduced.

Such problems often arise during geographical journeys, and will probably arise in interplanetary expeditions too.

V. Shkurba, *Ek. prom.*, 7D21, July 1962.