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VEHICLE MAINTENANCE IN THE SMALLPOX ERADICATION PROGRAMME IN SOMALIA, 1977-1979

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Introduction by Dr I. Arita [2]

From early 1975 until 1977, Mr R. Hatfield was engaged as a technical/administrative officer in smallpox eradication campaigns in Bangladesh and Bihar State, India, dealing with the maintenance and management of large vehicle fleets during the active phase of the eradication programmes. He was transferred urgently in 1977 to Somalia to handle financial, administrative and transport problems during the emergency smallpox eradication campaign. During his work in Somalia, he was able to closely follow-up the condition of vehicles enabling him to analyse the best possible way in which to handle the problems of their gradual deterioration.

We know that many health programmes suffer from a lack of reliable transport but for the smallpox eradication campaign in Somalia, reliability never became a critical problem due to the early recognition of the importance of the subject and the timely provision of adequate staff and resources.

This paper presents the Somalia experience and recommendations for the management of transport in a health programme. For instance, from the analysis comes the recommendation that unless a programme manager, under conditions such as occur in Somalia, is prepared to invest an amount similar to the purchase price of a new vehicle in parts and maintenance during the first 100 000 km of a vehicle's life, his project will probably suffer from a shortage of reliable vehicles. The article does, I believe, make worthwhile reading for any project manager, as well as for health officers concerned with the transport and logistics of health programmes.

Background

Constantly serviceable transport was considered vital in smallpox eradication campaigns and emphasis was placed on providing technically competent staff as well as adequate funding for spare parts and repairs. While programme requirements and restraints are very variable, an attempt has been made to formulate some appropriate guidelines on vehicle maintenance from the practical experience gained in the smallpox eradication programme in Somalia.

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The smallpox project in Somalia operated a fleet of over 50 four-wheel-drive vehicles of similar make[a] from July 1977 until the end of the project in October 1979. The cost of maintenance and operation of the vehicle fleet was borne by WHO and maintenance was controlled by a WHO technician, permitting a clear evaluation of the input and real costs involved. In this article the operating costs of a section of the fleet are analysed to illustrate the average total financial and practical commitments to maintenance that the project incurred for each vehicle. The spare parts utilized by ten vehicles for a two year period (90 000 km) are catalogued to determine the quantities and replacement frequencies involved.

Maintenance costs

The costs of maintenance during a 12 month period were considered for two groups of vehicles. One group (A) was of five vehicles in their first year of service, the other group (B) of ten vehicles which had already completed one year of service at the start of the period studied.

Each group comprised vehicles received new at about the same time. All vehicles were studied over approximately the same time period, therefore cost comparisons were not affected by inflation rates. Records for the period studied were well maintained.

The project utilized commercial garages for the repairs. A system of agreed basic job prices was used rather than competitive estimates, as the number of alternative facilities was limited. Each month, the user of a vehicle notified the WHO technician of the maintenance he considered necessary. An examination of the vehicle was then made and the technician issued an appropriate work order to a garage and a spare parts requisition (if necessary) to the project store. Supplementary work orders and requisitions were issued as necessary.

On completion of the work, to the satisfaction of the technician, the garage prepared an invoice with the work order attached. These were filed chronologically, along with spare parts requisitions, for each vehicle.

For the study, costs of spare parts were calculated using the most recent purchase price. Most parts had been purchased and imported in 1977/78. It was calculated that over the life of the project, packing, freight and insurance costs added 25% to the initial cost of spare parts. A similar proportion was added to the total cost of the spare parts included in the study.

Two of the vehicles in group A required the replacement of a major mechanical unit (engine, gearbox or axle assembly) within their first 48 000 km. By contrast, none of the vehicles in group B had received a major replacement during their first year, however, seven of these older vehicles received such a unit during the second year (one had two major replacements), and the remaining three had a major replacement within 10 000 km of the end of the studied period.

The reason for the earlier failure of major units in the group A vehicles is presumed to be that in early 1979 good quality lubricating oil was not available. High speed diesel oil, which owing to its detergent properties does not provide adequate cylinder lubrication, was the only available alternative.

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[a] Landrover, 109" wheel base, station wagons with petrol engines.

TABLE 1

SUMMARY OF MAINTENANCE COSTS FOR 15 VEHICLES
DURING 12 MONTHS OF FIELD SERVICE, SOMALIA 1978-1979

	Group A (5 vehicles)	Group B (10 vehicles)
Month of arrival	July/August 1978	July 1977
Period of study: from to Year of service	July/August 1978 July/August 1979 first	July 1978 July 1979 second
Average distance covered (in km): in first year in second year	48 000 -	48 000 42 000
Average cost of spare parts [a] (range)	US$ 2202 ($1248 - $2541)	US$ 3380[b] ($949 - $5397[c])
Average cost of maintenance labour[a] (range)	US$ 1035 ($505 - $1365)	US$ 1523 ($882 - $2813)
Average total cost (spare parts and labour)	US$ 3237 = $67/1000 km	US$ 4903 = $117/1000 km

[a] Not including tyre repairs and repair kits, tools, oil purchased between routine services, and cleaning and greasing charges.

[b] Includes $385 for fitting of five 10-ply tyres fitted to each vehicle when new.

[c] Eight major replacement units were fitted among seven of the vehicles (see text).

Table 1 shows that spare parts and labour cost an average of $70/1000 km for the first 48 000 km of a vehicle's service and $120/1000 km for the next 42 000 km. In fact, the increase in maintenance cost is gradual and not stepped from year to year as implied. Looking at these figures in another way, maintenance costs for the first 48 000 km equalled 32% of the purchase cost of the vehicle and those of the next 42 000, 49%.

Use of spare parts

For the 10 vehicles of group B a record was compiled of all spare parts utilized over their two years of service, during which time they each covered an average of 90 000 km. Utilization of parts was recorded by quarter. By consultation of the repairs invoices, spare parts occasionally purchased by the garages were also included. The quantities of parts used are presented in Annex 1[d] where they are arranged into suitable technical categories.

[d] Available on request from the Smallpox Eradication Unit, WHO HQ, Geneva.

The list is not intended as a definitive statement of essential spare parts but it does:

- demonstrate the relative quantities of different spare parts used;
- show that maintenance begins with the arrival of a new vehicle;
- provide a factual framework on which to base a useful spare parts order;
- illustrate that many of the bewildering number of spare parts in a catalogue are rarely used;
- indicate the difficulty, even with careful record keeping and regular service, of predicting the failure point of any particular component.

Reasons for replacement of parts, subject to their availability, included:

- preventive maintenance at regular services;
- original component defective, damaged or stolen;
- previous replacement component defective or damaged;
- component damaged in collision;
- component failed or worn out.

Reasons for replacement of complete units, comprising a number of components, included:

- persistent failure or unavailability of one component;
- actual or imminent failure of unit due to multiple component wear;
- unit damaged in collision;
- urgent repair of a vehicle.

In consideration of the high labour costs involved and the vital need for reliable vehicles, the programme increasingly adopted a policy of unit replacement. It was found that, under the locally prevailing conditions, overhaul of a major unit was almost as expensive as its replacement and was often followed by further failure. Similarly, repair of small units, particularly electrical ones, was invariably temporary and often more expensive than replacement. This policy also reduced the time which vehicles were off the road for repairs. Sound technical assessment was nevertheless essential before unit replacement was undertaken.

Special considerations

1. Field conditions

The studied vehicles operated exclusively in the field in Somalia. It is doubtful if a more punishing environment could be encountered. Broken rock, soft sand, clay and 'cotton' soil are the predominant surfaces. Within Somalia these contrasted with excellent metalled highways where project vehicles were often driven at high speeds over long distances (up to 1500 km non-stop). These factors caused rapid deterioration of the vehicles. The thorn scrub, a feature of much of the country necessitated the use of 10-ply truck tyres to minimize the occurrence of punctures. These, combined with heavy-duty suspension components, increase the vehicle's unsprung weight with consequent accelerated wear on brakes and transmission components. This also contributed to metal fatigue in the chassis and major structural components. Towards the end of the project, metal fatigue was an increasing problem and it is estimated that after 150 000 km structural failures would occur with a frequency unacceptable for further unrestricted service.

2. Repair facilities

In utilizing commercial garages for all repairs the project was exposed to the vagaries of a profit-taking market. Undoubtedly, a well-equipped and efficient government workshop would have reduced costs to the project. However, such facilities rarely exist and their utilization by joint WHO/government projects would, in any case, require careful prior evaluation.

As vehicles were usually away from the acceptable repair facilities in Mogadishu for about one month at a time, perhaps more preventive maintenance was effected than if suitable regional facilities had existed.

Although facilities for vehicle repair outside Mogadishu were limited, some costs were obviously incurred in the field especially for maintenance labour. A few spare parts most likely to be required in the field, were carried in the vehicles and repairs were sometimes made by local mechanics. In addition, small repairs were often made by the WHO technician, or his assistant in Mogadishu, with no apparent labour charge.

3. Drivers

The capability and experience of the concerned drivers is an unquantifiable but significant factor in the cost of maintenance. Those employed by the Somali smallpox eradication programme were among the best available and were generally thoroughly competent. It was a project practice that the same driver kept the same vehicle and the best drivers were transferred only when new vehicles were introduced. Drivers were responsible for vehicle tools and were generally careful to safeguard them.

4. Source of spare parts

In the study, only those spare parts actually used on the vehicles have been considered. Other parts were imported in anticipation of their being required. A reliable national supply of spare parts did not exist and parts that were available were some five times more expensive than if purchased from the makers in Europe. A reliable local source of spare parts would have facilitated repairs and obviated the maintenance of spare parts inventories.

If spare parts must be imported and the vehicles are to be constantly maintained, excess spares are clearly an inevitability. This excess stock could be minimized by pooling the spare parts stocks of various WHO-assisted projects. (In practice, these stocks are generally non-existent as the imported spares are transferred to government workshops in accordance with accepted practice and are rapidly dissipated, not necessarily to the vehicles of the project concerned. Inventory records are often not maintained or expected even though collectively spare parts purchases may represent a considerable proportion of a project's allotment of supplies and equipment.) In the studied vehicles a number of failures occurred in the first half year of service which would theoretically have been the manufacturer's responsibility, under warranty, had they been adeqately represented nationally.

Discussion

When considered together, the vehicles of the various WHO-assisted projects in a country often represent a considerable fleet. In Somalia, despite the existence of a large number of project vehicles, reference to the minutes of WHO staff meetings indicates that one of the most frequent complaints of project leaders is the lack of serviceable transport, even for their own use for project supervision.

Although it is usually the agreed responsibility of a government to provide transport and to maintain it, it is apparent that in many cases WHO accepts that the provision of spare parts for transport, at least that which was provided by WHO, is an obligation that has to be accepted if an attempt is to be made to maintain mobility for project implementation.

Medical experts can hardly be expected to be conversant with the procedures or requirements for maintaining transport. The usual response to the lack of serviceable transport is, if funds permit, to purchase a new vehicle. This study demonstrates that this is a very short-lived solution to the problem.

The obvious answer, if full project implementation is the goal, is to ensure technical, transport oriented assistance, as does UNICEF to a large extent at national level. This, however, is linked to overall development rather than immediate improvement.

It is postulated that an improvement in project implementation could be achieved through an improvement in transport availability by:

At country level:

1. Realistically evaluating the quality and capacity of national input into project transport maintenance and effecting a reduction in the size of the projects' vehicle fleets if funds and facilities are inadequate, thereby permitting adequate maintenance to a smaller overall number of vehicles.

2. Pooling, as far as possible, within a country the annual spare parts requests of all projects and maintaining an organized distribution system subject to regular audit.

3. Establishing national/regional baselines for withdrawal from service and replacement of vehicles to avoid unreasonable demands on the spare parts pool. Experience in Somalia indicated that 150 000 km was the absolute limit of serviceability under the particular conditions prevailing.

4. Providing technical assistance if projects are consistently hampered by unserviceable transport.

At project level:

5. Making an early commitment to large spare parts orders at the time vehicles are ordered rather than considering it only following their arrival or after the first major failure. It should be considered that spare parts and labour could cost the equivalent of the purchase price of the vehicle within 100 000 km.

6. Replacing spare parts by unit rather than component particularly when mechanical repair facilities are limited.

7. Ensuring drivers are as far as possible assigned to one vehicle only and are responsible personally for tools and ancillaries.

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