THE DRIVER, THE SPEED AND THE PAVEMENT IN THE ACCIDENTS OF THE TRAFFIC IN CUBA

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ABSTRACT

Cuba has a total of 64 400 km of roads, of which 17 700 are paved and in correspondence with two-lane roads in most of them, that is, more than 85%. Systematic evaluation works of the pavements have started in 1994, and qualification of Good being attained in 67% of the cases in 2001, whilst 10% were qualified as Bad. In terms of fatal-accidents the rate decreased from 10.2 to 7.0 per each 100 millions of vehicles-kilometers, date that is high in comparison with those ones from another countries.

On the other hand, the operation speed studies in roads reports high values in respect to the actual possibilities of the road safety that offer the same ones, taking into account the state of the road signals, the pavement surface characteristics, the restrictions in minimum visibility distance in driving, the treatment and fracture of the pavement edges, the presence of commercial vehicles, the technical state of the vehicles and motivations, actions and non-adequate reactions of the drivers while driving, which causes, among other things, the incident of sorry traffic accidents.

In this report, the possibilities and results that have been attained in Cuba for the monitoring of the causes provoking the traffic accidents - taking as basis the non-fullfilment of the Minimum Breaking Distance in different sectors of the roads, are analyzed. Actual results that have been attained in technical inspection works are given, and an economic valuation of the benefits being reached by the reduction of the traffic accidents in the roads of the country is carried out.

KEY WORDS

ROAD SAFETY / ACCIDENT / DRIVER / FATALITY / SPEED / CUBA

1. INTRODUCTION

The traffic accidents take place when failing one of the three component elements of the traffic safety: the man, the vehicle and the road.

With the results of the studies it has been verified that 80% - 95% of these facts depend on faults of the human factor, and among 5% and 20% correspond to the vehicle and the road. From this point of view is our interest to fix the driver like reference premise in all a set of measures to develop in order to avoid and/or to diminish the traffic accidents.

In order to reduce the road accidents it is needed:

- Better skill of the driver
- Greater safety of the vehicles
- Suitable legislation, monitoring and control

- Conditions that allow better operation of the road system

In 1963, 533 dead people were registered in Cuba; and in 1978, 1214. In 1963 a death by each 44,9 accidents took place; and in 1978 a death by each 23,3 accidents was registered.

It is important to emphasize the presence in the road of three different generations of vehicles: from the 40's and 50's (North American), those ones corresponding to the decades of the 70's and 80's (in its majority from the ex-USSR), and vehicles acquired in the last years. Vehicles with noticeable theoretical differences in the speeds and the possibilities of braking are appraised, which determines an increase in the accidentality.

The proved trend of the Cuban driver of not keeping in many cases the Minimum Distance between vehicle is noted, which provokes the potential risk of accident with high circulation speeds, phenomenon to which the inadequate surface characteristics of the pavement also contribute, when a sudden breaking is set in presence of a danger and the driver can not stop the vehicle at the Minimum Breaking Distance accordint to the design.

From 1963 to 1978, both included, more than 410 541 accidents were reported in Cuba, with 13 385 deads and 270 698 injuries. The annual average was more than 24 000 accidents, 800 deads and 16 000 injuries. In 1979, 4 000 accidents took place, provoking 400 deads and 2 000 injuries above the annual average.

The practical application of the works demands to classify the road stretches based on their excellent characteristics with respect to the road safety, as a base for the calculation of the accident average index on stretches of similar characteristics. The aspects that are due to consider in this classification are the following ones:

- Type of highway (functional classification).
- Character of the section (urban, interurban, intersection, far away of the intersection).

Numerous researches in different countries have demonstrated that the relation between the number of accidents and the volume of circulation in a same stretch is not linear, that is, that the accident indexes vary based on the volume of circulation.

In general, for stretches of similar characteristics, the danger index diminishes when the Traffic Daily Average Intensity increases. For that reason, the intrinsic risk of a stretch is set up for the circulation level that supports and varies if this changes of important manner. In Cuba the influence of the traffic intensity has not been determined in the index of reported accident.

2. IDENTIFICATION OF THE DANGEROUS STRETCHES AND ELEMENTS

One of the most important processes for the development of the programs of road security is the dangerous identification of the sections and elements from the data on the accidents, the traffic and the road network including in the data base.

The preventive performances of safety are grouped in the following manner:

1. Signalization and marker beacons
2. Containment and lateral defense systems
3. Treatments in the passages

4. Lighting
5. Intersection treatment
6. Access rearrangement
7. Other treatments of safety (corrections of layout, improve of the cross section, treatment of the shoulders and the lateral ones, dowries of safety in the tunnels, suppression of grade crossings, lighting, marking beacons, etc.).
8. Creation of rest areas.
9. Pavement surface treatments
10. Others

There are several procedures of different levels of complexity and precision to identify the dangerous stretches. One of them consists of:

The Inventory of the dangerous elements of the network: It has like objective the identification of those stretches or places that do not normally show a high accidentality; but they present characteristics that originate a high risk of accident. This supposes to adopt a preventive approach in relation to the definition of the measures for the improvement of the road safety. This alternative has been applied in Cuba in different stretches of main roads and intersections.

2.1. Preventive performances for the improvement of the road security

The planning of the preventive or improvement measures of the road safety varies from a case to another one, since the situation of each network is variable and the resources of the different administrations are not the same ones. Nevertheless, in most of the cases, the process in general terms includes the following steps:

a) Adoption of suitable service and quality levels for each functional cathegory of the network.
b) Preparation of an inventory of the road safety faults or lack.
c) Study of the relation between the safety lack and the registered accidents.
d) Estimation of the future costs of the accidents.
e) Design of alternative study of correction of the safety lacks.
f) Comparative cost - benefit study of the propose preventive performances.
g) Selection and Execution of the most effective performances.
h) Evaluation of the results of the executed performances.
i) Monitoring of the performance for a time.

2.2. Criteria of identification of the sections with safety lacks.

a) Defects of the pavement

- Skidding pavement due to:
  - Texture wearing.
  - Polished aggregate surface.
  - Problems of aquaplaning by bad drainage
- Pollution of the pavement by oil, mud or clay.
  - Badly executed batchings.
  - Unevenness and incomplete paved cross section.
  - Badly executed pumping and superelevation.
  - Lack or faults of paving in the zone of connection with the drainage pipes or other networks.

b) Defects of the cross section

- Lateral steps and unlevelling
- Depressed shoulders
- Unstable or degraded shoulders.

c) Defects of the layout

d) Problems of drainage.

e) Road lateral margins.

f) Safety barriers and marking beacons.

g) Road Signaling and marks

- Lacking or deteriorated signals
- Nonauthorized, unnecessary or not regulated signals
- Support of rigid signals
- Deteriorated or inadequate road marks

3. MAIN ACTIVITIES IN THE STRUGGLE AGAINST THE TRAFFIC ACCIDENTS IN CUBA

The struggle against the traffic accidents should center the efforts of many organizations and institutions. The work of the Road and Traffic Commissions at all the levels, as well as that of the subcommissions, it should be basically preventive, aimed to avoid the accidents and to eliminate the conditions that cause them. In Cuba these Commissions are constituted at level of nation, province and municipalities.

In order to investigate in the road safety field traditionally two basic systems have been used.

The first one consists in improving the geometric characteristics or of another part of a road stretch where accidents are reported and later making a comparison between the accidents happened before and after the improvement.

In the second system the data of the accidents, flows, traffic composition and the characteristics of the layout of each analyzed stretch are statistically compared.

With the application of these systems there is a progressive advance in struggle against the traffic accidents. With the first one a listing of the more suitable types of improvement in each case is obtained, classified by its income; and with the second, the classification by its importance or percentage of influence, of each one of the factors that influence in an accident.

A great part of the accidents that are reported in Cuba has like main cause to circulate at an inadequate speed according to the conditions of the surface of the pavement, and the road signaling. The restricted Visibility Distance in the two-lane roads is another factor

associated very frequently to the accidents with inadequate speed, mainly in the extended curves and straights.

Other frequent factors associated to the accidents with inadequate speed in Cuba are:

- Pavement - pneumatic bond lack according to the speed.
- Deficiencies in the pavement surface texture
- Alcoholics drinking
- Damages in the road signals and road marks do not exist or are observed
- Dangers in the road by stopped vehicles or loose animals
- Deficient lighting, together with damages in the pavement
- Grade crossings with the railroad or other roads

The drivers know that when the roadway is wet a greater risk of accident exists; but they do not know in what measure the safety conditions diminish as the circulation speed increases. In general, the driver exceeds his/her minimum safety limits when the roadway is wet and he/she does not reduce the speed, increasing the risk of accident in this circumstance.

4. THE TRAFFIC ACCIDENTS IN CUBA FROM 1976 TO 1995.

In this stage 372 196 accidents, 28 262 deads and 158 392 injuries were reported. While the number of accidents diminished in a 41% in 1976-1980 and 1991-1995, the dangerous increased 3 times, aspect this that called to the reflection, because in the last five years the traffic flows diminished among 40% to 70% with increases of the speed and the massive introduction of the bicycles in the main cities of the country, in special City of Havana, until reaching the rate of a bicycle by each 1.62 inhabitants among 14 and 65 years old.

The accidents, deads and injuries in a high percent occurried in the capital during 1976-1980; from 40%, 25.5% and 25% respectively, diminished in the period 1991-1995. The equitable development carried out towards the interior areas of the country, where the transport of loads and passengers grew in other territories, is reflected here.

Losses for about 100 million of Cuban pesos yearly have occurred due to material damages, dead and mutilated people or those ones who remained long periods of time disabled to work or to study.

Today a set of educative and technical measures are applied in Cuba, positively influencing when rescuing the road order and discipline. The traffic flows already reach 70% of those ones from 1988 and the intensities of bicycles are high in some cases, and the number of accidents and their consequences has slightly decreased, but these indexes still are high.

This positive result has been backed by the increasing of the educative and diffusion work, a slight improvement of the vertical and horizontal signaling, the conditions of the pavement and the system of monitoring and control of the traffic police.

The role of the Provincial and Municipal Road and Traffic Commissions has been rescued, beginning to influence on the rest of the institutions and organizations of the State for the sake of having a greater participation in this purpose to diminish the traffic accidents. An

important part of articles of the in force Road and Traffic Code were reviewed and modified, above all those ones related to the manner the drivers act.

5, CONCLUSIONS

1. The performance of the traffic accidents in the developed and developing countries constitutes a serious problem of health at worldwide level, when yearly around 200 000 people die, in first case; and more than 500 000, in the second one.

2. The high index of motorization and the high growth of the population - every day more concentrated in the great cities, causes the trend to the increasing of the individual transport, the environmental pollution indexes and the high numbers of the traffic accidents.

3. As a comparison and reference manner the data of developing countries with low annual indexes by each 100 000 inhabitants are reflected as follows:

Holland - 8,5;
Japan - 11,6;
Austria - 13,6;
United States of America - 16.4;
France - 18,5.

In the case of Cuba the values reported in every five year plan are:

1976 - 1980, 160,8;
1981 - 1985, 103,6;
1986 - 1990, 97.8
1991 - 1995, 67,5.

These results reflect values indexes in Cuba that are until 10 times higher than those reached in developed countries

A road safety plan that does not include a quantitative commitment of the diminution of the accidents in a certain term and that does not include priorities and costs of performance, it will not pass to be a gesture of good will and coordination, valuable in itself, but incapable of an radical improvement of these pitiful events.

5. The traffic accidents and their mortal consequences are an indicating phenomenon of health that requires of an prioritized attention. In opposition to the previous one, our country has obtained an index in children mortality below 6 by each 1 000 alive born, similar or better ones than many developed countries.

At the present time the life expectancy of a Cuban citizen is considered 76 years. The deads by traffic accidents are among 80% and 85% in the ages from 14 to 60 years. 671 400 years were let of living by the Cuban population in the last 20 years, figure very high and without reporting benefits to the community.

6. If we consider the resources that the State invests annually to maintain the high levels of health of the population, it is concluded in the urgent necessity to take care of and to take the opportune measures to avoid and/or to diminish the traffic accidents in Cuba.