THE SYSTEMS APPROACH TO ACCIDENT PREVENTION

ANDREÁS JANKÓ

FROM TROUBLE TO CONFLICT SITUATION

FERENCE IRK
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Ference Irk
András Jankó

One of the basic concepts of traffic safety research based on systems theory is that between safety and its anti-synonym the accident - the two extreme situations - there are several stages. Lately there have been experiments carried out in order to study the relationships and mutual influences of these phenomena. It can be observed at the same time that while the two extremes are comparatively well defined and elaborated upon as such, the stages in between are mostly "shadow spots" both for researchers and lay people.

Nothing can illustrate this situation better than the dispute on the rôle of chance in accidents, especially noted among outsiders who have a strong conviction about their expertese. At the same time the interference of factors of the necessary, the probable, the possible and of the occasional is not fully established and understood even among professionals yet.

The aforementioned statement is even more valid for the stages between safety and accident and for their manner of application. The experiments started in the seventies both abroad /1/ and at home /2/ were aimed at studying these internal stages already mentioned, their place, their interrelation and the possibilities of regulating the system in a more thorough way. With this in mind the study and analysis of the "near-accident" became more intensive. The investigations proving that, in the case of these accidents studied and analysis of the neccessary factors, there are several distinct events which play a rôle in the "near accident". These enable a better analysis of such accidents.

This makes it even more curious that an importante phase, the most important one on the course from safety to accident, the trouble has not even been slightly treated in a systems theory approach. It is very probable that the introduction of this trouble concept into the systems approach would cause interference, however without it the system is distorted and therefore more likely to prevent arriving at a valid result.

But, what is trouble in fact ?

"Trouble" as a substantive noun many maenings. First it means to agitate, to disturb or be disturbed. For us, however, an other definition gives more, where trouble means abnormality, irregularity in the operation or in the course of something. In the meaning as a verb this expression may mean that somebody is unsettled from rest or activity either on a permanent or a repeated way. According to an other meaning it disrupts the standstill situation or normal flow of something.

It seems that the everyday use of the word can well be applied to our phraseology. Moreover the definition of the verb form calls for further clarification. In my opinion the more frequent or durable the troubling of this constant system the less chance remains that the trouble caeses and safety prevails. To the contrary !
The more frequent and/or the more lasting the trouble, the more likely the occurence of the potential danger situation or even of a more perilous stage. That is to say the likeliness of the joint meeting of the inevitable and occasional elements is distinctly augmented.

It goes without saying that the character of the trouble plays a decisive role in the further changes and their ultimate nature in the system. Nevertheless, the most decisive role is played by the situation itself and its

formation in time and space. The "troubles" in man - as a sub-system of the communication system - and the problems in the environment develop further as a function of time and space.

It can well be seen that in systems such as the communication or work in workshops, as well as the use of kind of technical means, the trouble is constituted by the disorder in the operation of this particular system. The essence of this can stated as follows : the "trouble" in the moment of its formation, in principle, includes the possibility of the occurance of serious consequences.

In our point of view - as a consequence of the above statement - real accident prevention should act, in fact, against the emergence of "trouble" or for the liquidation of potential trouble sources /4/. The main problem at this stage is that a substantial part of these troubles - due to the diminishing effect of other system's coefficients shortening the duration of the trouble - remain unnoticed. This is especially characteristic for human beings, who - without the warning of environmental signals - cannot perceive the arising problems in the psychophysical subsystem.

In consequence of the aforementioned it is obvious that under this concept the basis for traffic safety is a "trouble free-state". The development rate of "troubles" is variable within this system. There are first-, second- and multi rated ones. To call attention to this is practical, because for the "maintenance" of a given system there are limited means available and in using them (keeping in mind the aforesaid precedence) one has to decide which investment could result in the firmest, the quickest and the best effect.
At this point one has to point out that among the trouble elements we rank safety helmets and safety belts - which

influence traffic behaviours and human error only slighlty or by no means. Part of this system is the lack of these passive protecting devices, their bad quality, misuse or the evaluation of experiences gained by the neglect or their use. On the basis of trouble analysis one can establish what are the most common factors that imperil traffic safety.

At present a substantial part of research deals with accident-analysis. The modern prevention techniques go back only to danger-situations in general. This is why at present the correlation between "trouble" and "accident" is narrowed down only to the connections of the danger-situation and the accident.

Although - as it is pointed out in several Hungarian research articles i.e. in the literature mentioned in /4/ it is possible and necessary to analyze jointly the trouble- and accident-elements. There is a need to urge for the interlink and broadening of information systems. Perhaps it is worth mentioning the wish to collect, evaluate and analyse the trouble elements of technical character at the Motor Vehicle Supervising Authority (as is already done in the German Federal Republic). This does not necessarily diminish the value of the joint evaluation of medical evidence with other trouble-elements. At the present technical level is an urgent demand on the side of researchers.

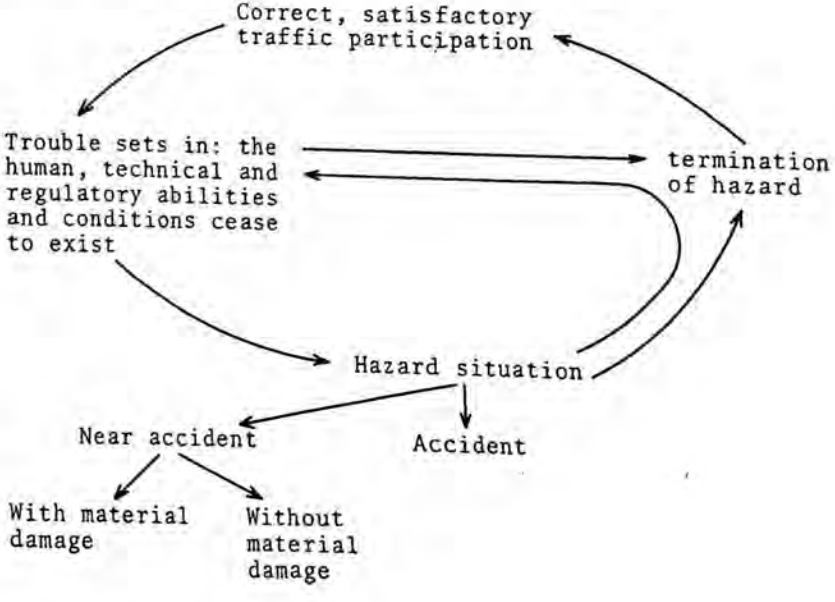
Thus in the interest of fruitful accident prevention there is a need for the investigation of systems approach beyond the analysis of real accidents to the analysis of the situation preceding the accident and of the accident-like happenings (seemingly) not causing injuries, that is of the "near accidents".

The concept of "near accidents" :

Near accidents are characterized by the fact that in them one can observe all the characteristic incidents of accidents but they do not result in casualties.

The notion of accident in this concept has to be narrowed down to the happenings resulting in casualties. A casualty is an effect on the human organism which happens independantly to his will, suddenly or in a comparatively short time and causes injury, intoxication or other health hazards, respectively causes death.

Near accidents are closely connected to with accidents and one can rightfully suggest that their observation and analysis provide accident prevention opportunity. The close connection with accidents provides the implication that in clearing the question of near accidents the accident-process should be used as a start.



The following conclusions can be drawn from the examination of the process :

- correct, satisfactory participation in traffic ---> trouble termination of hazard ---> correct, satisfactory traffic participation
- correct, satisfactory participation in traffic ----> trouble hazard situation----> termination of hazard ----> some trouble again (because the evoking cause still exists) ;
- correct, satisfactory traffic participation --> trouble ----> hazard situation ----> termination of hazard ----> correct, satisfactory traffic participation ;
- correct, satisfactory traffic participation ---> trouble ----> hazard situation ----> near accident without material damage ;
- correct, satisfactory traffic participation ---> trouble ----> hazard situation ----> near accident with material damage ;
- correct, satisfactory traffic participation ----> trouble ----> hazard situation ----> accident.

The observation of accidents has proved that there is a numerical connection between the certain elements. Thus after circumscribing the actual accident cause groups and types we can connect to each of them a group of presumably an order of more important numbers of causes out of the elements of the occurence process.

We could easily be convinced by the help of the process diagram that the hazard situation - if it does not cease - develops into an irreversible process as regards safety and results in dangerous consequences. The mildest form of this is the "near accident" without material damage, while the most serious one is the accident with personal injury.

The state that is known as a hazard situation more practically can be mentioned as potential- or abstract danger. The essence of this is that the trouble sources in time and space provide all the possibilities for the termination of the danger and at the same time all the chances for the induction of an actual danger situation in the communication system which any participant can well perceive. (In serious cases this is an accident with material damage or with personal injury).

At this stage it is necessary to define clearly and in short the trouble and the hazard situation. Trouble is a comparatively long lasting and static state; while the hazard situation is a sudden and dynamic process. Trouble is the starting phase of the accident process.

Modern traffic safety research plays ever increasing attention to the study of these near accidents. This research trens has been labelled conflict-investigation. A jargonistic term used since the middle of the seventies.

Before turning to the substance of this, it is worth looking back to the sources of this research trend. The expression "near accident" was very probably used first by Arbous and Kerrich. /5/ They first suggested that these phenomena have to be included in accident investigation - in the course of the study of industrial accidents. They contended that in the process of the accident the chance-event has a definable role (in the occurance of the casualty or in its absence). The analysis of near accidents leaves less opportunity for chance, thus analysis become more reliable. According to the definitions of that time the basis of near accidents was that the driver of the vehicle did not become participant of the accident, but the accident nearly took place /6/. Many experts interconnected the research of accidents and near accidents /7/.

It seems to be necessary to express concurrence of opinion with the standpoint according to which the investigation of near accidents is important because according to probability the occurence of accidents is not simply the sequence of risks connected to the several accident elements, but the probability has to include those probabilities which are linked to the elements able to prevent accidents as well. One of these is the stimulation of the insurance system toward accident prevention. The traffic offence data-bank which is capable of storing the individual offences in a systematic way, - may be mentioned here too. Not less success can be expected from the more developed from of further- and posteducation - especially if it will be operated together with the previously mentioned systems.

The tendency called conflict-investigation (from the second half of the seventies) is a variety of the previous concept developing under the influence of the compelling conditions of environment and the advancement of improved techniques broadly applied ever since.

In the most highly devoloped countries economically the application of money to control environmental conditions is easily understood. Experts have come to the conclusion that it is extremely expensive to decide, according to superficial observations, on the reconstruction of some junction, moreover on their mode; or to wait for an unbearable number of accidents at a certain place. Conflicts perceived or near accidents (with the application of appropriate traffic apparatus and processing technique) provide good information in respect of regularity of accidents occuring, comparatively scarcely, in the space of a fewhours.

The development of various techniques means that the last few years have brought opportunities for the exact measuring

of conflicts and for their visual reproduction. This can be attributed to the general use of automatic cameras and video-tape recorders.

One could drawn the conclusion rightly of the afonrementioned that the expressions "near accident", "conflict" or "direct danger" mean the different description of the same notion and are understood uniformly.
The formation of such a standpoint at this stage would be thoughtless. It is a mistake to think that the notions are irrevocably established- although they are based on common grounds . This is illustrated by terminological hesitations and sometimes by the differences in basic experiences established by both foreign and domestic researc literature /8/.

A higher degree of development is marked by the fact that the experts attempts to give some kind of definition to the notion.
The hinderance of research can come from reseachers who elude the use of this notion while providing the appearance of their investigating something else. It has been felt equally unfavourable when they use such expressions as "public property" without taking up a stance, by doing this do they establish themselves with several existing standpoints, or do they, perhaps, form a new point of view ?

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