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A TACTICAL APPROACH TO TAKING CURVES IN TRAFFIC

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Abstract: *From the point of view of traffic safety, the braking-system operation and the handling of the steering wheel are the most important operations which are made by a driver. In this paper we deal with the tactical approach to car turns; by tactics I mean the organization, the preparation and the conducting of the maneuver. Speaking again from the point of view of traffic safety the necessary and sometimes sufficient condition for a driver to turn the car is to keep his road lane regardless of driving conditions and vehicle characteristics. This is sometimes impossible to do, first of all because of the vehicle's dimension. In this situation the driver has to be sure that he is not going to disturb the other traffic participants.*

Keywords: *the handling of the steering wheel, trajectory, the loop of pathway, landmarks, the factors of correct turning*

1. INTRODUCTION

From the point of view of traffic safety, the braking-system operation and the handling of the steering wheel are the most important operations which are made by a driver. In this paper we deal with the tactical approach to car turns; by tactics I mean the organization, the preparation and the conducting of the maneuver.

Speaking again from the point of view of traffic safety the necessary and sometimes sufficient condition for a driver to turn the car is to keep his road lane regardless of driving conditions and vehicle characteristics. This is sometimes impossible to do, first of all because of the vehicle's dimension. In this situation the driver has to be sure that he is not going to disturb the other traffic participants.

2. PATHWAYS IN TRAFFIC

When large vehicles approach the curves with small radius ("tightly turns"), they use the method called "with loop". This "loop" can be done before changing the direction of the road, after this point or combined.

The pathways which are going to be (or could be) followed by A vehicle are presented in figure 1:

- the red pathway – turning with loop after the corner of the crossroads;
- the blue and the black pathway (depending of the vehicle's length) – turning with loop before the corner of the crossroads;
- the green pathway – turning with double loop (combined style).

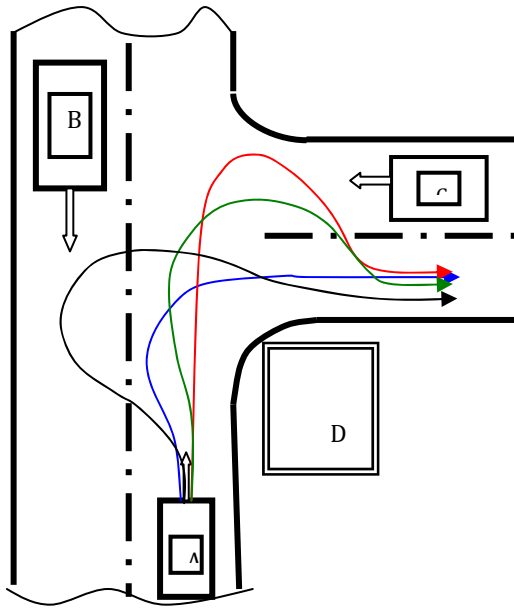


Fig. 1 (conducting to taking curve “with loop”)

If B vehicle is in traffic in the position presented in figure 1, the black pathway can not be followed, than, possibly, with the approval of B driver. It is suggested that the dimensions of A vehicle do not allow following the blue pathway. If this is not possible, the green or red pathway will be followed.

If C vehicle is there, A driver will choose the black or blue pathway. The situation does

C vehicle direction), will choose the black and blue pathway. When we talked about “unpleasant situations”, we referred, for example, to a traffic jam because of meeting face to face of the A vehicle with the C vehicle (if they have trailers, it could be impossible to move back).

Conclusion: in the situation from figure 1, taking into account the traffic presence of the B and the C vehicles and the D obstacle which obstructs the A driver to see if somebody comes from the C direction, the A vehicle could follow the next pathways:

- the blue pathway if the dimensions of the car allow it;
- the black pathway in two possible ways: 1. exploring the route without disturbing the B driver, and 2. first getting the permission from the B driver.

Be careful! The larger the vehicle, the bigger the loop made during the maneuver must be.

We have to emphasize the right way to taking a curve especially for the untrained drivers because of the possibility to hit the border with the rear wheels. This can happen because the pathway followed by the front axle, which is seen all the time by the driver, is completely different from the pathway

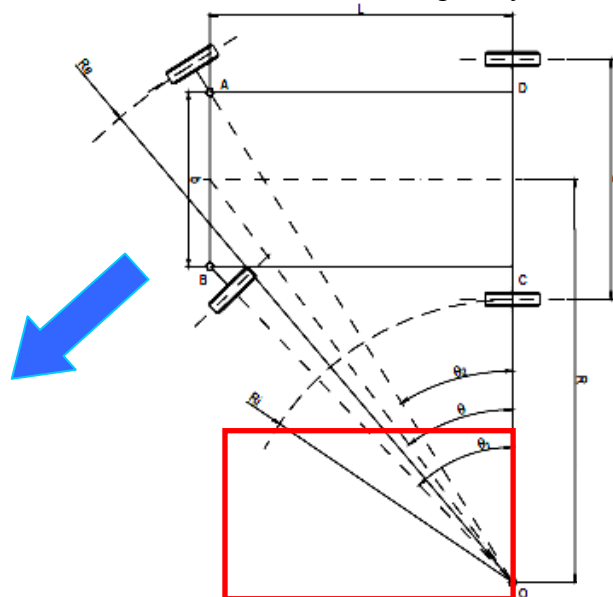


Fig. 2 Turning tightly (curve with small radius)

not allow asking C driver’s permission by the A driver. The A driver, in order to avoid some traffic unpleasant situations (caused by the presence of the D obstacle which does not allow the A driver to see the situation from the

followed by the rear axle as we can notice in figure 2.

As we can easily notice, if the wheels of the front axle, called A and B, and the right wheel of the rear axle, called D, avoid without



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problems the red obstacle, the left wheel of the rear axle, called C, hits the border and this situation could cause serious damages to parts of the wheel. In order to avoid this situation, the driver must make a little loop. In this case, the wheel which is on the internal part of the curve will avoid the red obstacle. On other words, the driver will turn the steering wheel to the left after the moment when the C wheel passes by the obstacle (the maneuver is similar to the red pathway from figure 1). If the vehicle is longer, the maneuver will take more time.

3. THE RELATION BETWEEN EYES AND HANDS

There is a direct relation between the eyesight and the reactions of the body, depending on the direction we are looking, because all the moves of the body will be done so that the vehicle to be driven to that direction.

At the first sight, this principle seems to be an advantage. But, at the same time, it could be a great disadvantage because our hands and feet will take us, instinctively, to the direction we are looking, but, we should be careful (!) as they will do this even if we are looking the wrong direction! Moreover, they will "wish" to do this using the shortest route no matter what there is on this route (obstacles, for example). So, if we, during turning the car to a direction, look at a tree near the road, we will realize that we will drive, instinctively, the car directly to it! A situation more dangerous could be when we set our eyes on the vehicle that comes to us from the other direction and we will go, without noticing, to its direction. If

we do this, we can easily pass the road separation line and we can cause a frontal crush.

The solution to avoid these situations is to set our sight on the accurate landmarks during driving, especially during difficult traffic situations.

The correct succession of landmarks during turning the vehicle is:

- during training maneuvers to approach the curve (braking, speeding down, taking correct position of vehicle on the lane) our sight must look for and fix the turning point (the point where we have to start the handling of the steering wheel);

- during the application phase (the turning itself) our sight will fix the apex (the point where the way of the vehicle is going to be tangential to the internal radius of the vehicle's lane) and immediately after ensuring the way of reaching the apex, our sight the must move to the exit point of the turning maneuver or even further in order to know what it is going to be after the curve and to act accordingly.

The longer the driving experience, the faster the mental process of identifying these landmarks is going to be and the "deeper" the sight will be.

4. TURNING EFFICIENCY

Speed, fluency, elegance and safety of the journey depend to some extent on the modality of taking curves with the vehicle. That is why the factors of correct turning must be analyzed very carefully.

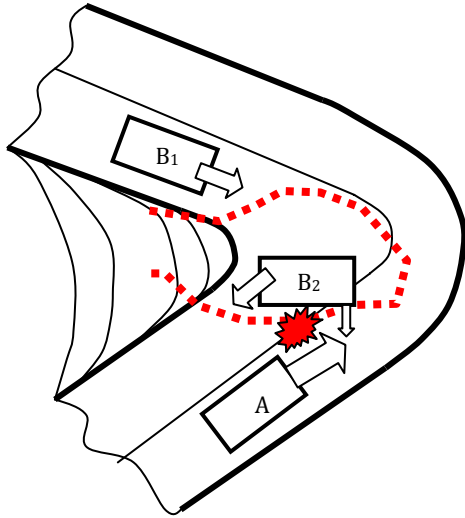


Fig. 3 (the unexpected appearance of risk factors during turning which could cause a temporarily loss of grip)

These factors are:

- **The adherence (grip)** – a decisive factor in order to choose a correct path. In order not to have “unpleasant surprises” and for maximum efficiency, the driver must develop a real grip “feeling”. This skill develops in time together with the driving experience. Drivers should pay attention to the temporary variation of adherence that could surprise them in curves: mud, sand, drained gravel from slopes, wet leaves (in curves they can grow until the border of road), water ponds which could lead to the aquaplaning (in curves they appear because of the overloading of the asphalt), frozen snow drained from the slopes etc. one of these situations is presented in figure 3 where the B vehicle is surprised by the temporary presence of some disturbing factors of road adherence in curves - the red area (could be snow, mud, gravel etc.). It skids and, despite the fact that it succeeds to keep the steering wheels to the correct direction, the rear axle loses the adherence, the B vehicle reaches B₂ position and hits the A vehicle.

- **The available live wheel power (torque)** – before entering a curve, the gear down is recommended. Turning attack with a lower gear position and higher engine revolution gives the vehicle a higher engine power and torque which increase the stability of the turning vehicle. It is recommended that the vehicle should enter the curve with an “in

force” engine on deceleration (engine braking) and acting the brake pedal. The exit must be with an “in force” engine, too, but on the acceleration and the driver must be ready to gear up (stable in the driver’s seat, using “the fourth/false pedal”).

- **The turning speed** – it is recommended, for maximum efficiency, taking the curves at a maximum possible speed of the vehicle but in maximum safety road conditions. Taking into account that, for an amateur driver, safety of traffic must be the most important thing, it is mandatory to give a subunit safety coefficient for this speed of the vehicle. The higher this safety coefficient, the higher the safety of passing the curve. But, we must not forget that each meter from the straight road which follows after the curve will be passed with higher speed if the supplementary speeding of vehicle when the one exiting from curve is bigger!

- **The turning radius** – the modality to approach the curve, the chosen trajectory, the speed of passing the curve and the safety of passengers depend on the turning radius.

- **The characteristics and settings of the vehicle** - the modality to approach the curve, the chosen trajectory, the speed of passing curve and the safety of passengers also depend on the stability and maneuverability of the vehicle.

5. CONCLUSIONS

Recommendation: in order to turn as efficient as possible, try to choose a right trajectory (be careful to the landmarks which have to be followed with the eyes), approach turning with an enough low speed that could allow the driver to correct some mistakes, to gear down before beginning to move the steering wheel in order to have enough engine speed to exit from the curve with a sufficient speed to have a maximum efficiency. Sometimes it is better to act the brake pedal, to tight securely the steering wheel without shaping. Be careful to the turning speed! Approaching “on the limit” to taking curves will generate an accident when doing the least error. This can happen mainly on Romanian



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roads where unpleasant surprises could appear every step of the way!

Attention! Do not change the gear speeds during taking curves. You could do this only if there is some danger of accidents because the maneuver requires moving the right hand to the gear shift lever and, in this situation, only the left hand will be on the steering wheel and, when taking curves it is recommended to have both hands on the wheel. Moreover, the driver's body would not be steady in the seat because he can not place the left foot on the "false pedal". He needs the left foot to act the clutch pedal.

Therefore, for the driver, there will be only a fix support point (his back on the seat). There is also another one, not very fix because the driver can not force too much on it (the heel of the right foot which is busy acting the accelerator) .The third support point is unstable -the left hand, which stays in its place, on the steering wheel. Normally,

passing the curve must be done with the same gear speed from the beginning to the end of the turning. If the curve radius varies, surprising the driver or this one did not appreciate correctly the trajectory, maintaining the correct direction of the vehicle depends on the driver's experience and his skills.

REFERENCES

1. Cristea, P., *Arta de a conduce automobilul*, City: *Bucharest*, Publishing House: *Stadion* (1970).
2. Cunesco, S., Ignat, D., Pavelescu, T., Săvulescu, A., *Îndreptar automobilistic*, City: *Bucharest*, Publishing House: *Tehnică* (1968).
3. Drăgan, A., Cosma, V., *Linia vieții*, *Auto motor și sport*, no: 9/2011.
4. Păușan, N., Aur, T. *Auto CONTROL tehnici și tactici de conducere defensivă și sportivă*. City: *Cluj-Napoca*, Publishing House: *Napoca Star* (2011).