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HOW TO AVOID CAR ACCIDENTS

Abstract: *Improving the safety of the car, including its controlled, is one of the main and complex tasks of the automotive industry, maintenance and traffic control services. Improving the operational characteristics of the car, aimed at preventing or at least reducing the severity of injuries in road accidents, was carried out in this thesis in the direction of improving controllability, stability and reliability, improving living conditions in the car cabin.*

The choice of vehicle parameters that provide the best characteristics of controlled and related stability guarantees optimization. Based on this: the acting forces acting on the car when driving along a circular path at a constant low speed; considered the phenomenon of drift of a car wheel associated with the lateral elasticity of the wheel, to a degree affecting the handling and stability of the car; from consideration of the turning scheme of a car with elastic wheels, a graph of the car's handling was built, which connects the parameters (turning radius and speed of the car, the angle of rotation of the steered wheels, centrifugal force, the difference in the angles of withdrawal of the rear and front wheels of the car) the movement of the car along a curve the definition for the critical speed under controlled conditions is determined, which allows to determine three cases of occurrence of neutral understeer and oversteer of the vehicle.

Key words: *analysis, influence of the technical condition of the vehicle, stability, the dependence of the angular deviation, the car, the speed when braking the car, when one front or one rear braking mechanism.*

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Introduction

Confident actions of the driver in emergency situations are possible only if he understands how various factors affect the behavior of the car in general and knows the features of a particular car. The latter can only be achieved by regular training in this type of vehicle.

Braking and acceleration based on traction. Imagine that, driving at high speed, the driver saw a sharp turn late or an obstacle suddenly appeared on the road. The most correct response in most, but not all cases, is emergency braking. This reaction is correct on a road with a flat dry surface and the distribution of braking forces along the axles is proportional to the load, which ensures a positive margin of static stability. In this case, the car will move straight and the driver only has to prevent the wheels from locking. To do this, when you press the brake pedal, the force increases only until the start of blocking. Then it must be lowered to unlock the wheels. After that, increasing the effort on the brake pedal, bring the wheels to the start of blocking and release the pedal, repeating this several times. The higher the frequency of pressing and releasing the pedal and the less the deviation from the force causing the start of blocking, the more effective the braking and the shorter the stopping distance. With hydraulically actuated brakes without a booster, or with a properly adjusted booster, the moment when the lock starts creates the feeling on the pedal as if a spring is being compressed to the end, when the foot begins to press against the fixed support. If the effort on the brake pedal causing the wheels to lock is small, the moment when the lock occurs must be determined by other indicators [1. p.296].

On a road with a high coefficient of adhesion, skidding of the wheels produces a characteristic sound; on a slippery road, it can only be determined with experience. If the wheels of the rear axle lock earlier, the static stability margin becomes negative, and the value of the critical lateral force becomes close to zero, which leads to a skid. The most common mistake in this situation is an attempt to get the car out of a skid without stopping braking. Therefore, to stop the skid, you first need to release the brake pedal, and then turn the steering wheel towards the skid. As soon as the skid stops and the car moves in a straight line, you can start braking again.

If, during braking, the front wheels begin to move to the side, this happens with uneven operation of the front brakes, in order to level the car, you must first also release the brake pedal. Attempting to level the vehicle in this situation without stopping braking is dangerous. When the front wheels are locked, the vehicle does not respond to steering wheel movements [2. p.255].The driver, starting to turn it, mistakenly hopes that this can force the car to move in the right direction. However, in this case, the wheels will be turned at an angle much greater than necessary to move in the desired direction, and if the driver releases the brake pedal, the car will literally "jump" to the side, which can lead to an accident.

It is necessary to brake on ice even in an emergency situation without disengaging the clutch until the very last moment, since in this case the front (not driving) wheels will quickly lock, while the rear wheels will not be locked due to the supplied torque. The stability margin will remain positive and the risk of skidding the vehicle will decrease [3. p.208].

It is mistakenly believed that engine braking on a slippery road always saves you from skidding. Of course, this reduces the likelihood of skidding, since the braking torque of the engine is much less than that created by the brakes and is regulated more smoothly. One to that something is safe braking only until the moment when the braking force generated by the motor exceeds the traction wheel and the road. After that, in the case of a drive to the rear wheels, a skid will begin, and it will be possible to stop it only by removing the braking torque from the rear wheels, that is, by squeezing the clutch. In theory, this can be done by increasing the engine speed. However, in practice, this may not work even for a well-trained driver, since a fraction of a second is released to find the position of the fuel control pedal corresponding to the transition of the engine operation from braking to traction mode. Therefore, if the skid continues, the clutch must be disengaged. In this case, the absence of longitudinal forces on the wheels will be guaranteed.

Braking techniques on the "skid" border can be expressed in the following phrase, if you press the brake pedal, then the wheels should be in a straight position, if you turn the steering wheel, then the brake pedal should be released.

The ability to accelerate with full use of traction is necessary when, during overtaking, an oncoming vehicle is found to be approaching much faster than anticipated. However, it should be remembered that when driving in icy conditions on a snowy road, a skid can occur not only during braking, but also during acceleration [4. p.416].

The acceleration technique at the skid border is similar to the braking technique at the skid boundary. At the initial moment, the pressure on the fuel control pedal is carried out quickly enough (but not abruptly) until the driving wheels begin to slip, after which it is necessary to start releasing the pedal. When slipping stops, you need to gently press the pedal again until slipping appears and then repeat everything again. The sooner slipping stops and the less the thrust reduction required to eliminate it, the faster the acceleration will occur [5. p.216].

When accelerating at the skid limit, the car usually drifts. To stop them, it is necessary to reduce the tractive force simultaneously with turning the steering wheel. The more the skid, the more you will have to release the fuel pedal. However, if engine braking occurs, it will contribute to the development of skidding, which may require disengaging the clutch, as in the case of engine braking.

The maximum acceleration when accelerating on slippery surfaces is determined by the traction of the wheels with the road. In this case, it is very important to shift into top gear in time to reduce traction. It should be noted that in lower gears it is much more difficult to grasp the clutch boundary, therefore precise recommendations on the choice of the gear shift moment in these conditions are impossible. [6. p.168].

However, it should be pointed out that if even a gentle press on the fuel control pedal immediately causes a skid, then you need to shift to a higher gear. The best effect in these conditions it is possible to learn only the basis of experience.

If fast acceleration is required on a road with a high coefficient of adhesion, it is necessary to ensure the full use of engine power and, accordingly, tractive force in gears, but for this it is not enough just to shift gears at maximum crankshaft speeds. It is also necessary to carry out the gear change itself as quickly as possible.

When it’s useless to slow down. There are cases; when the driving speed was too high and the braking distance was short. In the next instant, the car should enter the turn, and the speed is much higher than the permissible one. In these cases, braking becomes useless, and the last chance is the ability to release the brake pedal and steer the vehicle with the steering wheel and, to some extent, with the fuel and clutch pedals. The driver's actions in these cases are determined by the vehicle's stability margin, which, however, does not remain unchanged. If such situations have arisen on a road with a hard, dry

surface with a high coefficient of traction, then before starting a turn, you must engage a lower gear in which the engine will operate at a given speed of the crankshaft close to maximum. When there is enough time for braking and the road situation allows, it is advisable to be near the outer edge of the road in relation to the center of the curve before turning. You need to start the turn with some advance, which can only be determined on the basis of experience. To compensate for the lag in the response of the car, which always increases with increasing speed, a quick advance turn of the steering wheel is necessary. To increase the turning radius, drive the vehicle by guiding the vehicle from the outer to the inner edge of the pavement with respect to the center of the turn and returning to the outside in a smooth arc. However, entering the lane of oncoming traffic to defuse an emergency is permissible only if there is sufficient visibility of the road and the absence of oncoming vehicles. With a positive stability margin, which, as a rule, most cars have, with an increase in speed, the steering angle required to move along a curved path increases. For each car, in specific driving conditions, there are critical values of the speed and angle of rotation of the steered wheels, upon reaching which its front axle will begin to slide and further rotation of the steering wheel will no longer reduce the turning radius. When that moment comes, turning the steering wheel further becomes not only useless, but even dangerous. Resistance to cornering when the vehicle reaches its grip limit increases dramatically and its speed begins to decrease. When the front axle slides, you just have to wait for what happens first: will the speed decrease to a value that allows you to move along this turn, or the car will reach the edge of the road. If the car does not leave the road by the time the steering wheel sensitivity is restored, then when the steered wheels are turned at a greater than necessary angle, it can completely unexpectedly for the driver rush towards the steering wheel turn. This phenomenon is similar to the release of turned wheels. Since reducing the speed in this situation is the only way to prevent dangerous consequences, engine braking will be the only correct action [7. p.326]

Increasing traction at the wheels in these situations will cause a slower deceleration and therefore may only be useful if it causes the rear axle to skid with good grip on the front wheels. In this case, the turning radius will decrease.

With a decrease in the coefficient of adhesion or due to the design features of the car, the stability margin may have negative values, at which the magnitude of the lateral force exceeds the critical value, which will cause a skid. The nature of the required control actions in this case will change. The question of whether it is possible to brake with the engine and with what intensity does not have an unambiguous solution for this case. Everything is determined by the speed of the skid and the possibility of stopping it in the presence of braking torque on the rear wheels. In most cases, this issue has to be resolved during the development of an emergency. Disengaging the clutch is the last attempt to stop the skid. It is not possible to determine in advance how much and how to turn the steering wheel. The driver's actions are determined only by the behavior of the vehicle. You can only form a few general provisions.

There is a critical angle of rotation of the longitudinal axis of the vehicle at which it becomes impossible to stop the skid. The later the driver starts to turn the steering wheel and the lower the speed of its turning, the more angle the car will have time to turn. Therefore, turning the steering wheel should be started as soon as the rotation of the car begins to be felt, and immediately at the highest speed.

If the steering wheel continues to turn at a constant speed until the skid stops, a skid will occur in the opposite direction. Therefore, the steering speed must be reduced as the skid speed decreases. The reverse rotation of the steering wheel, as a rule, must be started a little earlier than the rotation of the car in the opposite direction, since the advance of the rotation of the wheels relative to the angle of rotation of the car is the main condition for the rapid termination and elimination of re-skidding.

Advance turning of the wheels during repeated drifts is possible when the driver knows where their neutral position is. To do this, you need to be able to turn the steering wheel to the maximum possible angle without changing the points of contact of the hands with its rim. Skid correction causes an increase in the turning radius. Therefore, having eliminated the skid, it is necessary to turn the steering wheel again in the direction of the turn, which will cause a new skid and everything will be repeated again, until the speed of the car drops to a safe one for driving on this turn or until the car goes straight. In such a situation, it is also better to immediately disengage the clutch, since the presence of traction or braking force on the wheels will only accelerate the development of a skid.

When the front axle is demolished, the car leaves the road to the outside, and when skidding, to the inside of the turn. However, if the maximum speed is significantly exceeded at the entrance to the turn, even in the event of drift, the car, rotating, begins to move to the outer edge of the road. In this case, it is necessary to try to stop its rotation by the methods described earlier, since this will allow, to some extent, to choose the place for the exit from the road, which will help to reduce the severity of the consequences in the further development of the road traffic accident.

From all that has been said, in no way should one conclude that you should not brake at all when cornering. It is often necessary to brake when cornering. But it should always be remembered that the higher the speed and, accordingly, the lateral acceleration of the car, the lower the amount of allowable deceleration.

When the sum of the braking and lateral forces becomes equal to the traction force, the vehicle starts to drift or drift. Therefore, when braking on a corner, you must be prepared for this and do not forget that to eliminate drift or skid, first of all, you need to brake the wheels [8. p.220].

If an obstacle suddenly appears on the path of the vehicle at a distance less than the stopping distance, then it will be impossible to prevent the collision with the help of braking. However, it can still be avoided by avoiding the obstacle. For example, at a speed of 80 km / h, the minimum possible braking distance is 30 - 35 m, and the minimum detour distance is 16 - 18 m.At a speed of 120 km / h, this difference becomes even greater: 65 - 90 m when braking and 28 - 30 m when bypassing. However, only a well-trained driver can make a detour at a minimum distance. The difficulty lies in the fact that during this maneuver almost all cars, including those with a positive stability margin at cornering, are swept up. In addition, if the drift speed is high, exchange rate fluctuations occur. According to the test data, the detour distance at which a skid of cars occurs is approximately 26 m at a speed of 30 km / h, and approximately 40 m at a speed of 120 km / h.

This suggests that when braking is no longer useful, in some cases a detour can be made even by an inexperienced driver. However, in most cases, this is hampered by the fear of lowering the brake pedal at the sight of an inexorably approaching obstacle [9. p.312].

Driving under the influence of external disturbances. If the vehicle starts to slip sideways due to a crosswind or a sideways slope in the road, braking also produces the opposite effect than expected. As in a corner, only the steering wheel, fuel and clutch pedals remain at the driver's disposal. When eliminating deviations caused by external forces, it is very important to start reacting to their action before the vehicle begins to deviate [10. p.87].

This is possible when the driver senses lateral forces in the form of an increase in steering force. One of the mistakes that often leads to a loss of control in this situation is the desire to immediately return the car to its original place when it deviates to the edge of the pavement. The fact is that when you try to quickly return to the middle of the road, a centrifugal force arises, directed in the same direction as the external force [11. p.135].

As a result, skid occurs earlier than one would expect. Therefore, the first task when the vehicle is deflected to the side under the influence of external forces is to stop this deflection. Only by stopping it, you can begin a smooth return of the car to the middle of the road.

If the car hits the wheels of one side on a soft shoulder or in the snow, it begins to uncontrollably pull into a ditch. In this case, first of all, you need to try to keep the car on a straight line and remember that sometimes it is better to get into a ditch than to be unexpectedly thrown into the oncoming lane with very vigorous attempts to get onto the road.

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