need. Similarly, we can define the threshold $C_1(S, S+1)$ size C_1; in effect $C_1(S, S+1) = C_2(S, S+1) \cdot C_1 / C_2$.

Conclusions. The basis for the establishment of maintenance equipment forest complex methods are specialized maintenance machines that take into account the specific conditions of forest production with the use of mobile devices; alteration of the active material and technical base of enterprises; providing producers with technical services in the "purchase - operation - maintenance"; selection of artist maintenance is based on its technical capacity and financial equipment owner, and proposed mathematical model for calculating the need for mobile vehicles will implement them efficiently.

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In this article predstavlenы Results for methodical descriptions provisions Mathematical models Provision potrebnosty in funds tehnycheskoho Maintenance lesnыh МЭС.

Funds, Tehnicheskoe Maintenance, lesnoe МЭС.

The paper presents results on methodological regulations describing mathematical models of equipment needed to ensure maintenance of forest MEM.

Means, Technical maintenance, forest MEM.

UDC 657.1.002

STABILITY PARAMETERS front mezze OF WORK

MV Panfilov Engineer

In the article the results of testing the agricultural vehicle safety.
Tool, work trials.

Problem. In the agricultural production of the country more than 50% of the traffic is carried wheeled tractors with trailers. At the same time, the exploitation of this type of transport is in farms in less than ideal conditions.

Analysis of recent research. Among them is the poor state of farm roads [1], failure to drivers approved route and mode of motion [2], low skills and poor organization tractor maintenance of tractors before leaving the yard machine [3]. This set of discrepancies or deviations contributes to a high level of road traffic accidents with wheel tractors and harvesters [4]. The most common situation among these events is lateral overturning cars, which usually ends for tractor and combine with severe injury or fatal.

The purpose of research justify increasing dynamic stability for the agricultural vehicle safety parameters.

Results. In order to identify the causes of overturning all the information on accidents with fatalities in this situation, we were divided into four groups. As a qualifying signs of aggregation used type in which the transfer occurred unit (tractor without mounted and trailed implements or machinery, tractors with mounted implements, tractors trailed implements and tractors with trailers). Considering that the number perekydan wheeled tractors with trailers is 45.4% of all perekydan, we have identified them as a separate group (Table. 1).

Table 1

1. Distribution perekydan wheeled tractors by type of aggregation%.

Tractor Brand	Type aggregation			
	trailer	with trailer tool	with mounted implement	without trailer and mounted guns
T-150K	62.5	25.0	0	12.5
UMZ-6AKM	61.5	23.1	15.7	0
MTZ-80 (82)	65.0	12.5	5.0	15.5
T-150	50.0	21.4	0	23.6
K-700A	51.1	2.2	11.1	35.6
MTZ 100	65.1	5.6	14.2	15.1
HTZ-121	0	24.2	32.3	43.5
T-25A	0	38.5	38.5	23.0

Analysis of the data table. 1 shows that the largest number perekydan is using wheeled tractors to transport works (tractor + trailer).

This indicates a negative effect on the dynamic performance trailer tractor, especially in the absence of a tractor and trailer brakes healthy.

We make classification wheeled tractors that spread for common causes. Total allocated 8 classes.

1st class. Were not connected or were no brakes on the trailer or trailed implements.

2nd class. Not complied with approved routes or bulky cargo transportation rules.

3rd grade. Admitted to the operation of the machine with defective steering, braking system and the absence tether.

4th grade. Manage your car while intoxicated.

5 th grade. Poor state of roads, ice, dirt raids on paved roads, bridges and alarm status crossings.

6th grade. Other reasons beyond the control of the tractor and technical condition of machines: tractor blinding headlights of oncoming traffic; collision with oncoming traffic, out-of band movement; overturning tractor towed on slippery roads; lack of visibility of the workplace.

7th grade. Fatigue tractor due to the violation of the length of the unit; lack prikurivaniya devices while driving a tractor, a painful condition of the tractor.

8 th grade. Low qualification tractor, resulting in the wrong choice of modes tractor is in maneuvers (overtaking), the motion for descents and ascents.

Table. 2 shows the proportion of each of the eight classes of causes of rollover.

2. The share class reasons for overturning brands of tractors%.

Tractor Brand	Class reasons							
	And	II	III	IV	V	VI	VII	VIII
T-150K	15.4	7.7	7.7	15.3	15.3	15.3	7.7	15.3
UMZ-6AKM	37.5	5.0	5.0	17.5	10.0	7.5	2.5	15.0
MTZ-80 (82)	18.8	6.3	25.0	12.5	6.3	12.5	18.5	0
T-150	7.1	7.1	7.1	14.4	28.6	7.1	0	28.6
K-700A	13.3	8.9	6.7	26.7	11.1	4.4	13.3	15.6
MTZ 100	19.8	18.0	16.0	13.2	13.2	9.4	6.5	4.7
HTZ-121	1.6	6.5	29.0	8.1	12.9	19.4	6.5	16.1
T-25A	3.8	3.8	7.7	3.8	19.2	23.0	7.7	30.8

The data presented in Table. 2, reveal the dominant class causes rollover on certain brands of cars. For example, tractors MTZ-80 (82) in 37.5% of cases and 19.8 respectively overturned due to nepidklyuchennya trailer brake that is aggregated and traktoгы T-150K - because of unsuitability to work in poor road conditions (VI Class reasons). Perekydan highest percentage (26.7%) brand power tractors K-700A is due to drunk drivers. Tractors brands HTZ-121 in 29% of cases overturned because of poor technical state of automobiles and tractors T-25A - due to low-skilled tractor.

Statistics show that wheeled tractors and combines different classes differ significantly on factor injuries in rollover situations, although the difference in the angle of static stability they have negligible. Moreover, tractors and combines with weight and size, such as K-700A, T-150 and SK-6A, often overturned. On this basis, we assume that in addition to organizational reasons for the transfer machines, both are present and are hidden outside technical reasons independent of the staff. In order to identify the nature of these causes and develop proposals to reduce their impact we developed a logic model transfer.

In developing such a model is accepted that the transfer of wheeled tractors and combines on dams, hills and curves is mainly due to the loss of stability of the exchange rate movement and access machines outside the allowable movement corridor. It is assumed that the stability of the exchange rate movement is a function of some parameters of roads and cars. In particular, the width of the carriageway N. gauge in the car, the height of the center of mass car h_c yaw values associated with the value of play in steering.

Let these parameters are linked to some addiction that causes stability cars on the road:

$$X = \frac{(H - B) \cdot B}{10 \cdot h_c \cdot \varphi} . \qquad (1)$$

Then, wondering traffic corridor width value N and substituting the appropriate values for B, h_c and φ machines, calculate the value of the parameter X. delaying the vertical axis statistical significance of the coefficients injuries ($K_4^{лет}$) With fatal outcome in a situation of "tipping" adjusted on the basis of equal annual working hours tractors, and the horizontal axis - the parameter X gain distribution coefficient of a complex injuries of quality indicators and road machines.

Draw approximation of the curve (Fig. 1) by square shapes. Now this dependence will take the form:

$$K_4^{років} = \frac{4{,}43}{0{,}43 + \frac{(H\text{-}B) \cdot B}{10 \cdot h_c \cdot \varphi}} . \qquad (2)$$

Analysis of the relationship (2) shows that increasing safety of machines can go in the direction of increasing the width of the corridor movement $\Delta H = (H - B)$ enhance the value of backlash steering systems associated with Wheel play φ_1 and lowering the center of gravity h_c machine.

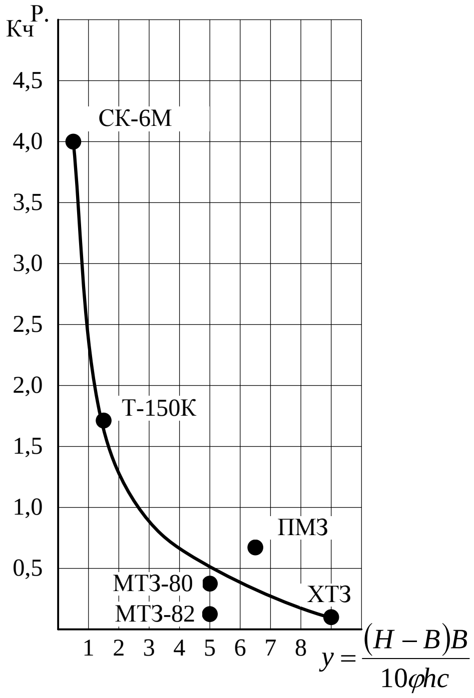

Fig. 1. The dependence of the reduced coefficient of fatal injury Rollover agricultural tractors and the characteristics B, H, φ, h_c.

It is possible that the deepening of research at a later stage will be able to clarify the relationship (2), which will formulate evidence-based requirements for technical characteristics of cars and roads. Selection and justification of a generalized index to characterize the safety tractors, MTA and other self-propelled agricultural machines currently not possible. However, by comparing the optimal conditions (angles, heights and velocities inequalities microrelief) can find the critical angle of the terrain, the largest allowable height microrelief and the largest permissible safe speed ahrehatu.Tsym way you can get the critical value, it is sufficient to determine the range of safe operation of the tractor or unit of the tractor. In specific operating conditions based on these parameters can be set as security and to take measures to prevent overturning tractor.

Thus, the authors [1, 2] propose to characterize the safety wheeled tractors by assessing their stability and manageability for determining the number of isolation steering wheels:

$$\nu = \frac{1}{2\pi}\sqrt{\frac{D_{\varepsilon}}{D_{\varepsilon}}} \cdot e - \frac{\varepsilon^2_{\partial on.}}{2D_{\varepsilon}} \quad (3)$$

where $D\varepsilon$ - Variance warp speed tires cm2/ S2;

$D\varepsilon$ - Variance deformation pin cm2;

$\varepsilon_{\partial on}$ - Deformation of the tire relative to the average value cm.

Valid values for the first criterion recommended $\nu = 1$ separation / s.

Resistance to overturning wheeled vehicles when driving on the road with a cross slope prompted us to characterize the magnitude of the maximum permissible speed V_{np} Which is determined by the condition of the machine without lateral transfer:

$$[V_{np}]^2 \le \frac{\tau\left[\beta - \alpha\sqrt{B^2 - \gamma^2}\right] - 0{,}5\gamma}{\rho^2 + \beta^2} \ \frac{км^2}{год^2}, \quad (4)$$

where

$$\tau = 3{,}6^2 \cdot 2g \cdot B^2 \cdot \frac{1}{D_{ij'} A_{2^2}}; \quad \beta = \sqrt{\frac{B^2}{4} + h_{c^2}}; \quad \alpha = \frac{h_c}{B}; \quad \gamma = B\sin\psi - A_1\sigma_y;$$

$\rho^2 = \frac{1}{12}\left(a^2 + B^2\right)$ - Square radius of inertia relative to the longitudinal axis of the machine, which passes through the center of mass, m2;

a - The height of the machine, m;

ψ - Cross the road angle, deg;

$A_1 = A_2 = 4$ - Factors that determine the probability neperekydannya;

$D_{ij}'; \sigma_y$ - Factors that characterize the road surface.

Evaluation of machines on dynamic stability should be made more important by the number of wheels margin or the maximum allowable speed.

Mathematical presentation and processing for determining the number of isolation tractor wheels on the road surface and the maximum permissible speed of the set in the works [1, 2].

Comparative evaluation of dynamic stability of vehicles should be made by comparing the calculated values of maximum permissible speeds (with conditions neperekydannya) with desired characteristics of relief.

Fig. 2 shows in graphs calculated by the formula (4) the maximum permissible value, safe conditions of neperekydannya speeds of self-propelled tractor-shasiT 16 mg $[V_{np}]$ By varying the transverse width of the lap cars in the range B = 1, 2 ... 2.0 m and the angle of static stability

$\alpha_{cm} = 26...50°$.

As estimated terrain track taken from the British Standard 4220, the expectation of the angle of inclination of relief ψ = 5 ... 10 in increments of 1. Angle ψ = 8 selected as optimal, since the ψ <5 uneven terrain did not significantly affect the dynamic stability of the machine.

Calculations showed that the linear relation between static and dynamic angle stability does not exist and that this relationship is not linear and is a function of two variables $V_{np} = f(\alpha, B)$.

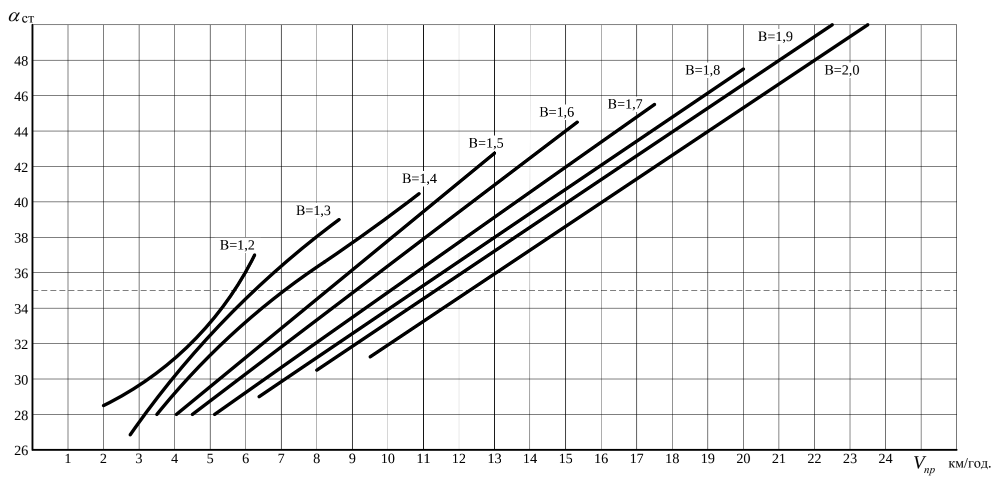

Fig. 2. Graphical depending Side permissible speeds machines V_{np} from the angle of static stability α and gauge machine B.

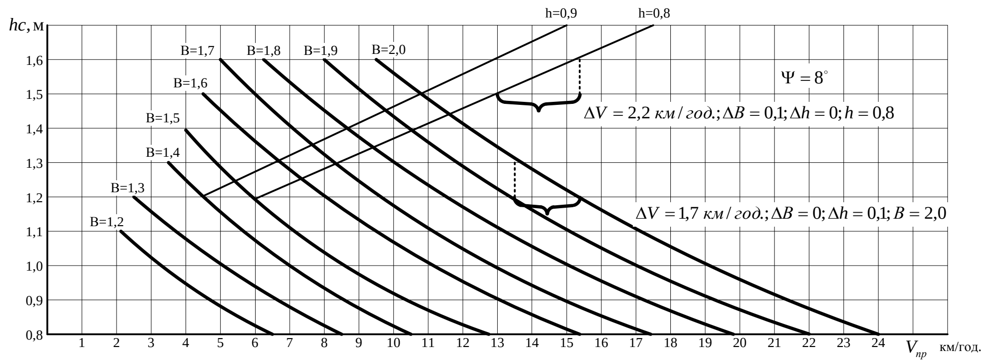

Fig: 3. Graphic Depending maximum permissible speeds machines V_{np} to gauge machines in height and center of gravity machines h_c.

Research graphical dependencies V_{np} (Fig. 3) as a function of B and h_c shows that V_{np} changes in the larger range by increasing the gauge in the car (at a constant value h_c) Than at lower center of gravity height h_c the same amount (at a constant gauge in the car).

Therefore, to improve the dynamic stability must first maximize gauges that in many cases, self-propelled machines perform structurally simpler than the lower center of mass.

Conclusions

1. Among the machines that are aggregated with wheel tractors, the greatest negative effect on its stability commit trailers. This type of aggregation have 50-65%. all perekydan tractors.
2. The empirical relationship between the statistical indicators of injury Rollover wheeled tractors and combines and some technical characteristics of cars and roads. The dependence is not linear, and graphical form - parabola.
3. It is shown that the increase in dynamic stability tractors better start to increase track width, and then move to lower the center of mass.

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In this article Results rassmotrenы yspыtanyya selskohozyaystvennыe transportnыh funds on Protection of labor.

Funds, Work, test.

In paper the results of testing the agricultural vehicle safety.

Tool, Work, testing.

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