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ANALYSIS OF THE OVERSTEER BEHAVIOR IN CURVES OF A VEHICLE:BAJA SAE

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INTRODUCTION

When starting a curve, the vehicle suffers the effect of lateral acceleration which, finally, generates load transfers on its axles.

There are three types of trends that describe the dynamic behavior of the car when exposed to the limit supported by tire grip: Neutralsteer (equal slippage in the front and rear portions, keeping it within the radius of the turn), Understeer (greater slippage from the front, increasing the radius of the turn), Oversteer (greater slippage from the rear, decreasing the radius of the turn).

GOAL

Analyze vehicle dynamic behavior and determine which one will be faster in curves.

MATERIAL AND METHODS

Circuits that present the conditions of high maneuverability are elaborated: the Skidpad and Slalom. Initially, in the Skidpad, figure 1, circular curves of different radii are made, varying the speed of the car to obtain the average speed, steering wheel steering angle and time. These parameters are obtained through electronic equipment: Hall effect sensor A3144, potentiometer and a stopwatch, respectively. Thus, through the velocity and radius data, the lateral acceleration is calculated, equation (1).

$$A_{Lateral} = \frac{V^2}{R} \quad (1)$$

Figure 1. Circuit: *Skidpad*, own authorship.

In turn, in Slalom, Figure 2, consists of performing zigzag curves to obtain the average time of vehicles with different trends.

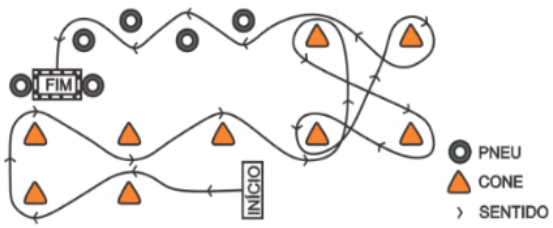

Figure 2. Slalom Circuit, own authorship.

The used car features: 10x5 wheels; Maxxis Maverick 21x7-10 tires with 12 psi; pinion-type steering96mm travel rack; double wishbone front suspension and rear semi-trailing arm.

RESULTS AND DISCUSSION

With Table 1, a graph of the steering angle of the steering wheel by the lateral acceleration is generated, figure 3. Table 2 shows the data of time and average speed, so that you can compare the trends and define which will be faster.

Distance (m).	Critical Speed (km/h).	Lateral Acceleration (m/s^2).
4	17,3	5,59
6	21,2	6,08
8	24,9	5,98
10	27,1	5,69

Table 1. Skidpad data, self-authored.

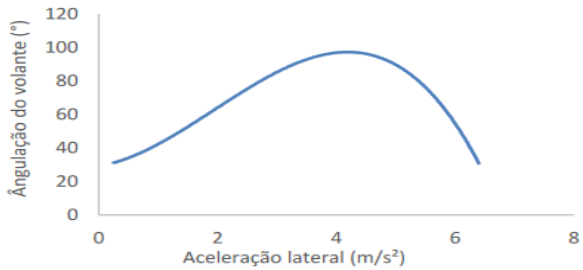

Figure 3. Steering within a radius of 10 m, own authorship.

Behavior	Average t ime (s).	Average of speed(m/s).
Understeer	30,12	2,21
Oversteer	21,53	3,09

Table 2. Data: *Slalom*, own authorship.

CONCLUSION

From the observation of figure 3, it is understood that when there is lateral acceleration close to 4.3 m/s², the rear slip starts, thus demonstrating an Oversteer tendency in the vehicle. Therefore, when this slip occurs, there is a need to use a counter-steer maneuver to correct its trajectory. Furthermore, relating this fact to Table 2, it is noted that the Oversteer behavior increases the car's speed in curves.

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[1] GILLESPIE, Thomas D. Fundamentals of vehicle dynamics. Warrendale: Society of Automotive Engineers, Inc., **1992**.