

Simulation of Effect of Suspension Geometry on Rollover and Squat Behaviour of a Sports Utility Vehicle (Title, Times New Roman (TNR), 20)

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Abstract (caption 'Abstract', TNR, italics, 12)

(A self-contained abstract outlining in a single paragraph the aims, scope and conclusions of the paper must be supplied (150-200 words))

Vehicle dynamics has been a pivotal domain in the field of automotive engineering. This vast subject is primarily divided into three subgroups: Performance Ride and Handling. Performance mainly deals with the efficiency and effectiveness of the vehicle in its ability to accelerate, brake and overcome obstacles. Ride is related to the vibration of the vehicle due to road excitations and its effect on occupants and cargo. Handling is concerned with the overall behaviour or response of the vehicle to driver inputs.

In this paper, a multi-body parametric model of a sports utility vehicle has been built to simulate on-road behaviour. Commercial software MSC. ADAMS 2003 is used for this purpose. After studying the baseline vehicle parameters in the model, steering maneuvers are simulated to establish the influence of suspension geometry on rollover of the vehicle. This is followed by independent study of front and rear suspensions for dive and squat performances respectively. Modifications were subsequently carried out to improve squat and dive based on industrial norms.

It was observed that the rollover risk of the vehicle increases with roll moment arm length, which is the distance between the roll axis and the height of Centre of Gravity (CG) of the vehicle. The vehicle suspension geometry showed excessive anti-squat and very low anti-dive properties. These parameters were considerably improved by simple modifications in suspension hard points, tuned such that requisite proportions of anti-squat and anti-dive forces are generated with a little compromise in handling. (text in TNR, italics, 9)

Key Words: (Caption "Keywords" in TNR, 9, bold, title-case) Vehicle Dynamics, Suspension Geometry, Sports Utility Vehicle (TNR, 9)

Abstract should be around 250 words with three paragraphs; first paragraph giving the introduction, second paragraph describing the methodology adopted and the third paragraph discussing the main results.

These to be in alphabetical order with capitals first, lower case letters next and special symbols at the end. All units be mentioned in SI units

In this section, give a general introduction to the topic within two or three sentences and then discuss the developments (literature) and identify the need for the study undertaken and finally mention the work carried out in the current study in brief (within thousand words)

Nomenclature (text in TNR, bold, 9)

A	Inlet area, mm ² (text in TNR, 9)
D	Bore diameter, mm
D _H	Hydraulic diameter, mm
d	Hydraulic diameter, m
k	Turbulence kinetic energy, m ² /s ²
u	Mean flow velocity, m/s
v	Velocity, m/s
ε	Dissipation rate, m ² /s ³
ρ	Density, kg/m ³
μ	Viscosity of air, kg/m-s

Abbreviations

CAD	Computer Aided Design
CFD	Computational Fluid Dynamics
EGR	Exhaust Gas Recirculation
MPI	Multi-Point Injection
PIV	Particle Image Velocimetry
PISO	Pressure-Implicit with Splitting of Operators
VVT	Variable Valve Timing
WOT	Wide Open Throttle

1. INTRODUCTION (Main captions in CAPS case, TNR, 10, Bold and numbered sequentially)

1.1 Structure and Description: (sub-headings in TITLE case, TNR, 10, Bold and numbered sequentially)

Single column text with text left justified.

Follow this order when typing manuscripts: Title, Authors, Affiliations, Abstract, Keywords, Nomenclature, Main text, Acknowledgements, Appendix and References. The pictures and tables must be placed at appropriate positions in the text. (body of text in TNR, 9)

The main text shall contain the sections like Introduction, Problem definition and/or Objectives, Methodology, Design/Simulation, Solution Procedure, Validation Studies, Results and Discussions and Conclusions. Links must be established between paragraphs, sections and subsections.

The proportions for each section are roughly as shown below:

Introduction: about 1,000 words

Problem Definition/Objectives: about 75 words

Methodology/simulation/solution procedure: about 1000 words,

Validation studies/Results and discussions: about 2000 words

Conclusions: about 100-150 words (preferably in bulleted formats)

Limit the length of the paper to 8 pages at most. The final paper must be preferably be of 4, 6 or 8 pages.

1.2 Units

Follow internationally accepted rules and conventions: use the international system of units (SI). If other quantities are mentioned, give their equivalent in SI. English units may be used parenthetically.

1.3 Nomenclature and Symbols

All symbols should be defined in the text. Each paper must have a separate nomenclature section that lists in detail and unambiguously the symbols used in the text and their definitions. Do not use the same symbol for two or more different meanings of definitions; use distinctly different symbols. Similarly, do not use more than one symbol for one variable/parameter. Each dimensional symbol 'must' have SI units mentioned at the end; English units may also be supplied as an option after the SI units. All dimensionless symbols 'must' be indicated as dimensionless after their definitions and should be defined explicitly by an equation either in the text or in the nomenclature.

All the 'parameters' cited in the text should be listed, in 'alphabetic order', in a separate nomenclature section at the beginning of the paper, with their definitions and units. 'Greek symbols', 'subscripts' and 'superscripts' should be separately identified. Only 'ISO symbols' may be used, always written in italics. 'SI units' should be used throughout; they are always separated from the numerical value by a space and written in roman. The μ in μg or μm is always in roman. The symbol for litre is L, minute is min. We use $^{\circ}\text{C}$, but K for temperatures.

Maths:

Mathematical symbols and formulae should be typed using MS-word equation-editor. Particular care should be exercised in identifying all symbols and in avoiding ambiguities. Distinction should be made between the number one (1) and the letter l and between zero (0) and the letter O. Vectors and tensors should be marked clearly on the manuscript. Equation numbers should appear in parenthesis and be numbered consecutively. All equation numbers must appear on the right-hand side of the equation and should be referred to within the text. Use the following sequence of parentheses:)}}.

1.4 Tables

Tables must be constructed using the table-tool available in MS-Word only. Do not include image of tables created in other applications. Tables must be numbered sequentially.

- The font for table text: TNR, 9, centered
- The caption in the table: TNR, 9, bold, centered
- The title of the table: TNR, 9, bold, centered
- In case the tables cannot be accommodated in the space within single column of two-column format, place the table in full page width (with single column format for the whole page) at the beginning or end of the page. An example is shown.
- Include the units of measurements in the table text wherever the variable list is used.

Sl. No.	Force (N)	Moment (N-m)
1	10.5	13.6
2	12.4	15.6
3	15.7	18.9

Table 1. The listing of forces and moments acting on the torsion bar

1.5 Figures

- Figures must be self-explanatory and proper caption must be given at the bottom of the figure.
- A graph, picture, copy of photograph are all considered as figures.
- The graphs and contour plots are required in “black and white” mode and not in colour mode.
- The centred symbols, curves, values on the axes shown in the graph must be distinct, legible and readable in the size it is printed.
- Figures must be clear and the texts in the figures must be readable with minimum font size of 9 in TNR or equivalent.
- All the symbols used in the graph must be labeled either within the frame of the picture or in the caption of the figure.
- The axes of the graph must be labeled and quantified. The units of the quantities used must be mentioned.

All figures and tables and references listed must be referred in the text. Please avoid snapshots of windows, poor images and too big-in-size pictures. The text and numerals if any in the picture must be of readable size.

- Figures must be labeled in TNR, 9, bold, centered
- Avoid figures extending beyond the column width of the two-column format
- In case the figure cannot be accommodated within the single column of two-column format, place it with single-column format wide across the page in the beginning of the page as is done in case of table.
- The graphs must contain the axis label with units for the axes; the label and the number must be readable with minimum font size of 9 in TNR or equivalent.

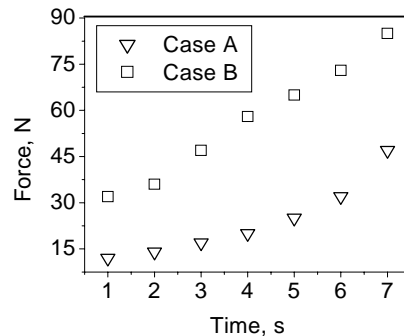


Fig. 1 Variation of reaction force with time

References must appear in the reference list in the order of appearance in the paper. Each reference must be cited at least once in the text of the paper. An example for citing a paper in the text is shown in the following example.

Rollover may be defined as any manoeuvre in which the vehicle rotates 90° or more about its longitudinal axis such that the body makes contact with the ground [1]. The independent research works carried out by many investigators [1, 4-8] have shown the impact of dynamic forces and couples on the stability of the vehicle.

Include references at the end of the paper. The referencing style for journal papers, conference papers, textbooks and websites are shown below.

- [1] N. Dombrowski and W. R. Johns (1963), The Aerodynamic Instability and Disintegration of Viscous Liquid Sheets, *Chem. Eng. Sci.*, vol. 18, pp. 203-220
- [2] N.A.Chigier (1991), The Physics of Atomization, Proceedings of Fifth International Conference on Liquid Atomization and Spray Systems, July 15-18, 1991.
- [3] Whitfield A and Baines N C(1990), Design of Radial Turbomachines, Longman Scientific Technical, New York.
- [4] www.unknown.com (browsed on 12th Dec 2006).