

Momentum – Angular Momentum

Overview: Computes the speed of a striking vehicle using pre- and post-impact data in conjunction with inertial and rotational information.

Entry into Module:

This module of the program is normally entered by clicking on the **REC-TEC** block in the upper left of the **REC-TEC Window** causing the drop-down menu to appear. Place the cursor on the **Momentum** block and click on **Angular Momentum** on the sub-menu to initiate this module.

Under certain circumstances, the user may choose to use the **Files** block instead of the drop-down menu approach. Selecting any file with an **.AMO** extension in the **Dialog box** accessed from either the **Open Single File** or **Open Multiple Files** block opens this module.

Selecting **AutoLoad [ON]** from either the **Setup Menu** or the **AutoLoad Icon** on the upper right side (third line) of the **REC-TEC Window** automatically loads the scenario that was on the screen when the module was closed, either individually, or when the program was closed. With **AutoLoad [OFF]** on the main **REC-TEC Window**, modules will start without loading a file.

Data Entry:

This module contains the following data entry blocks within the leftmost frame:

Mass Moment of Inertia

- **Inertia** - Enter the Yaw Moment of Inertia

Or

- **V1 Length** – Length of Vehicle 1
- **V1 Center to CG** – Distance from Center of Vehicle to CG of Vehicle
- **V1 Width** – Width of Vehicle 1

Plus

- **V1 Weight** – Weight of Vehicle 1

Rotation Point

- **CCW** – Counter-Clockwise Rotation
- **CW** – Clockwise Rotation

- **CG (Hi Spd)** – Rotation about CG (Usually a High Speed Rotation)
- **Axle (Low Spd)** – Rotation about Center of Axle (Usually a Low Speed Rotation)
- **Damage Point** – Select Front or Rear Location Point of Damage

Torque & Rotational Velocity

- **V1 Wheelbase** – Wheelbase of Vehicle 1
- **V1 Weight (A)** – Weight on V1 Axle closest to Centroid of Damage
- **V1 Friction (mu)** – Surface Friction for Tires on Axle closest to Centroid of Damage / All Tires
- **V1 Rangle (Degrees)** – Rotation Angle of Vehicle in degrees
- **V1 Dcom** – (Low Speed Rotation Only) – Distance from the Center of Mass of the vehicle to the Axle farthest from the Centroid of Damage.
- **V1 Moment Arm**
 - **Low Speed Rotation** – a line from (and perpendicular to) the PDOF to the center of farthest Axle from Centroid of Damage (Center of Rotation)
 - **High Speed Rotation** – a line from (and perpendicular to) the PDOF to the Center of Mass (Center of Rotation)

Delta V & Impact Speed

- **V2 Weight** – Weight of V2
- **V2 AAngle (degrees)** – Approach Angle of Vehicle 2
- **V2 DAngle (degrees)** – Departure Angle of Vehicle 4
- **V2 Speed (V4)** – Approach Angle of Vehicle 2

Output:

The output from this module consists of the repeated input variables plus the unknowns that were not entered into the left **Input** frame expressed in the primary and secondary configurations including the solution – **V2 Impact Speed**.

Formulae – Displays the formulae for computing the unknowns in this module. In addition to the basic formulae, the frame shows intermediate steps with the actual input data shown in the computation.

Options:

Several **Command Buttons** appear in a frame located at the lower right corner of the module Window. The **Command Buttons** allow the user to engage options including the option to **Open** and **Save** the data required to generate the scenario shown on the screen at the time the file was saved.

- **Open .AMO File** – Calls up a **Dialog box**, which **Opens** any pre-existing **.AMO** file and displays the output results.
- **Save .AMO File** – Calls up a **Dialog box**, which **Saves** data on the screen to files with any user-selectable filenames. This is independent of the automatic saving as “**LastFile.AMO**” of the data at the close of this module or the close of the program.
- **Graphics** – Graphic display of the vehicle positioned in the **pre impact** and **rest** positions (rotation only). **Translation Motion** is not shown, as it does not enter into the computations. Vectors show PDOF, moment arms and rotation arcs. **[Esc]** to Exit
- **Help File** - The paper “*Motorcycle Speed Estimates Using Conservation of Linear and Rotational Momentum*” is an exceptional discussion of Angular Momentum as applied to accident reconstruction. The paper is used with the express written permission of the authors. **REC-TEC** wishes to express our thanks to them for a job well done and for their gracious permission to use their paper.
- **N** – This button toggles a graphical number pad on the screen that can be used to enter data into the input boxes without using your keyboard number pad. This may be useful for presentations as data entry can be accomplished using a wired/wireless mouse.
- **Iteration / FDA Menu** – Calls up a frame that permits the user to input the minimum and maximum values for selected input variables along with the interval for **Iteration**. If **Finite Difference Analysis (FDA)** is selected, the resulting analysis computes the uncertainty level for the specified range of the input variables.

For a more in-depth description of **Finite Difference Analysis**, see the Finite Difference Analysis Section of this Manual – Press **[F2]** from any Active module of the program.