

## Collision Avoidance – Turning Maneuvers

**Overview:** Computes data on Turn and Lane Change maneuvers, including braking during the turn, and compares different common formulae used in accident reconstruction.

### 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 **Collision Avoidance** block and click on **Turning Maneuvers** 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 a **.CAM** 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:

- **Mu (Deceleration):** – required
- **Grade (Test):** – not required (default is zero)
- **Grade (Scene):** – not required (default is zero)
- **Speed (Initial):** – Speed of vehicle - Computes Distances for Turn and Lane Change Maneuvers **or** (Enter zero to change)
- **Distance (X):** – Distance of **Swerve (X-Axis)** - Computes Initial Speed for Maneuver and Lane Change Distance data
- **Time (Tr):** – Reaction Time
- **Acceleration (Lat):** – Lateral Acceleration factor
- **Lateral Distance:** – Distance CG must move in Lateral Direction.
- **Braking in Turn:** – **Optional** – Percent of braking in Turn (must be less than 100)

### Output:

The output from this module consists of the repeated input variables plus deceleration rates and speeds expressed in the primary and secondary configurations.

The top right frame **From Stop Distance (Dss)** shows the **Maximum Lateral Distance**

along the Y-Axis (for both maneuvers) that can be reached if the maneuver is started from the Slide to Stop Distance on the X-Axis for each of the maneuvers involved.

The left **Turn: (Distance)** and the right **Lane Change: (Distance)** frames show the following:

- **Distance** - X-Axis distance required for the maneuver
- **Hypotenuse** – Straight-line distance from the start of the maneuver to the Y-Axis point at the Lateral Distance
- **Arc Angle** – The angle or combined angles through which the vehicle has traveled in the maneuver
- **Arc Radius** – Radius of the turn(s) required for the maneuver(s)
- **Arc Distance** – Distance traveled by the vehicles following the arc(s) required for the maneuver
- **Arc Time** – Time required for the maneuver if Initial Speed is maintained

**Critical Turnaway** is a **Speed** at which the **Distance Slide to Stop** and the **Distance required** for the **Swerve** (or **Swerve and Return**) maneuver are identical. Again, **Critical Turnaway is a Speed at which two distances are identical**. It is similar to a point of no return.

- **Critical Turnaway Distance** – Distance for both Slide to Stop and Distance required for the maneuver
- **Critical Turnaway Time** – Time required to stop from the Initial Speed
- **Critical Turnaway Speed** – The Speed at which the Distance Slide to Stop and the Distance required for the Swerve (or Swerve and Return) maneuver are identical

#### **Braking (Turn) and Braking (Lane Change) – Optional output**

- **Distance: Distance** covered in the maneuver
- **Time: Time** required for the maneuver
  
- **Speed: Speed (Primary)** at completion of maneuver
- **Speed: Speed (Secondary)** at completion of maneuver

#### **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 .CAM File** – Calls up a **Dialog box**, which **Opens** any pre-existing **.CAM** file and displays the output results.

- **Save .CAM 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.CAM**” of the data at the close of this module or the close of the program.
- **Formulae Comparison** - Toggles a frame displaying the popular formulae for computing the **Distances** related to this module. In addition to the basic formulae, the frame shows intermediate steps with the actual input data shown in the computation. The graphical output is a visual representation of the computed distance.
- **Animation** – by **Time** or **Distance** in real time (1:1) or slow motion. The display shows the Deceleration curve in the upper block and the Swerve (upper middle block) and Swerve & Return (lower middle block). Time (top scale) and Distance (bottom scale) is shown for all three curves. Animation may be stopped and then resumed using the mouse or the spacebar. **[Esc]** to Exit
- **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.
- **FD Analysis** – Calls up a frame that permits the user to input the minimum and maximum values for selected input variables. 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 module of this Manual – Press **[F2]** from any Active module of the program.