Collision Avoidance – Vehicle Following

Overview: Computes speed, time and distance at which a deceleration or evasive maneuver must begin to match the speed of the accelerating, decelerating or constant-velocity lead vehicle.

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 **Vehicle Following** 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 **.CAF** 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:

- **V1 Speed (I) – Following (Bullet) Vehicle at Start of Maneuver**
- **V2 Speed (I) – Leading (Target) Vehicle at Start of Maneuver**
- **RSAVT (Rads/Sec) – Relative Subtended Angular Velocity Threshold in Radians per Second**
- **V2 Dimension – Height or Width Cue for Subtended Angular Rate Change Computation (Height/Width of Trailer or Distance between tail lights**
- **Min Lat. Dist. – Minimum Lateral Distance (Turn / Lane Change)**
- **Separation (I) – Initial Separation Distance Between Vehicle**
- **Acceleration (V1) – Acceleration Factor (X-Axis) if V1 Accelerating (+/-)**
- **Lateral Accel. (V1) – Lateral (Y-Axis) Acceleration Factor - Required**
- **Acceleration (V2) – Acceleration Factor (X-Axis) if V2 Accelerating (+/-)**
- **Maximum Decel. (g) – Maximum Available Deceleration (g)**

Entry of Data is sufficient to generate a solution and causes output information to appear in the **Output** frame. As the input data is changed, the output data is automatically updated without the need to tell the program to update the output. Error Message will be displayed if no Contact is possible for Data entered.

Output:

The output from this module consists of the repeated input variables entered into the left **Input** frame expressed in the primary and secondary configurations.

Lateral Distance/Acceleration Data enables computations on the right side of the screen showing **Turn** and **Lane Change** information.

The top frame heading shows the entered lateral distance. The next two lines show the **Maximum Lateral Distance** along the Y–Axis 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: (Lateral Distance @ f and V1**) and the right - **Lane Change: (Lateral Distance @ f and V1**) frames show the following:

- **Distance(X) -** 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 **Turn** (or **Lane Change**) 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 Turn (or Lane Change) 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 Turn (or Lane Change) maneuver are identical

1 **V1 Dist – Collision: V1 - Distance** to Collision from Time Zero (0)
2 **V2 Dist – Collision: V2 - Distance** to Collision from Time Zero (0)
3 **Time to Collision: Time** to Collision from Time Zero (0)
4 V1 – Dss: Distance to Decelerate from Initial Speed at **Maximum f**
5 V1 – Tss: Time to Decelerate from Initial Speed at **Maximum f**
6 V1 Maximum f: Maximum Deceleration Factor (g)

7 **Max Dec Dist.: Distance Required to match V2 Speed at point of Contact -** Maximum Deceleration (g)
8 **Max Dec Dist.: Time Required to match V2 Speed at point of Contact -**

Maximum Deceleration (g)

9 **V1 @ Max Dec: V1 Speed (Primary) at Maximum Deceleration Start**
10 **V1 @ Max Dec: V1 Speed (Secondary) at Maximum Deceleration Start**
11 **V2 @ V1 MaxD: V2 Speed (Primary) at Maximum Deceleration Start**
12 **V2 @ V1 MaxD: V2 Speed (Secondary) at Maximum Deceleration Start**

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

- **Save .CAF 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.CAF**" of the data at the close of this module or the close of the program.

- **Animation –** The display shows the Deceleration curve in the upper block and the Turn (upper middle block) and Lane Change (lower middle block). Time (top scale) and Distance (bottom scale) is shown for all three curves. Animation may be stopped and resumed using the mouse or the spacebar. **[Esc]** to Exit

- **Tables –** Tables show **f** required to clear (Match V2 Speed) and Closing Speed at Maximum Available Deceleration from Time frame or the Subtended Angle (Radians) and Rate of Change of the Subtended Angel in Radians/second. Both tables display Time in user selectable increment to Point of Contact. Table data includes instantaneous speeds for V1, V2, Closing Speed, required distance for Turn and Lane Change, Separation Distance between Vehicles and Time to Impact and Distance traveled by V1 and V2.

- **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.