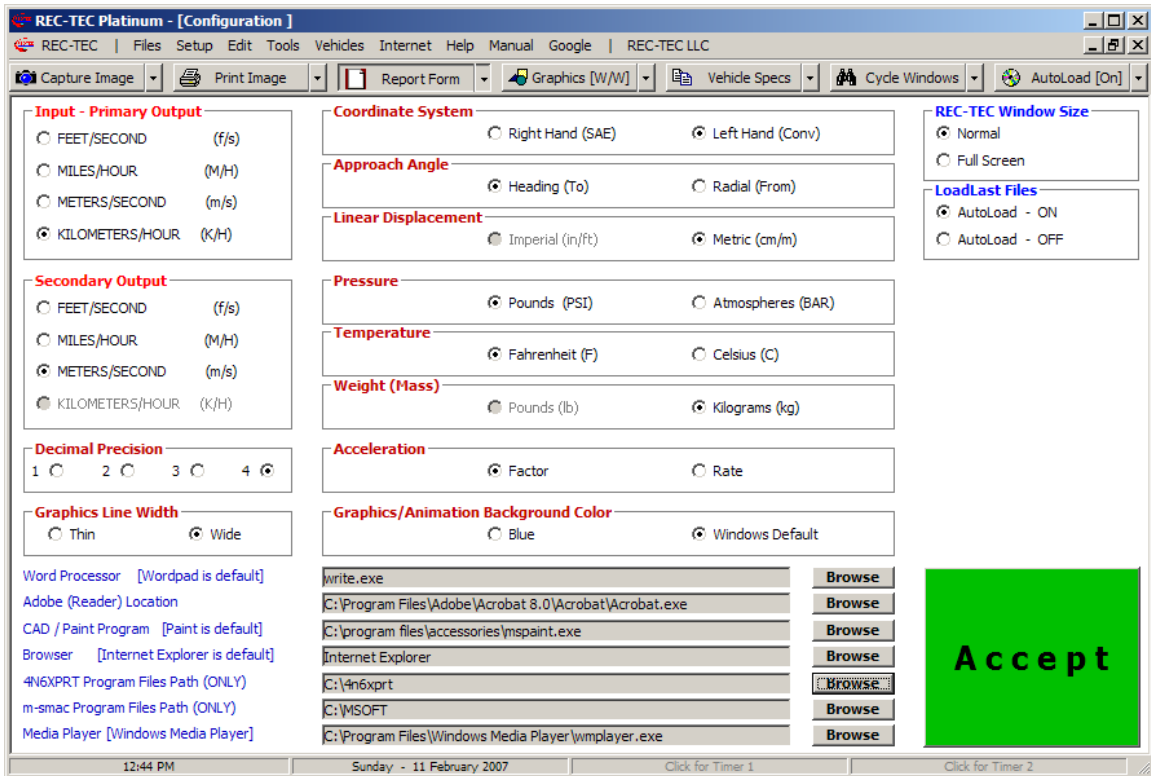
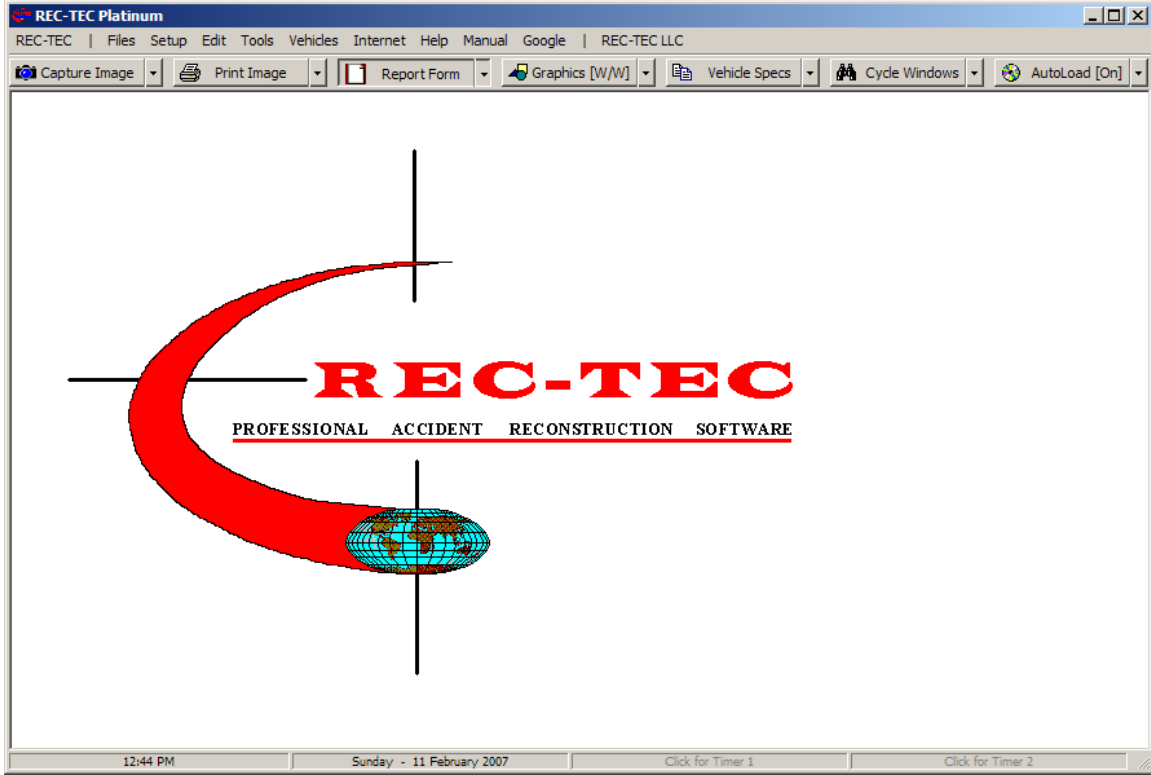


This document shows a Time-Distance problem worked in metric. It also shows parts of the built-in manual (Manual, F1 + F2 keys) that are applicable to this problem, including Finite Difference Analysis.



REC-TEC Platinum - [TDD (1) - Time Distance Deceleration]

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Capture Image Print Image Report Form Graphics [W/W] Vehicle Specs Cycle Windows AutoLoad [On]

**Time Distance - Deceleration**

Mu Surface

Grade Test

Grade Scene

Braking %

**Inputs: (2 of 4)**

Distance m

Time seconds

Speed (Initial) K/H

Speed (Final) K/H

**Optional Input Data**

Lateral Distance m

**Output**

Mu (Surface): .6000

Grade (Test): .0000

f (Level): .6000

Grade (Scene): .0000

Braking (%): 100.0000

f (Drag): .6000

Rate: 21.1896 K/H/s

Rate: 5.886 m/s/s

Distance (Event): 35 m

Distance (Stop): 35 m

Time (Event): 3.4485 seconds

Time (Stop): 3.4485 seconds

Speed (Initial): 73.0738 K/H

Speed (Initial): 20.2982 m/s

Speed (Final): 0 K/H

Speed (Final): 0 m/s

**Given Lateral Distance: 3.7 m**

**Maximum Lateral Distance (Swerve Only):** 9.3782 m

**Maximum Lateral Distance (Lane Change):** 4.4455 m

**Swerve - No Return**

Distance(X): 22.4568 m

Hypotenuse: 22.7596 m

**Arc**

Angle: 18.7120 degrees

Radius: 70 m

Distance: 22.861 m

Time: 1.1262 seconds

**Critical Turnaway**

Distance(X): 13.8085 m

Time: 2.1661 seconds

Speed: 45.8989 K/H

Speed: 12.7497 m/s

**Swerve and Return**

Distance(X): 31.9735 m

Hypotenuse: 32.027 m

**Combined Arcs**

Angle: 26.4487 degrees

Radius: 70 m

Distance: 32.3132 m

Time: 1.5919 seconds

**Critical Turnaway**

Distance(X): 29.13 m

Time: 3.1461 seconds

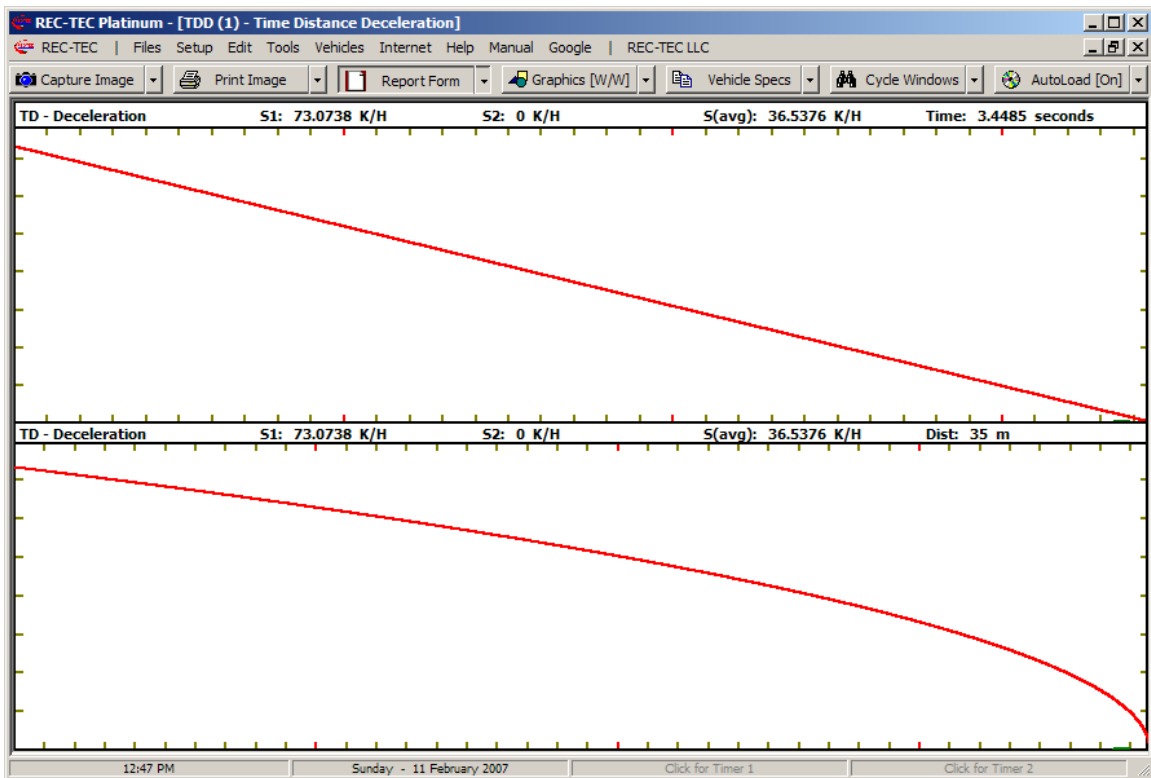
Speed: 66.665 K/H

Speed: 18.518 m/s

**Tables and Graphics/Animation**

Iteration / Finite Difference Analysis Menu

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#### Time Distance - Deceleration

Mu

Grade

Grade

Braking  %

**Inputs: (2 of 4)**

Distance

Time

Speed (Initial)

Speed (Final)

**Optional Input Data**

Lateral Distance

#### Output

Mu (Surface): .6000

Grade (Test): .0000

f (Level): .6000

Grade (Scene): .0000

Braking (%): 100.0000

f (Drag): .6000

Rate: 21.1896 K/H/s

Rate: 5.886 m/s/s

Distance (Event): 35 m

Distance (Stop): 35 m

Time (Event): 3.4485 seconds

Time (Stop): 3.4485 seconds

Speed (Initial): 73.0738 K/H

Speed (Initial): 20.2982 m/s

Speed (Final): 0 K/H

Speed (Final): 0 m/s

#### Formulae

$$T = (\text{Sqr}(\text{Abs}(V_i^2 - f * g * 2 * D)) + V_i) / (f * g)$$

$$T = (\text{Sqr}(\text{Abs}(20.2982^2 - .6 * 9.81 * 2 * 35)) + 20.2982) / (.6 * 9.81)$$

$$3.4485 = (\text{Sqr}(\text{Abs}(412.0169 - .6 * 9.81 * 2 * 35)) + 20.2982) / (.6 * 9.81)$$

$$V_i = \text{Sqr}(V_f^2 + D * f * g * 2)$$

$$V_i = \text{Sqr}(0^2 + 35 * .6 * 9.81 * 2)$$

$$20.2982 = \text{Sqr}(0 + 35 * .6 * 19.62)$$

$$D(s) = \text{Sqr}(2 * L * V_i^2 / (g * A f_y) - L^2)$$

$$D = \text{Sqr}(2 * 3.7 * 20.2982^2 / (9.81 * .6) - 3.7^2)$$

$$22.4568 = \text{Sqr}(2 * 3.7 * 412.0169 / (9.81 * .6) - 13.69)$$

$$D(s+r) = 2 * \text{Sqr}(L * V_i^2 / (g * A f_y) - (L / 2)^2)$$

$$D = 2 * \text{Sqr}(3.7 * 20.2982^2 / (9.81 * .6) - (3.7 / 2)^2)$$

$$31.9735 = 2 * \text{Sqr}(3.7 * 412.0169 / (9.81 * .6) - (3.4225)^2)$$

#### Tables and Graphics/Animation

Iteration / Finite Difference Analysis Menu

REC-TEC Platinum - [TDD (1) - Time Distance Deceleration]

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Capture Image Print Image Report Form Graphics [W/W] Vehicle Specs Cycle Windows AutoLoad [On]

**Time Distance - Deceleration**

Mu Surface 0.6

Grade Test

Grade Scene

Braking % 100

**Inputs: (2 of 4)**

Distance m 35

Time seconds

Speed (Initial) K/H

Speed (Final) K/H 0

**Optional Input Data**

Lateral Distance m 3.7

**Output**

Mu (Surface): .6000

Grade (Test): .0000

f (Level): .6000

Grade (Scene): .0000

Braking (%): 100.0000

f (Drag): .6000

Rate: 21.1896 K/H/s

Rate: 5.886 m/s/s

Distance (Event): 35 m

Distance (Stop): 35 m

Time (Event): 3.4485 seconds

Time (Stop): 3.4485 seconds

Speed (Initial): 73.0738 K/H

Speed (Initial): 20.2982 m/s

Speed (Final): 0 K/H

Speed (Final): 0 m/s

**Iteration/FD Menu**

FD	I - Var	Minimum	Maximum	Interval
<input checked="" type="radio"/>	f/Rate	0.55	0.65	0.01
<input type="radio"/>	Distance	33	37	0
<input type="radio"/>	Time	0	0	0
<input type="radio"/>	Speed (I)	0	0	0
<input type="radio"/>	Speed (F)	0	0	0

**Solve for:**

Initial Speed [K: D and S2]

Final Speed [K: D and S1]

Dist + Time [K: S1 and S2]

Send to Document

Iteration Tables

Cancel Finite Difference Analysis

**Tables and Graphics/Animation**

Iteration / Finite Difference Analysis Menu

Animation Graphics

Formulae Formulae\*

Open .TDD File Save .TDD File

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REC-TEC Platinum - [TDD (1) - Time Distance Deceleration]

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Capture Image Print Image Report Form Graphics [W/W] Vehicle Specs Cycle Windows AutoLoad [On]

**Time Distance (Deceleration) Tables** Copy Image to Report

Minimum: .5500 Maximum: .6500 Interval: 0.01

mu (Surface)	Distance	Time	Stop (Dist)	Stop (Time)	Dist (Srv)	Dist (S+R)	Initial Speed	Final Speed
.5500	35.0000	3.6019	35.0000	3.6019	22.4568	31.9735	69.9628	.0000
.5600	35.0000	3.5696	35.0000	3.5696	22.4568	31.9735	70.5960	.0000
.5700	35.0000	3.5381	35.0000	3.5381	22.4568	31.9735	71.2235	.0000
.5800	35.0000	3.5075	35.0000	3.5075	22.4568	31.9735	71.8455	.0000
.5900	35.0000	3.4776	35.0000	3.4776	22.4568	31.9735	72.4622	.0000
.6000	35.0000	3.4485	35.0000	3.4485	22.4568	31.9735	73.0738	.0000
.6100	35.0000	3.4201	35.0000	3.4201	22.4568	31.9735	73.6802	.0000
.6200	35.0000	3.3925	35.0000	3.3925	22.4568	31.9735	74.2817	.0000
.6300	35.0000	3.3654	35.0000	3.3654	22.4568	31.9735	74.8783	.0000
.6400	35.0000	3.3390	35.0000	3.3390	22.4568	31.9735	75.4702	.0000
.6500	35.0000	3.3132	35.0000	3.3132	22.4568	31.9735	76.0576	.0000

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REC-TEC Platinum - [TDD (1) - Time Distance Deceleration]

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Capture Image Print Image Report Form Graphics [W/W] Vehicle Specs Cycle Windows AutoLoad [On]

**Time Distance (Deceleration) Tables**

**Finite Difference Analysis**

Speed (I) 73.0738 K/H      Uncertainty (+/-) = 3.6951 K/H

	Variable	Nominal	Value	Speed (I)	Difference	Difference^2	Average	Square Root
High:	Friction (Mu)	.6000	0.65	76.0576	2.9838	8.9032		
Low:	Friction (Mu)	.6000	0.55	69.9628	-3.1110	9.6780	9.2906	
High:	Distance	35	37	75.1326	2.0588	4.2387		
Low:	Distance	35	33	70.9552	-2.1186	4.4881	4.3634	
High:	Time		0	73.0738	.0000	.0000		
Low:	Time		0	73.0738	.0000	.0000	.0000	
High:	Speed (I)		0	73.0738	.0000	.0000		
Low:	Speed (I)		0	73.0738	.0000	.0000	.0000	
High:	Speed (F)	0	0	73.0738	.0000	.0000		
Low:	Speed (F)	0	0	73.0738	.0000	.0000	.0000	
<b>Sum</b>							13.6541	3.6951

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## REC-TEC MANUAL

### Overview of the REC-TEC program

Use the [F1] key to initiate information on a specific section whenever it is the active REC-TEC screen.

Use the [F2] key for an in-depth description of **Finite Difference Analysis** from program sections having **FDA**.

Use the [F3] key for program sections creating **Animation Output Files** and how to create them in each section.

Use the [F4] key for website **Videos** on creating high-resolution **Animations** from the **REC-TEC Animation Output Files**.

[F5] **Private** key for Platinum and Plus users.

### General

- Light gray Input blocks indicate **Optional** Data that need not be entered.
- **Select** an individual Input block by Clicking on it.
- Use [Arrow] keys or [Enter] to negotiate input blocks.

- Use **[Tab]** for negotiating **Command Options**.
- Highlight data in any **Textbox** (green color) and **Copy** it using the right mouse button (menu) or **[Ctrl][C]** and **Paste** it using the right mouse (menu) button or **[Ctrl][V]**.

### Graphics and Animation Commands

- **Mouse(1) plus Mouse Movement:** Draws on Picture (Graphics or Animation) - Erase with Mouse(2).
- **SpaceBar or Mouse(2):** Re-Draw (Graphics or Animation) and Pause/Resume (Animation)
- **Esc or Mouse (both Buttons or Button 4 - Clicking Scroll Wheel):** Toggles screen (full/inset) or Kills Graphics/Animation

**Note:** Mouse commands are sensitive to Cursor position. Cursor must be on **Picture** area but not on **Text** sections.

### Animation Output Files

- The following sections automatically create .CVS compatible output files in both **Comma** delimited (\*C.asc) and **Space** delimited (\*S.asc) formats. These files are compatible with Hi-Resolution Animation software such as **Forensic3D**:
  - **m-smacRT** – (both vehicles) – **Automatic on RUN**
  - **Collision Avoidance Following** – (both vehicles) – **Created with Table** (Set Time Interval as .033)
  - **Collision Avoidance Passing** – (both vehicles) - **Automatic on Computation**
  - **Time-Distance Multiple Vehicles** – (both vehicles) - **Created with Time Table** (Set Interval as .033)
  - **Time-Distance Acceleration - Created with Time Table** (Set Interval as .033)
  - **Time-Distance Deceleration - Created with Time Table** (Set Interval as .033)
  - **Time-Distance Multiple Events - Created with Time Table** (Set Interval as .033)
  - **Time-Distance Multiple Surfaces - Created with Time Table** (Set Interval as .033)
  - **S-CAM II Air Brakes Surfaces - Created during Simulation** (Set Interval as .033)
  - **Motion Analysis (3D) - Created with DATA table**
  - **Vault – Airborne (3D) - Created during Animation**
  - **Vault-Slide Integration (3D) - Created during Animation**

- The files can be viewed by going to **Files** on the main toolbar on **REC-TEC** and selecting **Animation Files**.
- Corresponding Output files, some offering additional information, are viewed using the **Output Files** selection.

#### **CRUSH Text files for CAD conversion to .dxf files:**

- **Vehicle1.ASC and Vehicle2.ASC** – These files are text files that most CAD programs can import and convert to **.dxf** files. This will allow the user to export files with the damage profiles and vector data as they appear in this section for direct conversion to **.dxf** files. If vehicle data from **AutoStats** or **Autostats Lite** is imported into **CRUSH**, those vehicles, drawn to scale with scale damage, can be exported and converted. These files are created when the **Graphics** are displayed.
- These files can be viewed by going to **Files** on the main toolbar on **REC-TEC** and selecting **Crush Vehicle Text Files**.

#### **Entry into a Section:**

A section 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 specific section on the menu or sub-menu to initiate the section.

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

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 section was closed, either individually, or when the program was closed. With **AutoLoad [OFF]** on the main **REC-TEC Window**, sections will start without loading a file.

If a section seems to be locked and is not generating data, exit out of the section and set **AutoLoad [OFF]** using the icon on the Main screen. Open a new copy of the section in question and either enter the required data or load an example file.

#### **Printing Reports (Text & Graphics)**

**Note:** Use the Graphics Icon on the Toolbar to set the Graphics Background Color (Blue or Windows Default) and Line Width that best suits your needs.

**Quick and Easy** - Print each individual Image using the Printer Icon or assemble a professional looking document in Microsoft Word or WordPad.

**Print Image:**

- Use the Print Icon to print the "Captured" Image or the active **REC-TEC** form.

**Assemble a Report using Microsoft Word or WordPad - (Automated Process)**

- Use the arrow next to the Report Form Icon and Click on "Start New Word/WordPad Document (Integrated)"
  - Once the Document opens, minimize Word/WordPad or use **[Alt][Tab]** to send it to the back, bringing **REC-TEC** to the front.
- Click the Report Form Icon to transfer a "Captured" Image or the active **REC-TEC** screen (Default if no captured Image).
  - Minimize Word/WordPad and repeat above step as necessary to complete Document.
  - Use the features in Word/WordPad to open/insert files, add text or data, manipulate the images, finalize, name and save the document file.

**Other Text Editors and Word Processors**

**Assemble a document in a word processor or text editor - (Manual Process)**

- Select the word processor (configured using the **REC-TEC Setup** form) by clicking on Tools on the Main Menu Bar.
- Toggle **[Alt][Tab]** the word processor and **REC-TEC** program bringing **REC-TEC** to the front.
- Select an individual text or graphics screen using the steps outlined above under Main Menu Bar, the Capture Image Icon or the selections provided in the small arrow to the right of the Icon to "Capture" the specific image required.
- Toggle **[Alt][Tab]** the word processor and **REC-TEC** program bringing the word processor to the front.
- Position the cursor at the location where the Image will be pasted.
- Select "Edit" and then "Paste" on the word processor Main Menu Bar.
- Repeat steps 2 through 6 until all of the required **REC-TEC** information (including screens or documents from the Internet) is incorporated into the document.
- Information from other Windows compatible programs may also be "Captured" and "Pasted" into the document being prepared.



- Individual users may also want to create a template document that can be used as a Master Report Form that can be called up in the word processor and used to create future reports.

## **Iteration Tables / Finite Difference Analysis**

**[F2]** from any active Section starts a word processor with a more in-depth description of **Finite Difference Analysis**.

**Iteration/FDA** Command Buttons call up the frames permitting the user to input minimum and maximum values for selected input variables along with the interval for **Iteration** (Table Generation). 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 Section of the program.

## **Time Distance – Deceleration**

**Overview:** Computes detailed information on the Speed, Distance and Time of a single deceleration event. If lateral information is input, the section also computes detailed swerve and swerve-and-return data.

### **Entry into Section:**

This section 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 **Time - Distance** block and click on **Deceleration – Single Surface** on the sub-menu to initiate this section.

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

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 section was closed, either individually, or when the program was closed. With **AutoLoad [OFF]** on the main **REC-TEC Window**, sections will start without loading a file.

## Data Entry:

This section 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**)
- **Braking (%) – required**
- **Distance**
- **Time**
- **Speed (Initial)**
- **Speed (Final)**
- **Lateral Distance (Optional for Swerve / Swerve and Return)**

Entry of Deceleration, Grade and Braking plus two of the four remaining variables in the data boxes 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. The user is instructed to decrease the inputs if three or more variables are input.

## Output:

The output from this section consists of the repeated input variables plus all of the unknowns that were not entered into the left **Input** frame expressed in the primary and secondary configurations. If the deceleration either as entered, or as computed, was not to a final speed of zero, the times and distances are shown for both the event as defined with the input variables and to a stop.

## Optional Output:

If a **Lateral Distance** is entered, three additional Frames will appear on the right side of the screen showing **Swerve** and **Swerve & Return** 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 (**Swerve – No Return**) and the right (**Swerve and Return**) 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

### Options:

Several **Command Buttons** appear in a frame located at the lower right corner of the section 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 .TDD File** – Calls up a **Dialog box**, which **Opens** any pre-existing **.TDD** file and displays the output results.
- **Save .TDD 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.TDD**” of the data at the close of this section or the close of the program.
- **Formulae** – Opens a word processor (set by the user in **Setup**) with a file showing the basic formulae use in this section of the program. While the user may add to or modify the information in this file, it does not change the formulae imbedded into the program.
- **Formulae\*** - Toggles a frame displaying the formulae for computing the unknowns in this section. In addition to the basic formulae, the frame shows intermediate steps with the actual input data shown in the computation.
- **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 resumed using the mouse or the spacebar. **[Esc]** to Exit

- **Graphics** – Displays the graphics curves for Time (with scales) on the upper half and Distance (with scales) on the lower half of the screen. The right and left scales show the Speed. [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.
- **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 Section of the program.

## **Finite Difference Analysis**

**Overview:** Computes an “Uncertainty Level” based on a specific range of the variables within a formula.

Use the [F1] key to initiate information on a specific section whenever it is the active REC-TEC screen.

Use the [F2] key for an in-depth description of **Finite Difference Analysis** from program sections having **FDA**.

**Iteration Tables / Finite Difference Analysis** – Calls up a frame permitting 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.

**Iteration Tables** and **Finite Difference Analysis** are generally tied together in the same frame and called by a **Command** button.

**Iteration** requires entry of a **Minimum**, **Maximum** and an **Interval** for generating the **Table**. **Finite Difference Analysis** requires a **Minimum** and **Maximum** for the range but does not use an **Interval**.

Many of the forms offer choices that will define the output of both the **Tables** and **Finite Difference Analysis**.

The **Fall/Vault – Airborne** section permits a choice of **Given** or **Optimum** angle for the output but this choice applies only to the tables. **Take-Off** angle is input directly into the menu for **FDA** and that **Minimum/Maximum** is used for the computations.

The **Time/Distance – Deceleration** section can solve for Initial Speed, Final Speed or Time & Distance while keeping other variables as constants for Iteration depending upon the **Iteration Variable (I-Var)**. Inputs shape the choice of **Variables** subject to Finite Difference Analysis (**FD**).

The **360 Linear Momentum** section permits **Iteration** for **one** or **two** variables. Variable selections (buttons) have no influence on the Finite Difference Analysis computations.

**Note 1:** The **dV1 Lat, dV2 Lat, dV1 Lng** and **dV2 Lng** entries create highlights in the Iteration tables showing when these variables are outside of an acceptable range.

**Note 2:** **FDA** allows for inputs for all four angles and this approach has been used in some **SAE** papers on the subject. **Angle A1** effectively changes each of the other three angles (**A2, A3** and **A4**) by whatever range is used for **A1**, as the internal computations are accomplished for **A1** by shifting variables **A2** through **A4** allowing **A1** to be placed on the zero (**0**) degree axis, eliminating it from the computation. If **A1** is used with any of the other angles, it double dips the effect of ranging the other angles used by giving them too much weight in the computations.

#### Operation of FDA

In the **FDA** computations, the formula for each unknown (solution) is run twice. It is run with the **Minimum** value for one of the variables in the equation and then run again using the **Maximum** value for that variable. The result for each computation is then compared to the **Nominal** value for the solution. The mathematical difference is then squared (removing the negative sign). These two squared terms are then averaged to obtain the **Average Squares (Avg Sqrs)** for this particular variable.

This process is continued for all of the variables within the formula using the **Minimum** and **Maximum** values as input by the user. The average squares are then added together and the square root of that sum is obtained. The square root (+/-) is the **Uncertainty** value for the **Solution** based on the ranges used for the computations.

The selected **range** (minimum/maximum) for a given variable in Finite Difference Analysis should be based on the confidence level for that particular variable. A confidence level of **95%** for **each** of the **minimum/maximum** variables results in the **uncertainty** computed for the **solution** at the **95%** confidence level. If the confidence level is mixed for the input variables, then the solution uncertainty has no reliable confidence level other than that of the lowest confidence level variable used in the computation.

SAE paper 2003-01-0489 *Evaluating Uncertainty in Accident Reconstruction with Finite Differences* by Wade Bartlett and Al Fonda compares Finite Difference Analysis with the “Monte Carlo” type of computations done by various high-powered statistics programs on the market. For the same given ranges of the variables involved, the answers are identical.