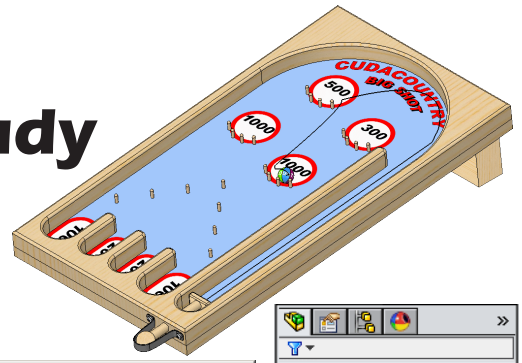
# Chapter 14

## Big Shot
# Motion Study




## A. Enable SolidWorks Motion.

Step 1. If necessary, open your **Big Shot Assembly** file.

Step 2. If necessary, turn on SolidWorks Motion. To turn on SolidWorks Motion, click **flyout of Options** on the Standard toolbar and click **Add-Ins**.

Step 3. Check **SolidWorks Motion** check box under **Active Add-Ins** and **Start-Up**, **Fig. 1**. Click OK.

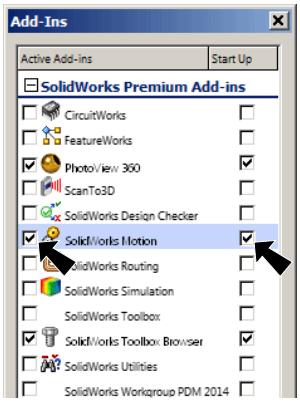



Fig. 1

## B. Confirm Two Mates Suppressed.

Step 1. **Expand Mates** in the Feature Manager and confirm the 2 mates are SUPPRESSED. The mates should be grayed out, **Fig. 2**.

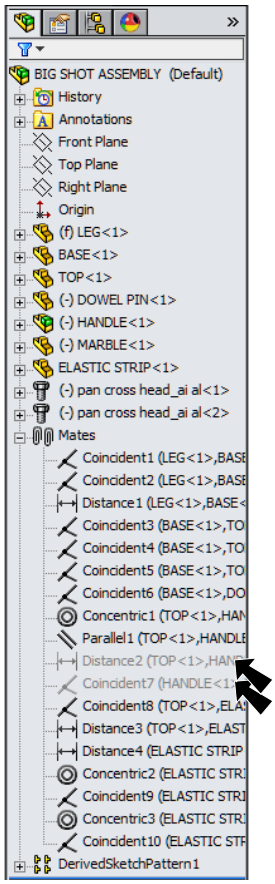



Fig. 2

Step 2. Click **Trimetric** on the Standard Views toolbar.

Step 3. Zoom in around **Handle and Marble**, **Fig. 3**. To zoom, place cursor over the area and spin the wheel on mouse back. While spinning the wheel keep cursor on the area where you want to zoom.

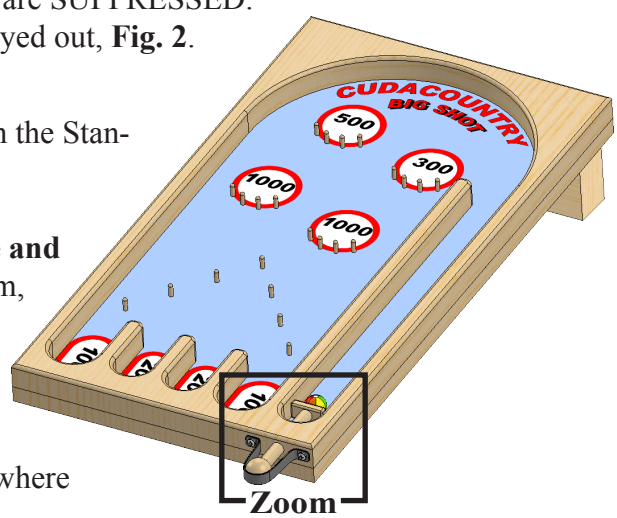



Fig. 3

## C. Type of Study.

Step 1. Click **Motion Study 1** tab at the lower left of the graphics area, **Fig. 4**.

Step 2. Set Type of Study to **Motion Analysis**, **Fig. 4**.

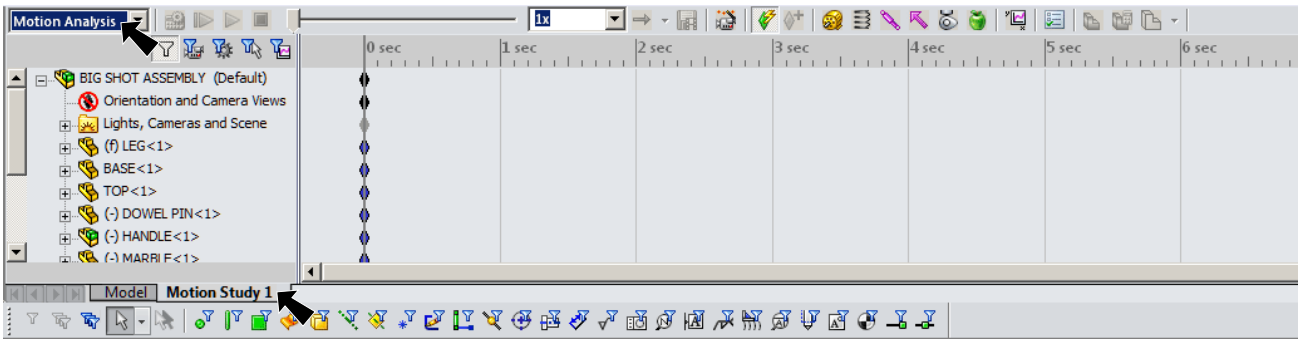



Fig. 4


© Cudacountry.net Tech Ed
http://www.cudacountry.net email:cudacountry@hotmail.com

## D. Add Motor.

Step 1. Click **Motor** on the Motion Manager toolbar, **Fig. 5**.

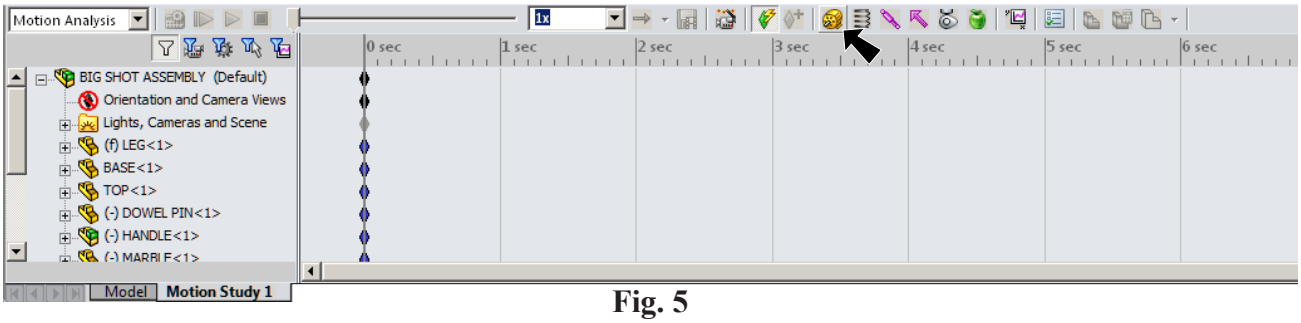



**Fig. 5**

Step 2. In the Motor Property Manager set:

under Motor Type, **Fig. 6**

select **Linear Motor**

under Component/Direction

for Motor Location click **cylindrical face of Rod**, **Fig. 7**

Motor Direction

direction arrow should point to rear, if positioned in opposite direction click **Reverse Direction**, **Fig. 7**

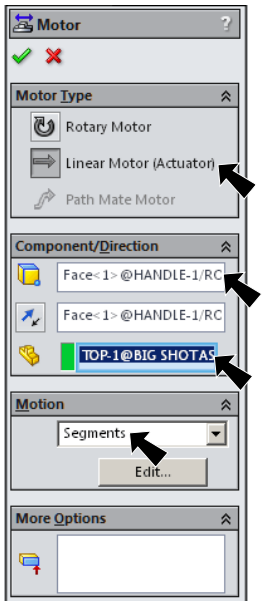



**Fig. 6**

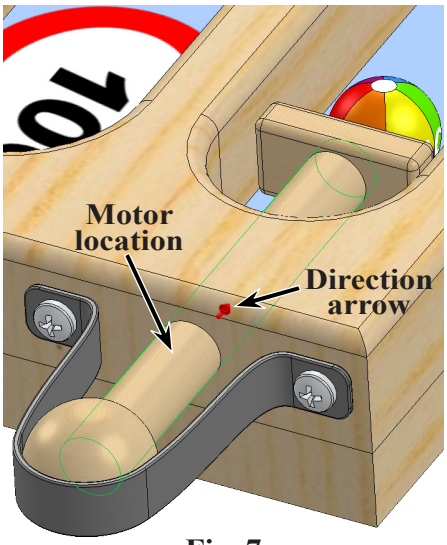



**Fig. 7**

click in **Component to Move Relative to** box, **Fig. 6**

click the **Top**, **Fig. 8**

under Motion

for Function select **Segments**, **Fig. 6**

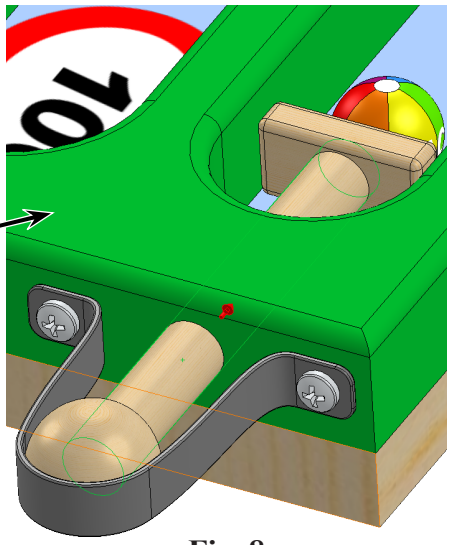



**Fig. 8**

Step 3. In the Function Builder dialog box set, **Fig. 9**
Value (y): **Velocity** (in/s)

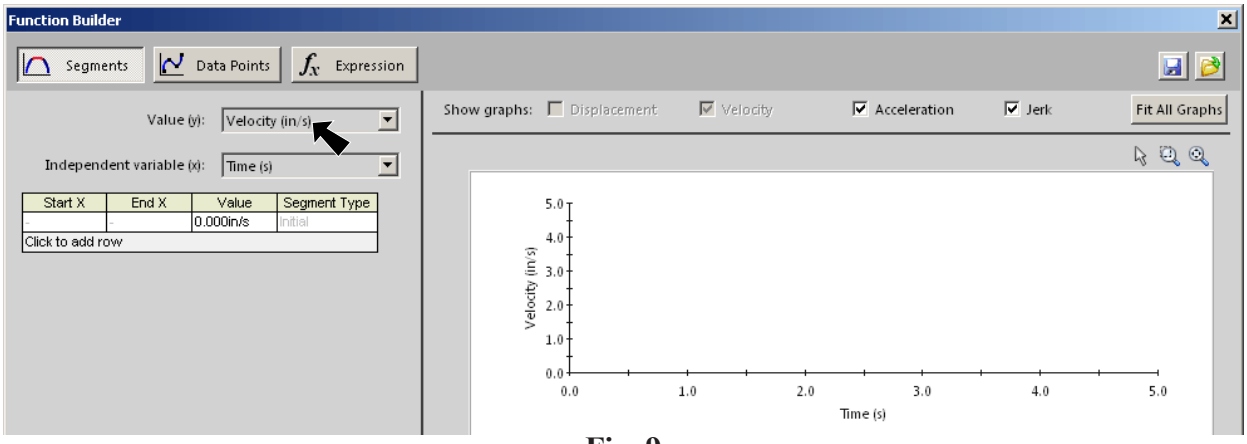



**Fig. 9**

Step 4. **Segment 1** in the Segments chart, **Fig. 10**
click **Click to add row**

under **End X** in new row
key-in **.001**
under **Value**
key-in **65**

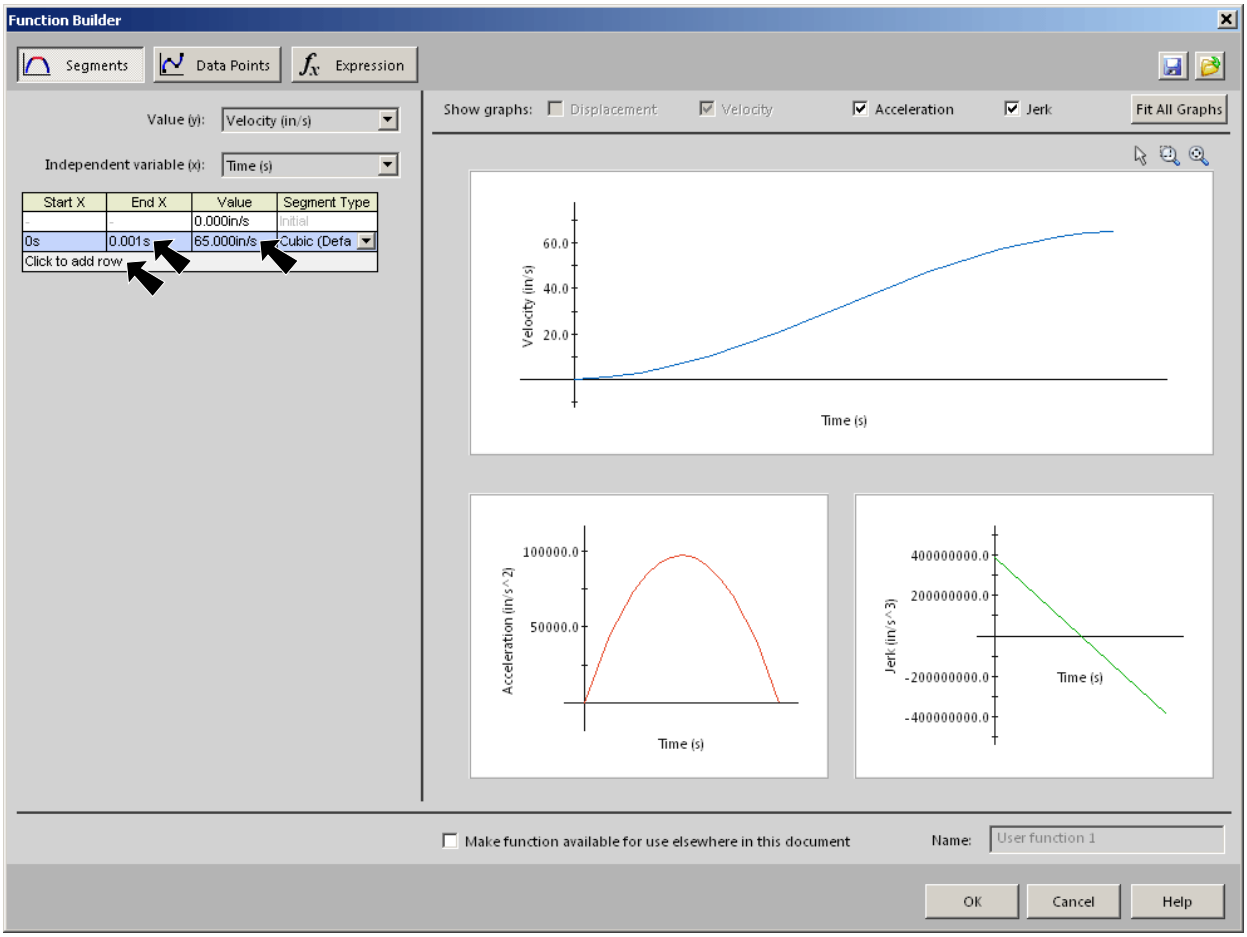



**Fig. 10**

Step 5. **Segment 2**, **Fig. 12**

click **Click to add row**

under **End X** in new row

key-in **.002**

under **Value**

key-in **0**

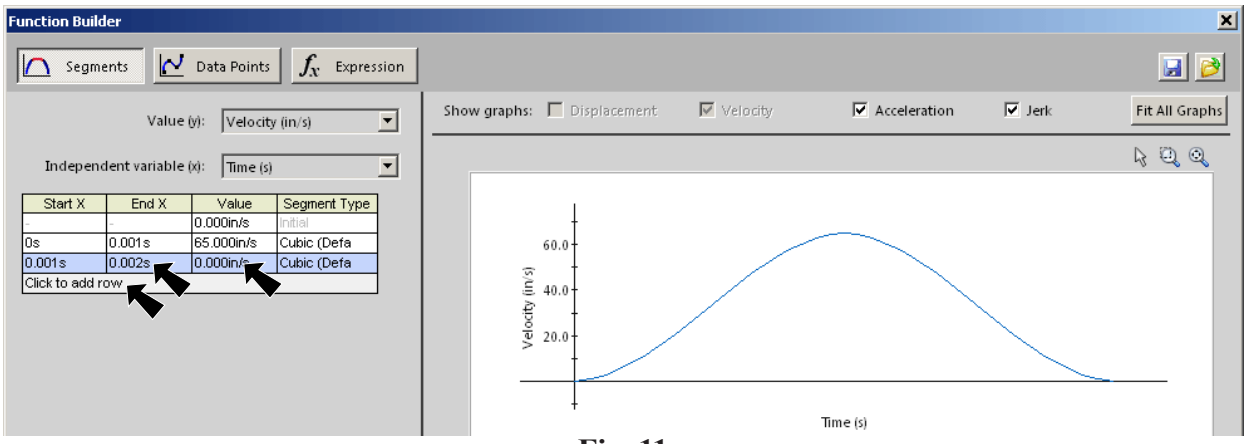



**Fig. 11**

Step 6. **Segment 3**, **Fig. 13**

click **Click to add row**

click **OK** in Function Builder and click OK in Motor Property Manager.

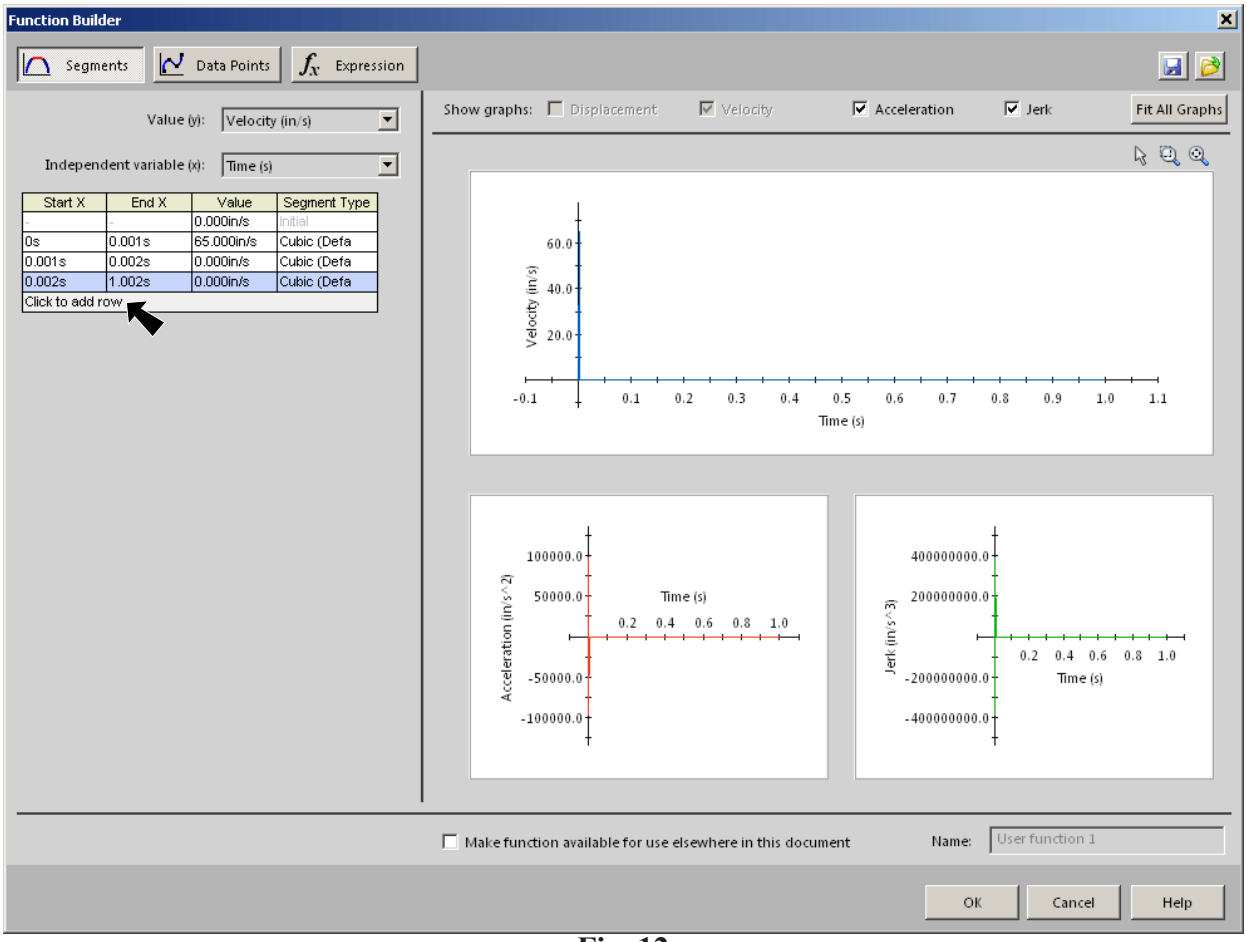



**Fig. 12**

## E. Contact.

Step 1. Click **Contact** on the Motion Manager toolbar, **Fig. 13**.

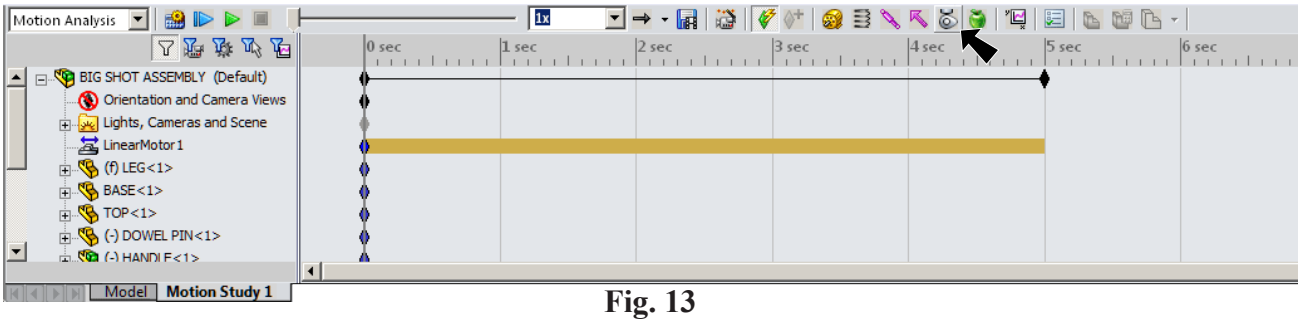



Fig. 13

Step 2. In the Property Manager set:

expand **Selections**, **Fig. 14**

check **Use contact groups**

in **Group 1** box expand the flyout Feature Manager design tree and click **Marble**, **Fig. 15**

click in **Group 2** box, **Fig. 14** in the flyout Feature Manager, expand **Derived Sketch Pattern1** **Shift click first Dowel Pin and last Dowel Pin** to select all, **Fig. 16**

**Ctrl click Base, Top, and Handle**

uncheck **Material**, **Fig. 14**

under Friction

**Dynamic Friction Velocity** $v_k$ **.4**

**Dynamic Friction Coefficient** $\mu_k$ **.1**

uncheck **Static friction**

click OK ✔.

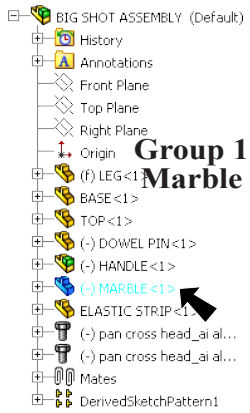



Fig. 15

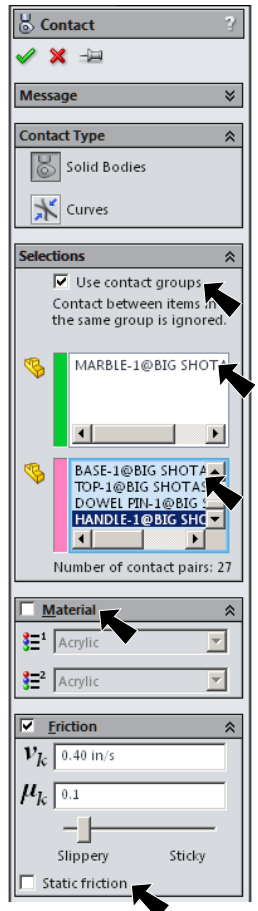



Fig. 14

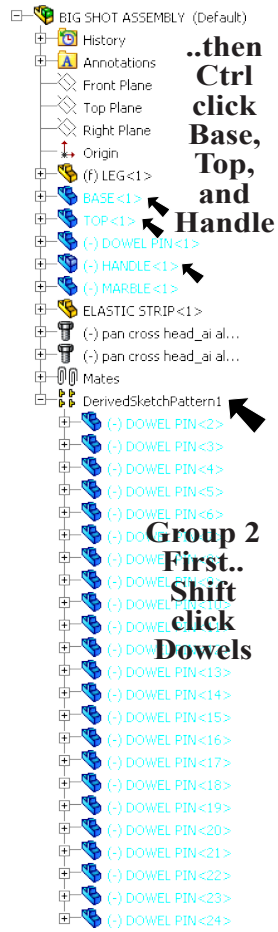



Fig. 16

Step 3. Save. Use **Ctrl-S**.

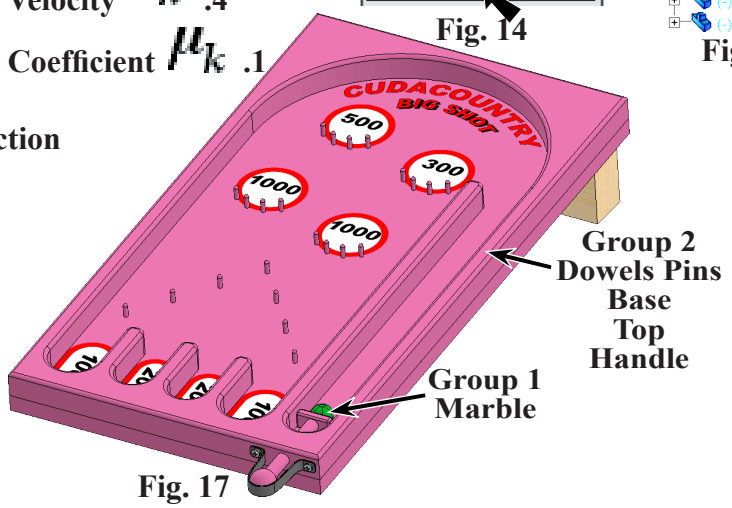



Fig. 17

## F. Gravity.

Step 1. Click **Gravity** on the Motion Manager toolbar, **Fig. 18**.

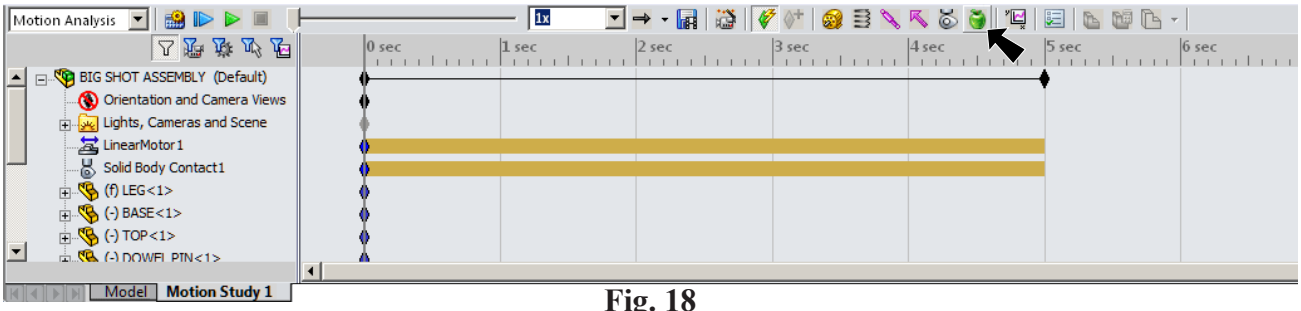



**Fig. 18**

Step 2. In the Gravity Property Manager set:

under Gravity Parameters, **Fig. 19**

select **Y**

the **green arrow** in the bottom right corner of the graphics area should **point down**, **Fig. 20**

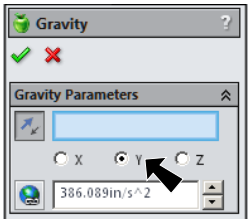



**Fig. 19**

click OK .

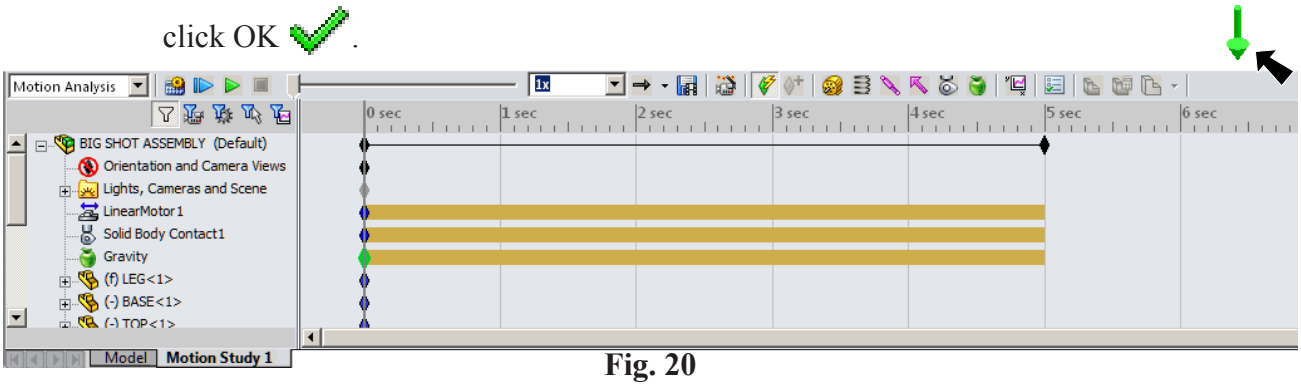



**Fig. 20**

Step 3. Save. Use **Ctrl-S**.

## G. Motion Study Properties.

Step 1. Click **Motion Study Properties** on the Motion Manager toolbar, **Fig. 21**.

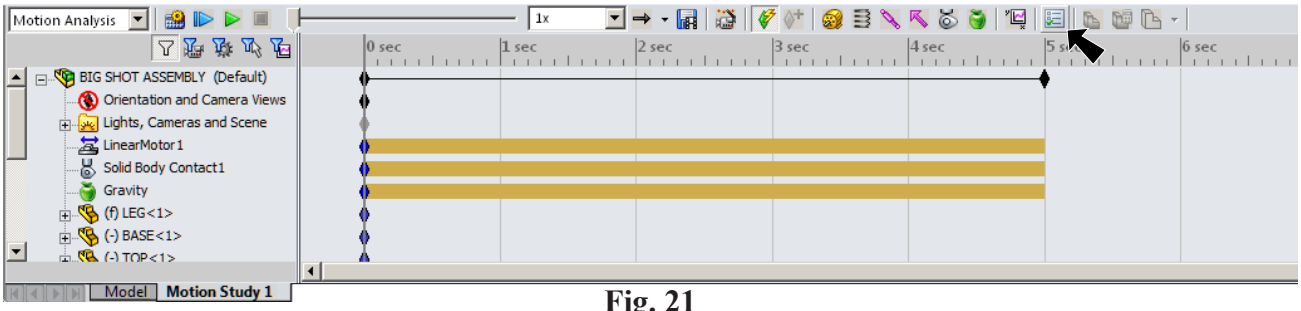



**Fig. 21**

Step 2. In the Property Manager set:

under Motion Analysis, **Fig. 22**

**Frames per second: 250**

check **Use Precise Contact**

under Accuracy

**drag slider down to .1**

click **Advanced Options** button

under Advanced Motion Analysis Options, **Fig. 23**

Integrator Type **WSTIFF**

click OK

click OK in the Motion Study Properties Manager.

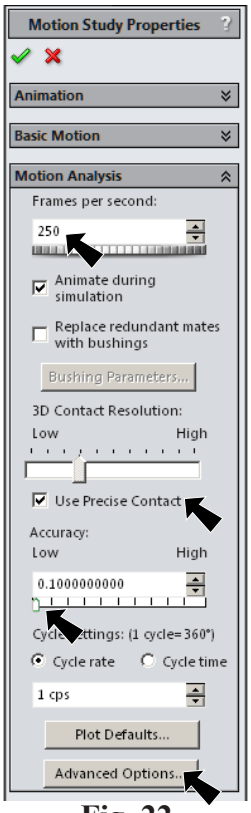



**Fig. 22**

Step 3. The WSTIFF solver will work best for this type of study.

Step 4. Save. Use **Ctrl-S**.

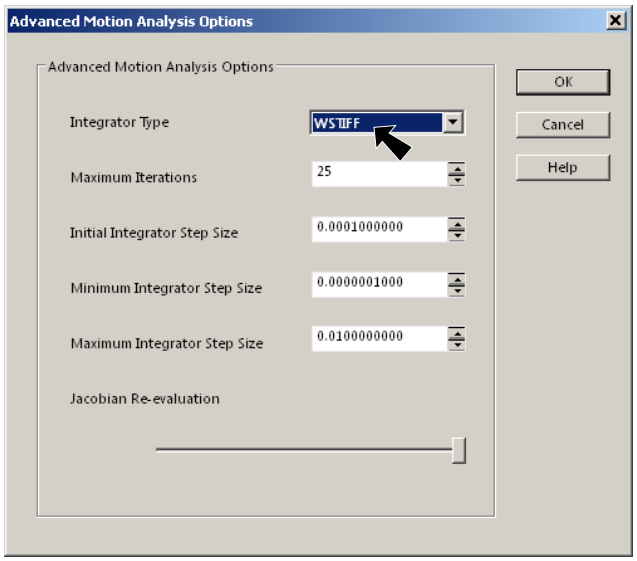



**Fig. 23**

## H. Disable Playback View Keys.

Step 1. **Right click** **Orientation and Camera Views** in the Motion Manager design tree and click **Disable Playback of View Keys**, **Fig. 24**. Disabling View Keys will allow viewing Motion Study from any view.

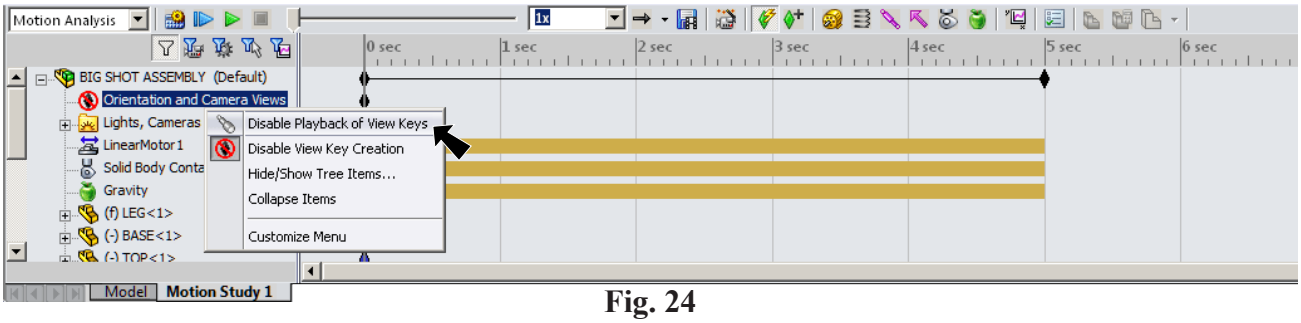



**Fig. 24**

## I. Duration 2.4.

Step 1. **Set the Motion Study duration to 2.4** seconds on the Timeline. To change duration, in the top Timeline drag the **Key Point** **at 5 seconds to 2.2 seconds**, **Fig. 26**.

Step 2. Set the **Playback Speed** to **.1**, **Fig. 26**.

Step 3. Save. Use **Ctrl-S**.

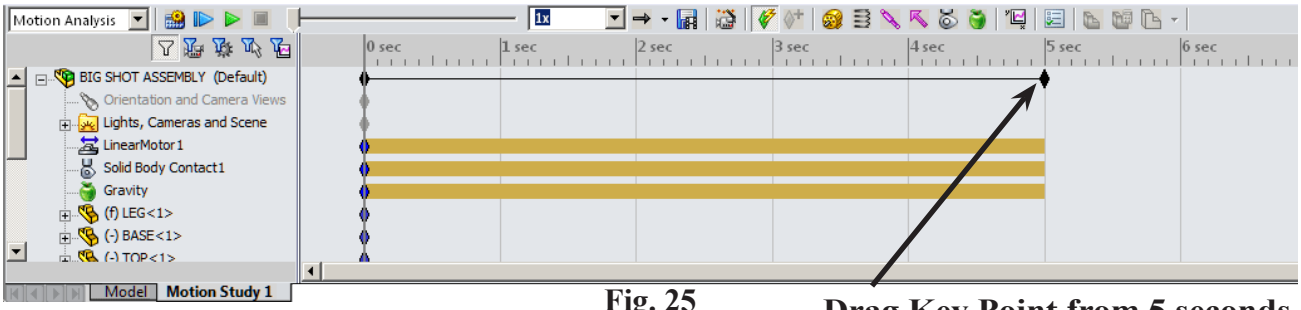



**Fig. 25**

**Drag Key Point from 5 seconds to .5 seconds**

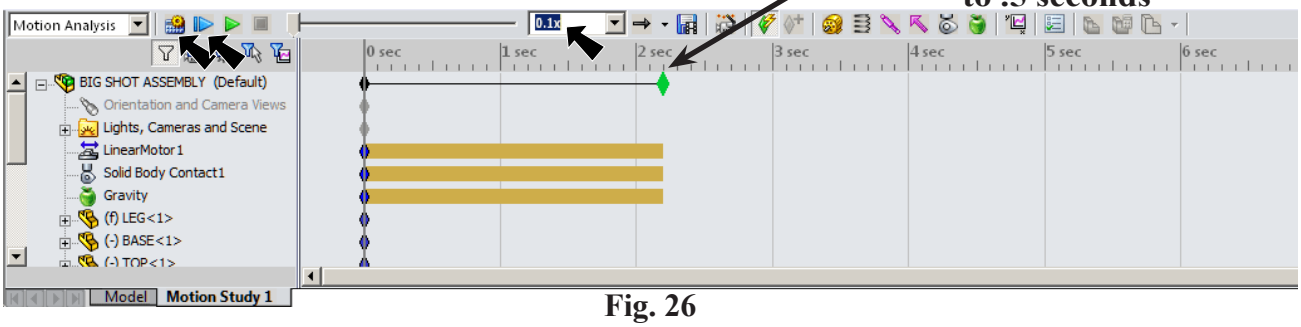



**Fig. 26**

## J. Calculate and Play.

Step 1. Click **Calculate** on the Motion Manager toolbar, **Fig. 27**.

Step 2. You can Stop the study calculating at any time or when the Marbles scores!

Step 3. Click **Play from Start** on the Motion Manager toolbar, **Fig. 27**. The motor velocity of 65 in/s should score **500 points**!

Step 4. Save. Use **Ctrl-S**.

Step 5. **Rewind Motion Study to 0 seconds.** To rewind, either **drag the Play Head** back to the beginning in the Motion Manager toolbar or **drag the Time Bar**, the gray vertical line back to 0 in the Timeline, **Fig. 27**. It's good practice to rewind before you make changes in the Timeline, otherwise you could create unwanted Keys.

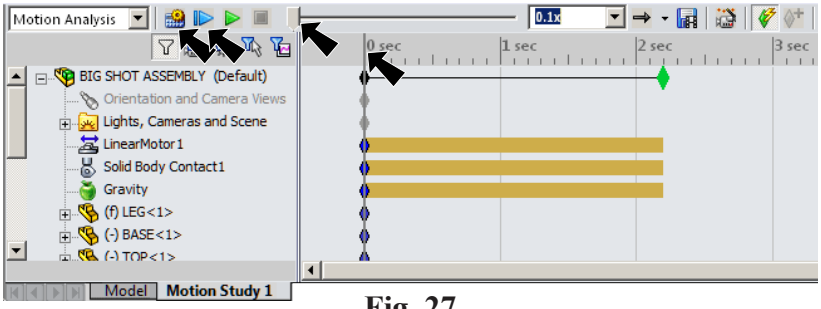



Fig. 27

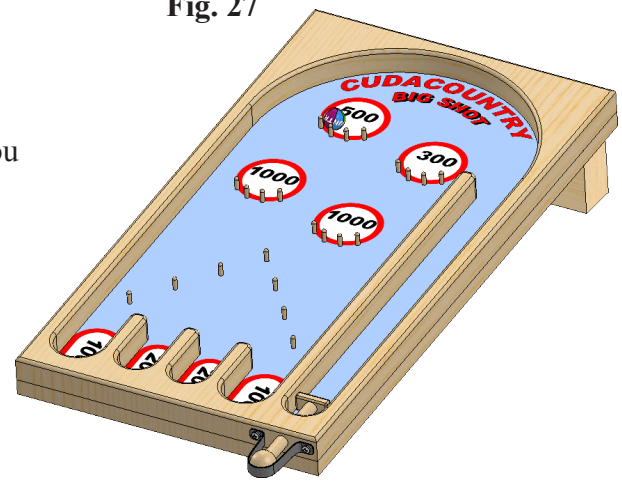



Fig. 28

## K. Adjust Motor Value to Score 1000 pts.

Step 1. **Double click Key Point** ♦ at **Time = 0** in the **LinearMotor1** Timeline, **Fig. 29**.

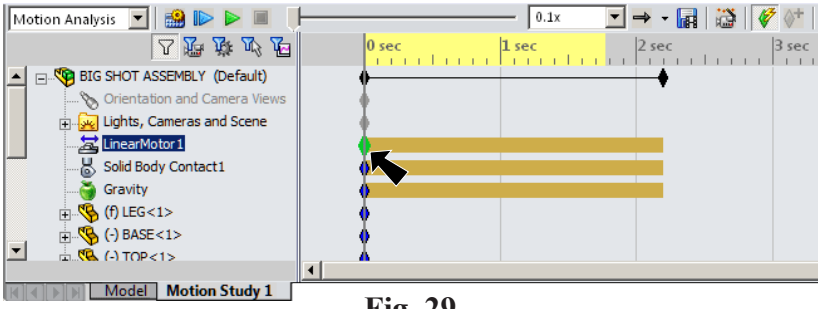



**Fig. 29**

Step 2. In the Motor Property Manager set:
under Motion
click **Edit** button,
**Fig. 30**.

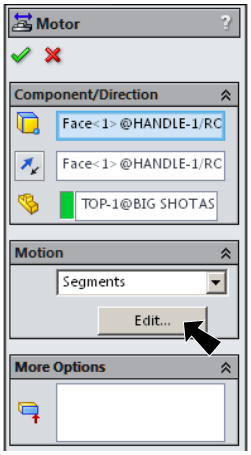



**Fig. 30**

Step 3. In the Function Builder dialog box set, **Fig. 31**
in **Segment 1** in the Segments chart
under **Value**
change Value to **??? you'll have to figure this one out!**

click **OK** and click OK ✔ in the Motor Property Manager.

Step 4. Click **Calculate** and **Play from Start** on the Motion Manager toolbar.

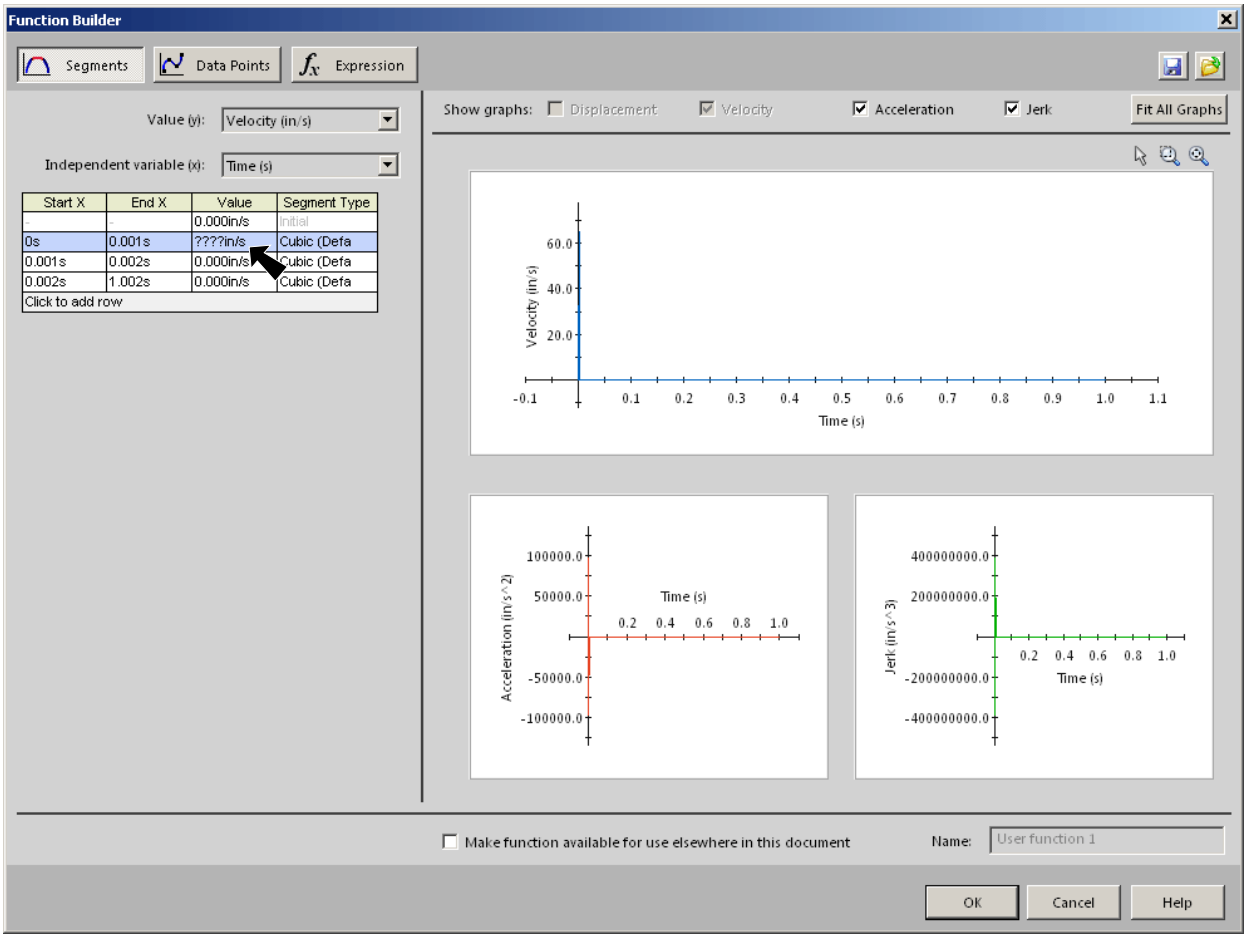



**Fig. 31**

## L. Results and Plots.

Step 1. Click **Results and Plots** on the Motion Manager toolbar, **Fig. 32**.

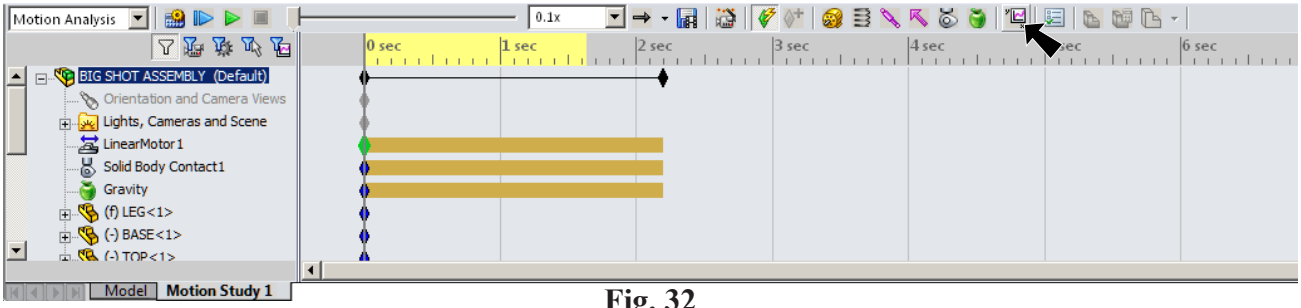



**Fig. 32**

Step 2. In the Property Manager set:

under Result, **Fig. 33**

Category **Displacement/Velocity/ Acceleration**

Sub Category **Trace Path**

for Feature

expanded flyout Feature Manager design tree, expand **Marble** and click **Origin**, **Fig. 34**

click OK .

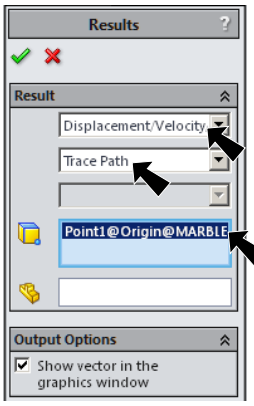



**Fig. 33**

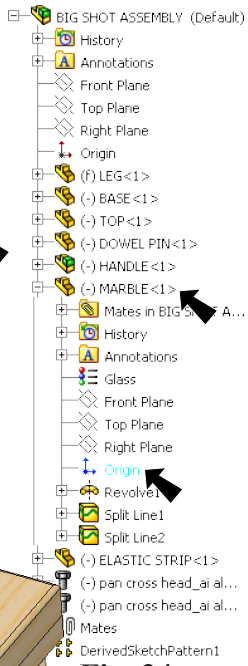



**Fig. 34**

Step 3. Click **Calculate** and **Play from Start** on the Motion Manager toolbar.

Step 4. Save. Use **Ctrl-S**.

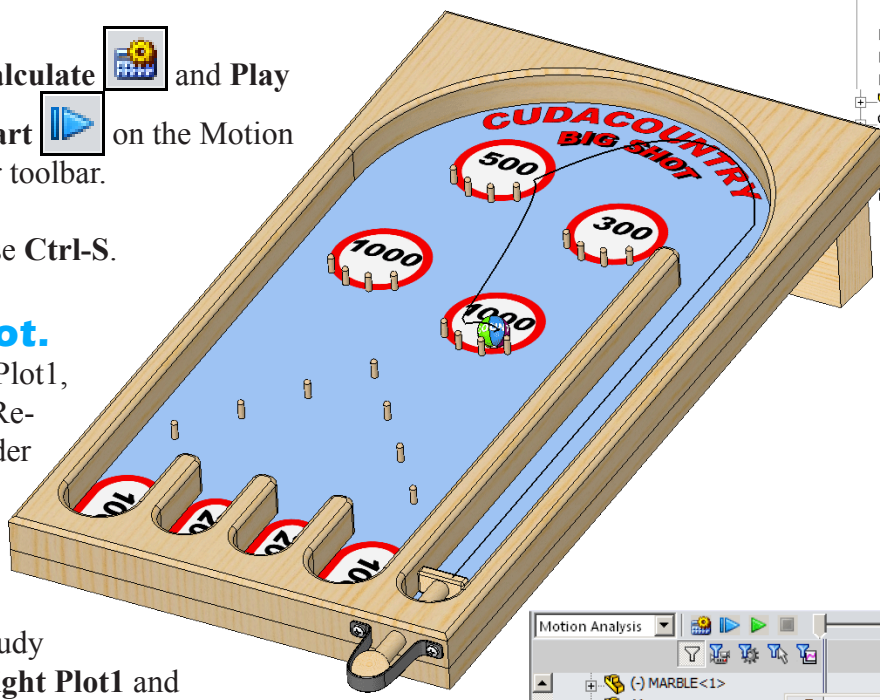



**Fig. 35**

## M. Hide Plot.

Step 1. To hide Plot1, expand Results folder at the bottom of the Simulation Study Tree. **Right Plot1** and click **Hide Plot** from menu, **Fig. 36**.

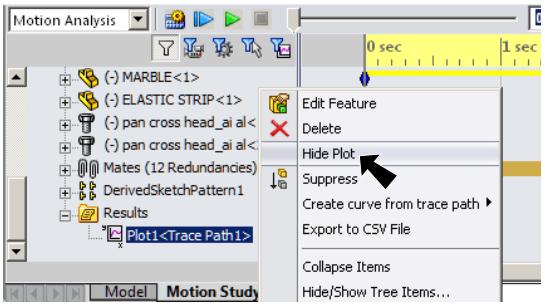



**Fig. 36**