Altair HyperView 2019 Tutorials

HV-3080: Creating Linear Superposition Loadsteps
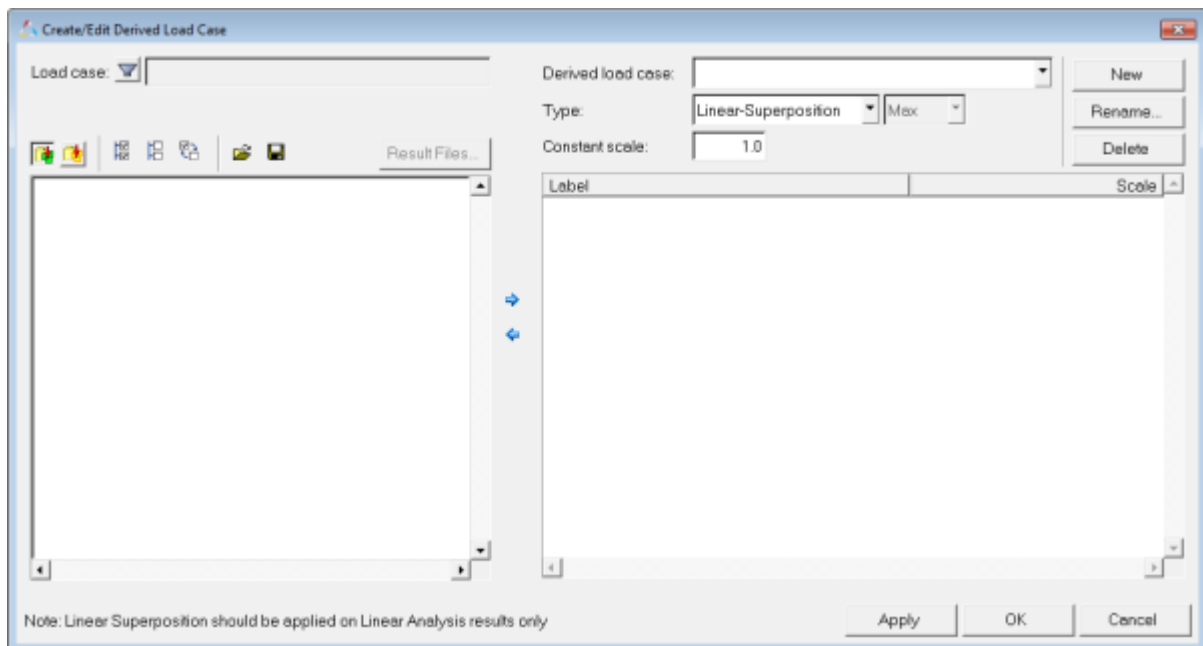
HV-3080: Creating Linear Superposition Loadsteps

In this tutorial, you will learn how to:

- Create a linear superposition loadstep from existing loadsteps
- Contour a linear superposition loadstep

Tools

To access the linear superposition loadstep utility, you can use one of the following methods:

- Right-click in the **Results Browser** and select *Create > Derived Load Case > Linear-Superposition*.

  OR

- Click the **Derived Load Cases** button 🔻 on the **Result** toolbar and set the **Type** to *Linear-Superposition*.

  OR

- Select *Results > Create > Derived Load Steps* from the menu bar and set the **Type** to *Linear-Superposition*.

This utility allows you to create linear superposition loadsteps using existing loadsteps and their simulation steps. Linear superposition loadsteps are saved to the session file. Using this utility, you can also create derived loadsteps and envelope loadsteps.

Exercise: Creating Linear Superposition Loadsteps

This exercise uses the results files `bezel.h3d` and `bezel_iter2.h3d`.

Step 1: Create a derived loadstep.

1. Load the `bezel.h3d` file, located in the `animation` folder, as both the model and results files.

2. From the **Results Browser**, right-click and select *Create > Derived Load Case> Linear-Superposition*.

    All existing loadsteps and corresponding simulations are listed.
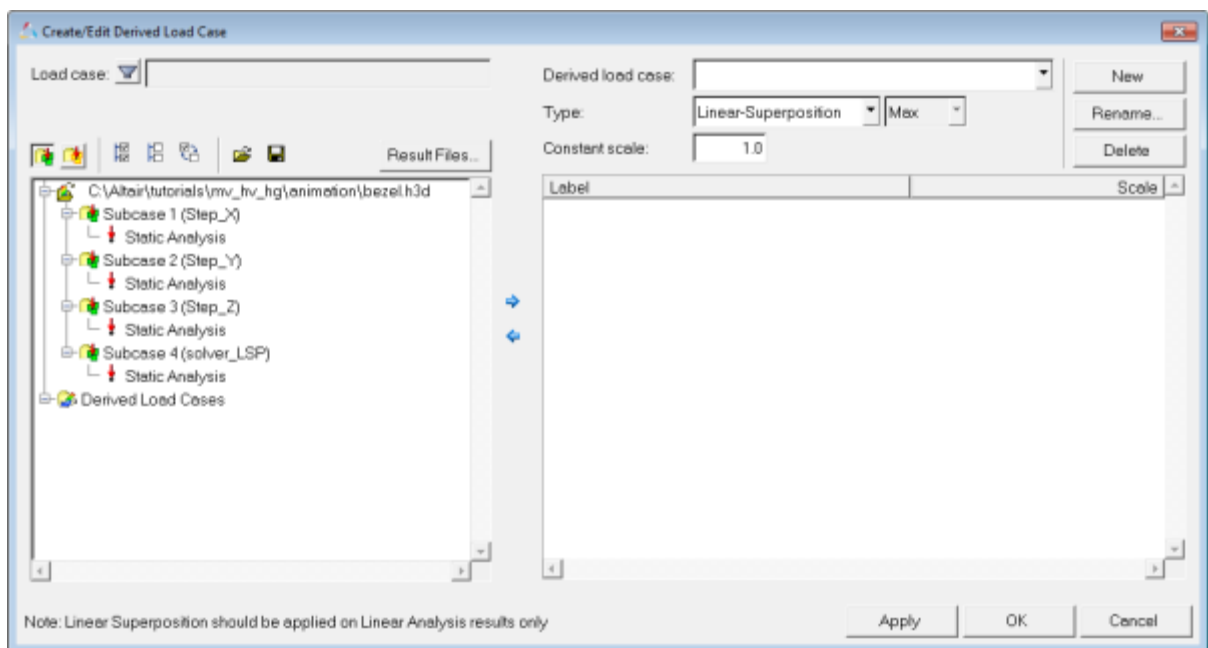
3. Select *Subcase 1 (Step_X)*, *Subcase 2 (Step_Y)*, and *Subcase 3 (Step_Z)* from the list of loadsteps on the left.

4. Click the right arrow button 🡒 , to append these selected loadsteps to the new linear superposition loadstep.

5. From the derived loadstep table (located on the right side of the dialog), highlight the row containing *Subcase 1 (Step_X): Static Analysis*.

6. Enter `-0.22` into the **Constant scale***:* field and press ENTER on the keyboard.

7. Repeat steps 5 and 6 for the rows containing **Subcase 2 (Step_Y): Static Analysis** and **Subcase 3 (Step_Z): Static Analysis**, using a scale value of `1.37` and `0.55`, respectively.

   A different scale is applied to each simulation in the linear superposition loadstep.
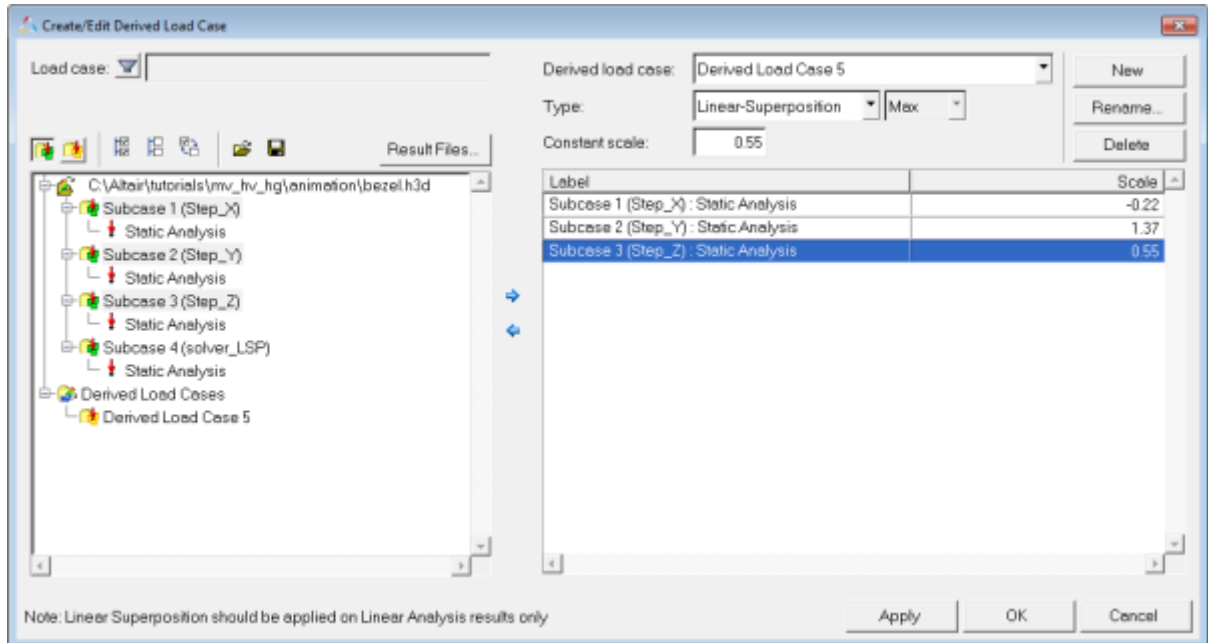
8. Verify that the **Type** field is set to ***Linear-Superposition***.

9. Click ***Apply*** to create the linear superposition loadstep.

10. Click on the ***Rename*** button.

11. Type `HyperView_LSP` in the **Rename** dialog and click ***OK***.

12. Click on the 🔘 button, to view the linear superposition loadstep that was created.

    Highlighting **HyperView_LSP** will display the three loadsteps which were used to create the linear superposition loadstep in the derived loadstep table area.

13. Click on the 🔘 button, to view the initial loadsteps in the results file.

14. Click ***OK***.

Step 2: Contouring the linear superposition loadstep.

1. From the **Results Browser**, use the **Change load case** drop-down menu to set the load case to *HyperView_LSP*.
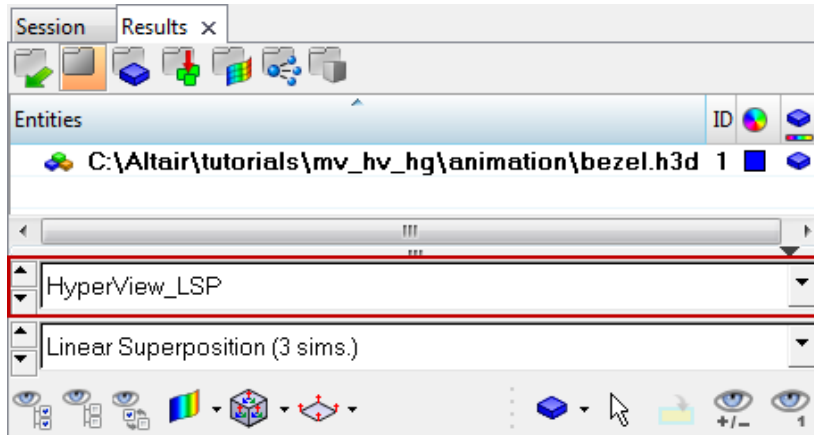
> **Note** The **Results Browser** can be turned on or off using the *Browsers > HyperView > Results* option located within the **View** pull-down menu.
>
> The **Change load case** toolbar visibility can also be toggled on/off using the **Configure Browser** option (located in the **Results Browser** context menu).

2. Expand the **Plot Styles** folder and click on the icon next to **Default Contour**. By default the displacement magnitude is contoured.

    Observe the contour displayed in the graphics area.
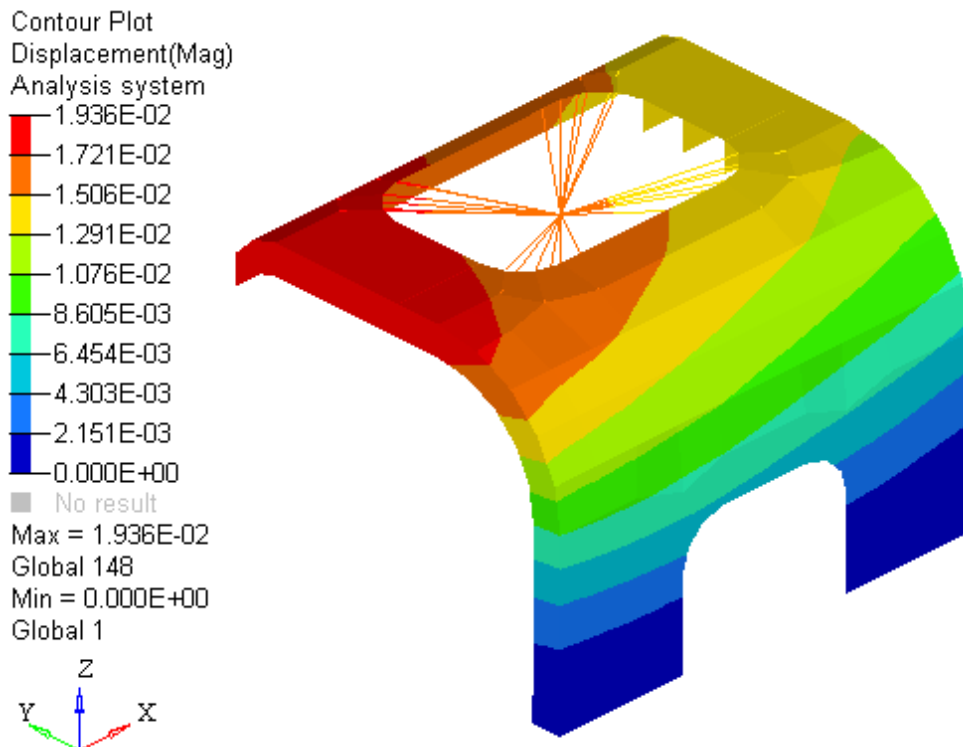
3. Repeat steps 1 - 3 by selecting ***Subcase 4 - solver_LSP*** instead of **HyperView_LSP**.

   Subcase 4 - solver_LSP contains results from the analysis. This subcase was set up as a combination of the loads applied in **Subcase 1**, **Subcase 2**, and **Subcase 3** according to the following linear superposition equation:

   ```
   Subcase 4 = -0.22 *(Subcase 1) + 1.37 *(Subcase 2) + 0.55 *(Subcase 3)
   ```

   Notice that neither the contour nor the min and max values in the legend changed when switching between **Subcase 4 - solver LSP** and **HyperView_LSP**. This shows that HyperView calculated the same results in the linear superposition **HyperView_LSP loadstep** as given by the solver.

   Note   Averaging can be applied to the results that are calculated in a linear superposition loadstep.

             The vector and tensor panels can be used to review vectors and tensors from a linear superposition loadstep.

Step 3: Adding simulation steps from another file.

1. From the **Results Browser**, expand the ***Load Cases*** and then the ***Derived Load Cases*** folders.

2. Right-click on ***HyperView_LSP*** and select ***Edit*** from the context menu.

3. Click on the ***Result Files*** button, to add loadsteps and simulations from another result file.

4. In the **Update Result Files** window, browse and select the result file ***bezel_iter2.h3d***.

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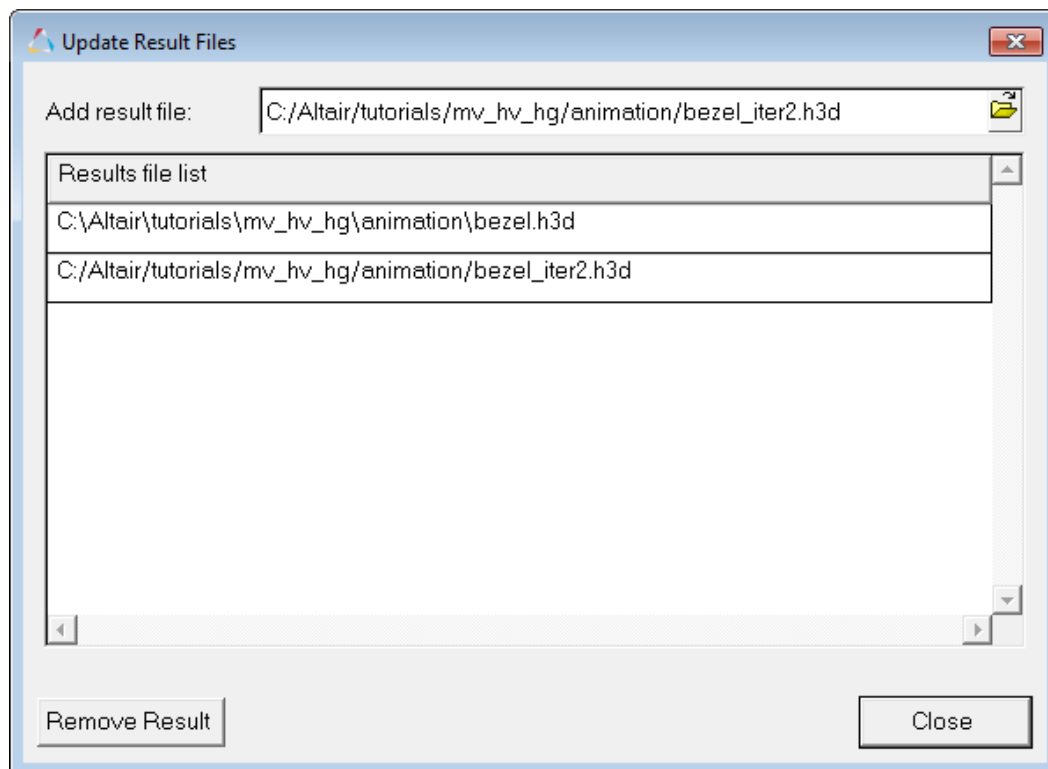
5.   Click **Close**.
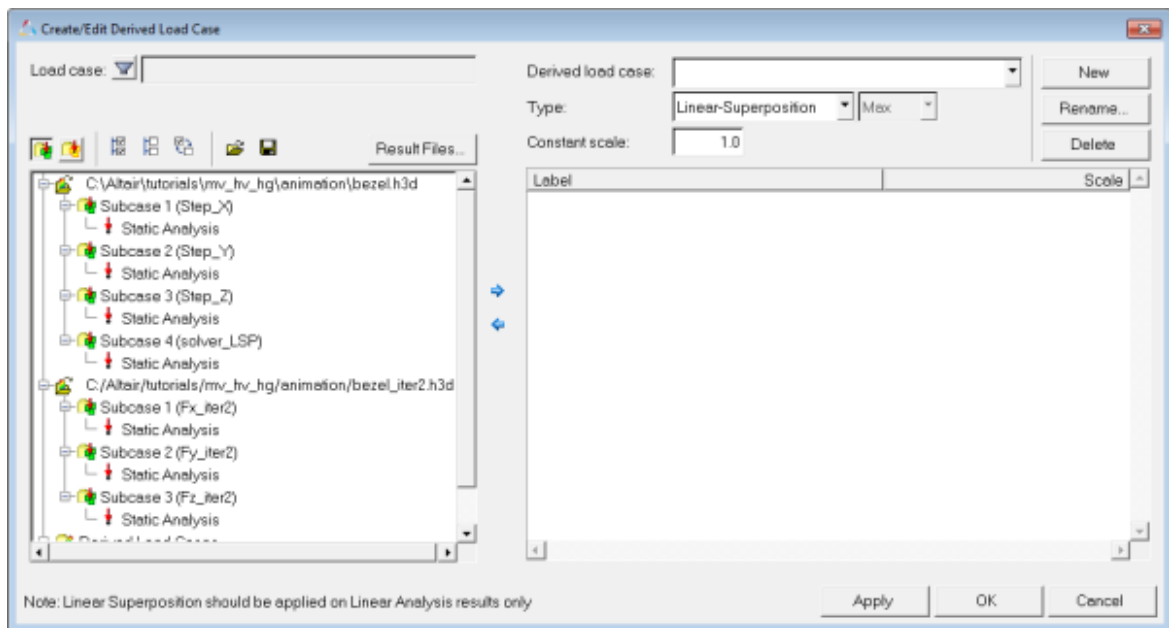
The loadsteps and simulations from the second results file will be added to the list of available loadsteps and simulations and can be used in creating derived loadsteps, linear superposition loadsteps, and envelope loadsteps.