

Altair MotionView 2019 Tutorials

MV-3040: Durability and Fatigue Tools

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MV-3040: Durability and Fatigue Tools

In this tutorial, you will learn how to:

- Convert results from a multi-body simulation run into file formats which can be used for fatigue analysis using a tool like NCode
- Write a fatigue analysis file from the MotionView animation window (HyperView)

Tools

The following functionalities are used in this tutorial: *Fatigue Prep*, *Flex File Gen*, and *build plots*.

The *Fatigue Prep* feature can be accessed by:

• On the *Flex Tools* menu, click *Fatigue Prep*.

7 Fatigue Prep - Sele	ct Translation Type	
Select translator type:	REQ to RPC	[
This wizard guides you t Convert: ALTAIR .H3D ALTAIR .H3D NCODE .DAC ADAMS .RES ADAMS .REQ	hrough the following types of file translations To: NCODE .FES NCODE .ASC ALTAIR .ABF NCODE .DAC NCODE .DAC	
MSOLVE .PLT ADAMS .REQ	NCODE .DAC MTS .RPC	
	< Back Next >	Finish Cancel

This panel translates the following files:

Original Format	Translated Format	
Altair .H3D flexbody (modal content)	Ncode .FES/.ASC	
Ncode .DAC	Altair .ABF	
ADAMS .RES (modal participation factors)	Ncode .DAC	
ADAMS .REQ files (loads information)	Ncode .DAC	
Altair .PLT	Ncode .DAC	
ADAMS .REQ files (loads information)	MTS .RPC	



The *Flex File Gen* feature can be accessed by:

• On the *Flex Tools* menu, click *Flex File Gen*.

2	Flx File Gen		
	This flx file requires *.gra (for rigid body graphics), *res (for rigid and flex results) and N *.h3d files (flexbodies). There are several optional statements to reduce the size of flx file which in turn helps in faster animations. Clicking "OK" creates the *.flx file which can be opened in the animation window.		
	Save the flx file as:	2	
	Number of Flexbodies:	1	
	Select model source (*.gra):	2	
	Select result source (ASCII *.res):	2	
	Select flexible body source (*.h3d):	🗃 ID:	
		OK Cancel	

The **Flex File Gen** feature allows you to create an .flx file using the **Flex File Gen** tool. This file references a .gra file (rigid body graphics), a .res file (flex and rigid body results), and .H3D files (flexbody graphics). These files are required to animate ADAMS results that contain flexbodies. The .flx file can be loaded directly into the animation window.

The **build plots** feature can be accessed by:

• Go to the HyperGraph client, and click the **build plot** icon, $\mathbf{\tilde{I}}^{\star}$.

The **Build Plots** panel constructs multiple curves and plots from a single data file. Curves can be overlaid in a single window or each curve can be assigned to a new window. Individual curves are edited using the **Define Curves** panel.

Step 1: Using the Fatigue Prep Wizard.

- 1. Start a new MotionView session.
- 2. Select the **MBD Model** window.



3. From the *FlexTools* menu, select *Fatigue Prep*.

7 Fatigue Prep - Sele	ect Translation Type	
Select translator type:	REQ to RPC	[
Convert: ALTAIR .H3D ALTAIR .H3D NCODE .DAC ADAMS .RES ADAMS .REQ MSOLVE .PLT ADAMS .REQ	To: NCODE .FES NCODE .ASC ALTAIR .ABF NCODE .DAC NCODE .DAC NCODE .DAC NCODE .DAC NCODE .DAC NCODE .DAC NCODE .RPC	
	< Back Next >	Finish Cancel

Fatigue Prep Wizard

The form shown above, describes the set of file translations possible using the **Fatigue Prep** wizard.

- 4. Use the drop-down menu to select the *H3D to FES* option.
- 5. Click **Next**.
- 6. Specify the H3D file as sla_flex.h3d, located in the mbd modeling\durability fatigue folder.
- 7. Specify the FES file as <working directory>\sla_flex_left.fes.

🛛 Fatigue Prep	- ALTAIR .H3D to NCODE .FES	x
Select H3D file: C:\Altair\tutorials\mv_hv_hg\mbd_modeling\durability_fatique\sla_flex.h3d Select FES file: C:\Altair\tutorials\working directory\sla_flex_lef.fes		
	< Back Next > Finish Cancel	

Fatigue Prep Wizard



8. Click *Finish*.

The Altair flexible body pre-processor is launched and the FES file is created in your working directory.

Using the **Fatigue Prep** wizard, you can convert your results files to <code>.fes</code>, <code>.asc</code> or <code>.dac</code> files. You can use these files for fatigue and durability analysis in Ncode's FE-Fatigue software.

Step 2: Converting ADAMS results from a REQ file to a DAC file.

The **Fatigue Prep** translator can be used to convert the request files created from an ADAMS run to DAC files. These DAC files can be further used for fatigue or durability analysis.

- 1. Start a new MotionView session.
- 2. Select the **MBD Model** window.
- 3. From the *FlexTools* menu, select *Fatigue Prep*.
- 4. Select the *REQ to DAC* option.
- 5. Click Next.
- 6. Click the file browser button attached to **Select req file** and select indy.req from the durability_fatigue folder.
 - **Note** The DAC file format does not support unequal time steps since only frequency is specified, not each time step. Therefore your REQ file needs to have equal output time steps.
- Click on the file browser attached to Select DAC file and specify indy.dac as an output filename in <working directory>\.
- 8. Under Y type, select Displacement.

Once you select **Displacement**, Y requests and Y components will populate the text boxes.



9. Select first five *Y* requests and the first three *Y* components.

🗸 Fatigue Prep - ADAMS .REQ to NCODE .DAC		
Select reg file: C:\Altair\tutorials\my hy hg\mbd modeling\durability fatigue\indy.reg		
Select DAC file: C:\Altair\tutorials\working directory\indy dac		
Note:		
Note: The user-specified base-name for the DAC file mentioned above will be used to generate a family of DAC files based on the selections below.		
X-Vector is TIME by default. Please select any number of Y-Vectors below.		
Y Type:		
Displacement		
Acceleration		
Force		
Y Request:		
REQ/997000 Global CG movement		
REQ/997001 CG movement w.r.t. cg		
REQ/511550 Steering Rack Disp.		
REQ/6001 Left Front Spring Disp. REQ/6002 Bight Front Spring Disp.		
REQ/6003 Left Rear Spring disp.		
REQ/6004 Right Rear Spring disp.		
REQ/6011 Left Front Wheel Displacement wrt Bod		
REQ/6012 Right Front Wheel Displacement wrt Bo		
REQ/6013 Left Rear Wheel Displacement wit Body		
Y Component:		
X		
Y		
RZ V		
< Back Next > Finish Cancel		

REQ to DAC translation

Note You can select any number of Y requests and Y components for REQ2DAC conversion.



10. Click the *Finish* button.

The message *Translation complete* is displayed on the screen.

MotionView generates 15 DAC files for each combination selected.

- 11. Click *Cancel* and close the window.
- 12. Change the application to *HyperGraph 2D*.
- 13. From the **Build Plots** panel, load the file indy_D_997000_X.dac from <working directory>\.
 - **Note** In this filename, D represents Displacement, 9970000 represents the request number, and X represents the component. This is how you get the information about the DAC file you are plotting.
- 14. Click **Apply** to see the plot.

You may plot the corresponding request from the original REQ file for comparison.

Step 3: Using the Flex File Tool.

- 1. Start a new MotionView session.
- 2. From the *Flex Tools* menu, select *Flex File Gen*.
- 3. The *Flex File Generator* dialog is displayed.

This dialog lists the files you will need for this conversion.

- Using the Save the *flx file as file browser, select your destination file to be <working-dir>\sla_flex.
- 5. In the *Number of FlexBodies* field, enter 2 since this model includes two lower control arms as flexible bodies.
- 6. From the **Select model source (*.gra)** file browser, select the sla_flex.gra file located in the durability_fatigue folder.
- 7. From the **Select result source (ASCII *.res)** file browser, select the sla_flex.res file located in the durability_fatigue folder.
- 8. Using the first file browser under *Select flexible body source (*.h3d)*, select the sla_flex.h3d file located in the durability_fatigue folder.
- 9. Using the second file browser under *Select Flexible Body Source (*.h3d)*, select the sla_flex_m.h3d file located in the durability_fatigue folder.



10. Under *ID:* field, enter 10404 and 20404 for the two h3ds, respectively.

These values should correspond to the actual IDs of the flexible bodies in the **ADM** input deck of the **ADAMS** solver.

The deformation of these flexible bodies during animation can be scaled using the **Def. Scale** field. In this case, accept the default value of 1.000.

7 Flx File Gen		
This flx file requires *.gra (for rigid bod statements to reduce the size of flx file animation window.	y graphics), "res (for rigid and flex results) and N *.h3d files (flexbodies). There are so which in turn helps in faster animations. Clicking "OK" creates the *.fix file which c	everal optional an be opened in the
Save the flx file as:	C:/Altair/tutorials/working directory/sla_flex	
Number of Flexbodies:	2	
Select model source (*.gra):	C:/Altair/tutorials/mv_hv_hg/mbd_modeling/durabi	
Select result source (ASCII *.res):	C:/Altair/tutorials/mv_hv_hg/mbd_modeling/durabi	
Select flexible body source (*.h3d):	C:/Altair/tutorials/mv_hv_hg/mbd_modeling/durabi 🚔 ID: 10404	
Select Flexible Body Source (*.h3d):	C:/Altair/tutorials/mv_hv_hg/mbd_modeling/durabi 🚰 Id : 20404 Det	f. Scale : 1.000
	ОК	Cancel

11. Click **OK**.

The translator is launched and the resulting *FLX* file is created in the destination directory.

- 12. Select the *TextView* window from the *Select application* list.
- 13. Click the arrow next to the *Open Session* icon, and toolbar and select *Open Document*.



14. Open the sla flex.flx file.

You should see the following contents of the FLX file:

```
•ModelSource("C:/Altair/hw/tutorials/mv_hv_hg/mbd_modeling/durability_fatique/sla_flex.gra")
•ResultSource("C:/Altair/hw/tutorials/mv_hv_hg/mbd_modeling/durability_fatique/sla_flex.res")
•FlexSource("C:/Altair/hw/tutorials/mv_hv_hg/mbd_modeling/durability_fatique/sla_flex.h3d", 10404)
•FlexSource("C:/Altair/hw/tutorials/mv_hv_hg/mbd_modeling/durability_fatique/sla_flex.h3d", 20404)
```

Note To load transients results for selected time intervals check the **Optional flx** statements check-box to enter the **Start Time**, **End Time** and **Increment**.

To load selected mode shapes from modal animation files for models with one or more flexible bodies, check the **Optional flx statements for linear analysis** check-box to enter the **Start Mode** and **End Mode**.

Additional statements are inserted in the FLX file reflecting the above mentioned parameters.

Step 4: Viewing Fatigue Results in the Animation Window.

- 1. Select *HyperView b* using the *Select application* option on the toolbar.
- Use the **Open** drop-down menu on the **Standard** toolbar (click the arrow next to the **Open Session** icon¹ to select **Open Model** .
- 3. Use the *Load model* file browser to select the file, sla_flex.flx that you just created. The *Load result* field automatically populates with the same file name.
- 4. Click Apply.
- 5. Click the **Start/Pause Animation** icon, **V** to animate the model.

Observe the animating model, which is a combination of rigid multi-bodies and two flexible lower control arms.

- 6. Click the **Contour** icon, **P** on the **Results** toolbar.
- 7. Choose different options from the *Result Type* drop down menu, to view the various results available in the analysis result files.

For a detailed description of writing a fatigue analysis file from here, refer to the *Fatigue Manager* topic in the *HyperView User's Guide*.

