Oasys
D3PLOT

D3PLOT 20.1

D3PLOT 20.1 – Contents

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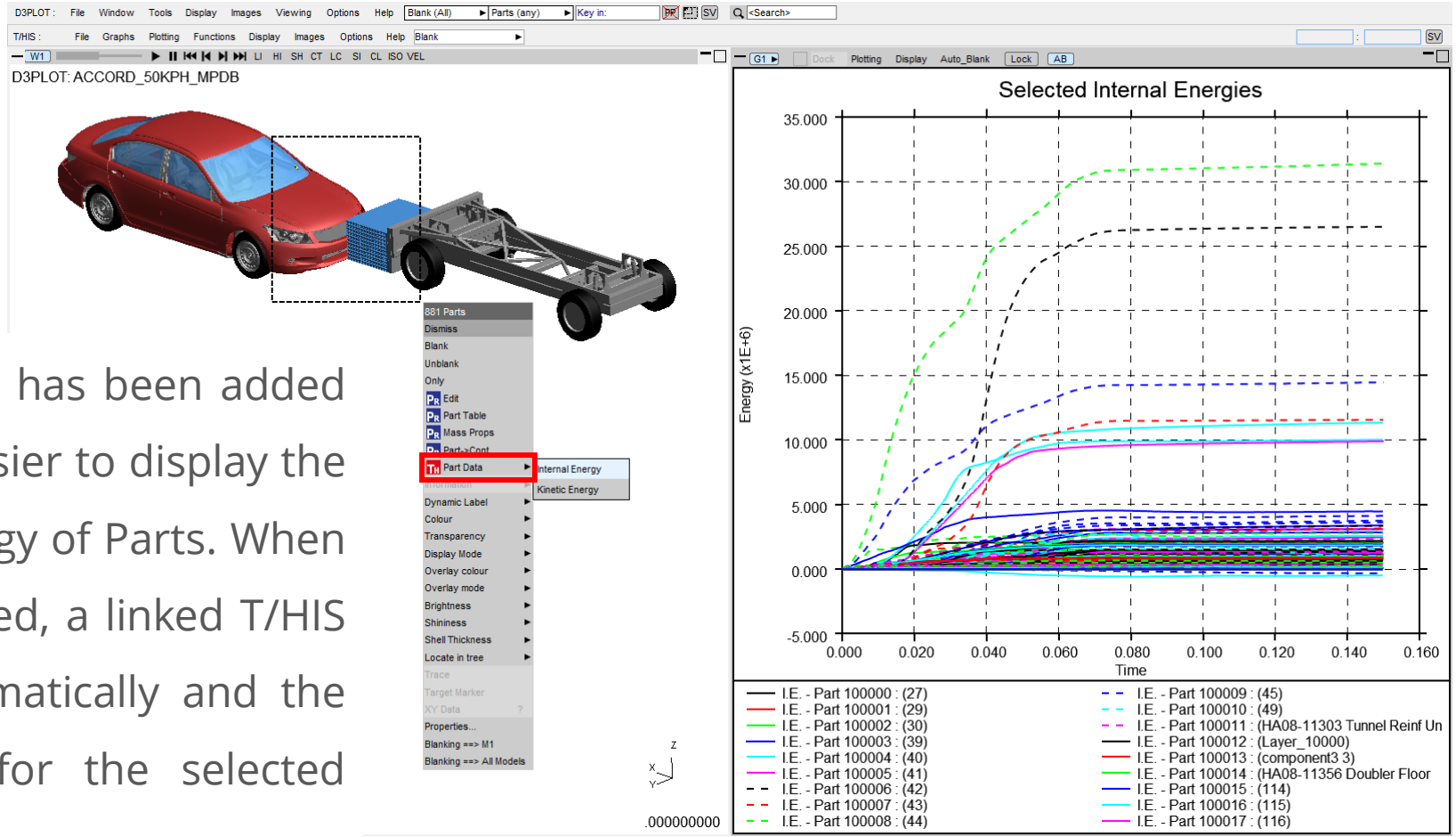
Part Energies

Part Energies

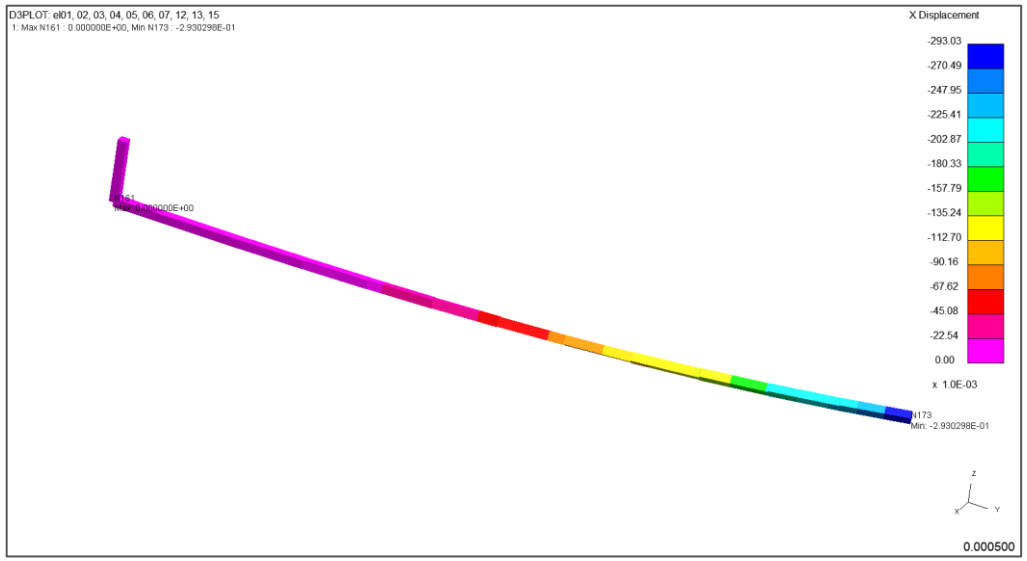


A new Quick-Pick option has been added to D3PLOT to make it easier to display the internal and kinetic energy of Parts. When the new option is selected, a linked T/HIS session is started automatically and the Energy time histories for the selected parts are plotted.

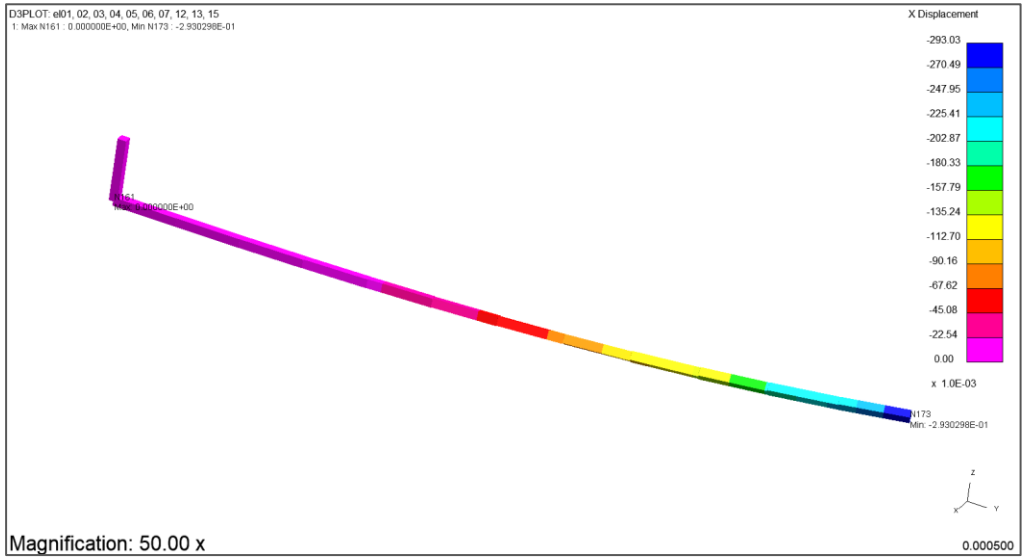
Magnification Display

Magnification Display – Visual Changes

- Users told us that you often added a magnification label to images manually in your reports (e.g., “50 × magnification”).
- Deformation magnification values can now be displayed on-screen in the bottom left-hand corner. A comparison before and after is shown below.
- By default, this is typically hidden for most models when set to its default value (1 × magnification).



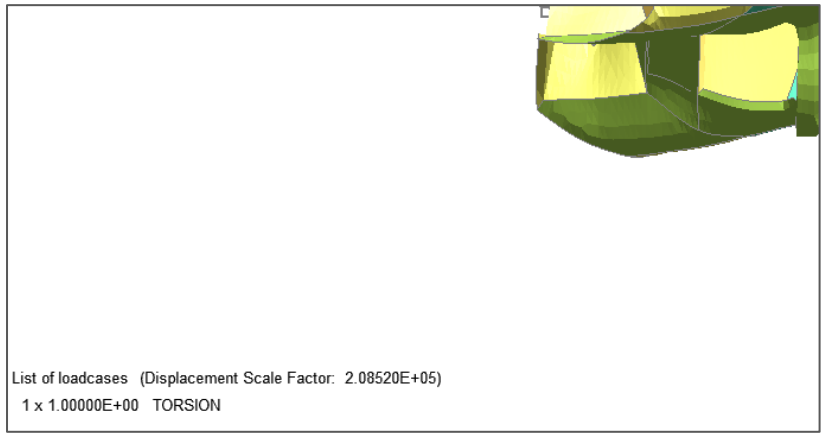
D3PLOT 19.1



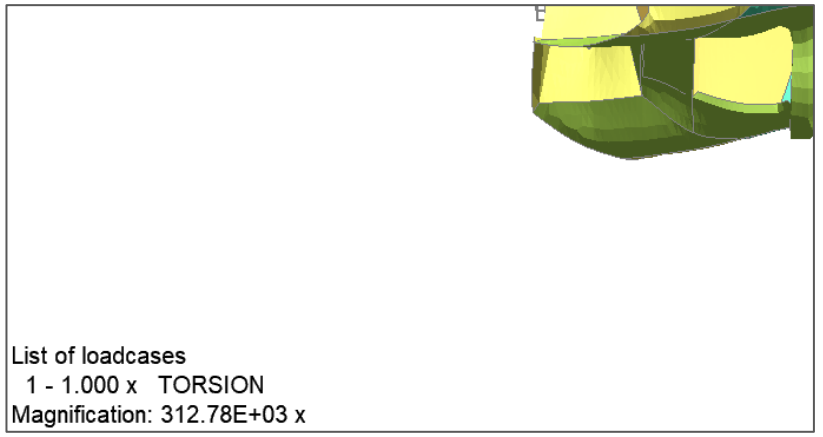
D3PLOT 20.0

Magnification Display – Visual Changes

- If magnification has been applied when models are read in (typical with Nastran files), and additional magnification is added, it is now factored into the displayed value.
- All usage of Displacement Scale Factor has been replaced with either Magnification or Magnification Factor for consistency.
- The images below illustrate a Nastran static load case model before and after the changes with an additional 1.5 × magnification applied.



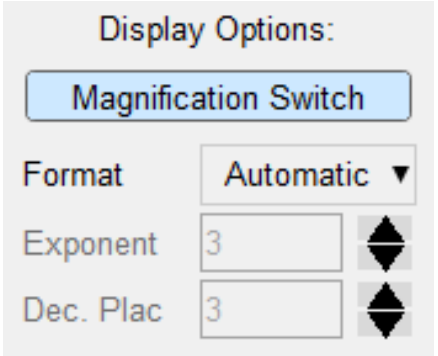
D3PLOT 19.1

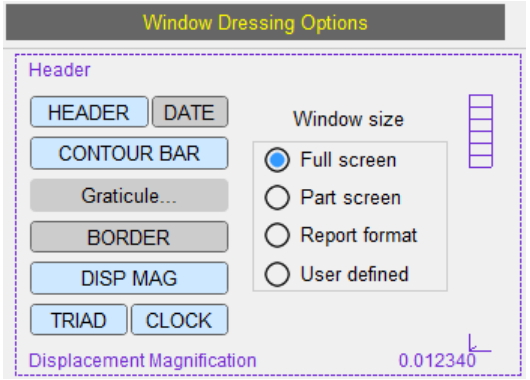


D3PLOT 20.0

Magnification Display – Controls

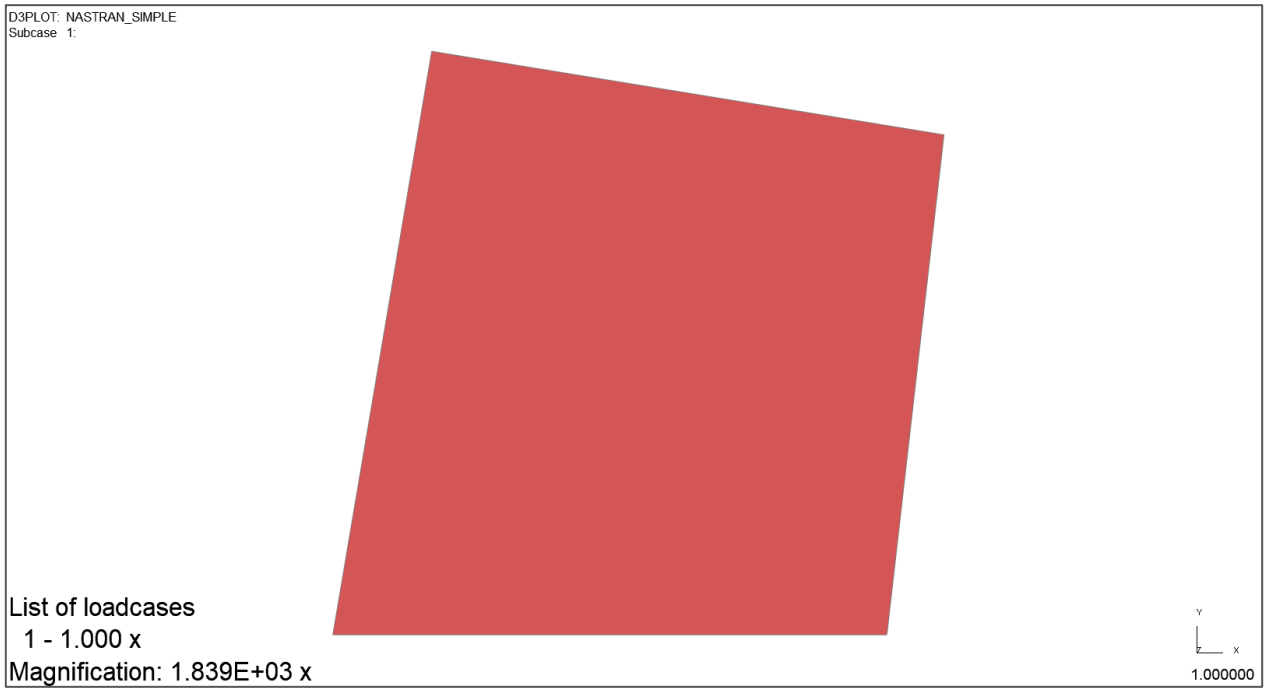
- Controls to customise magnification values are now available under **Tools** → **Deform** → **Magnify**. You can:
  - Toggle visibility of the displayed text
  - Control the number formatting
- Visibility of magnification values can also be toggled through the new **DISP MAG** button available under **Display Options** → **Window Dressing**.
- Visibility can also be controlled via the dialogue command:
  `/DISPLAY_OPTIONS DISP_MAG_SWITCH`
- Default visibility can also be controlled via the new preference:
  `d3plot*plot_disp_mag`

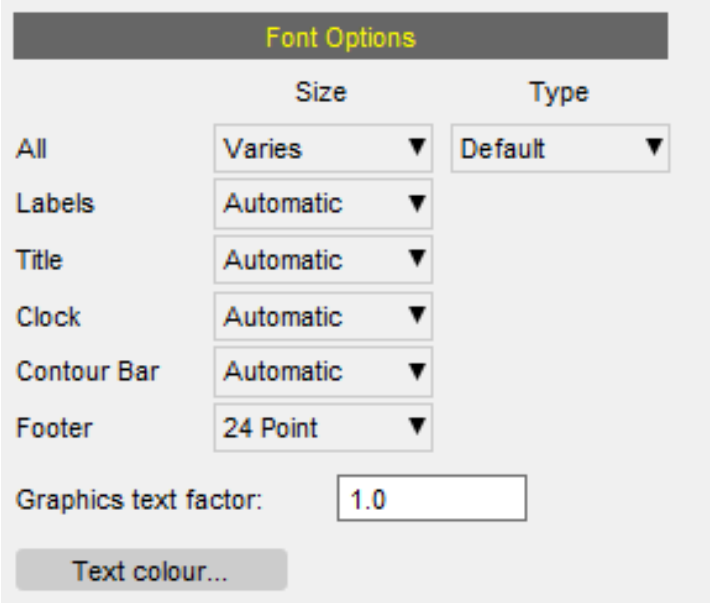




Magnification Display – Controls

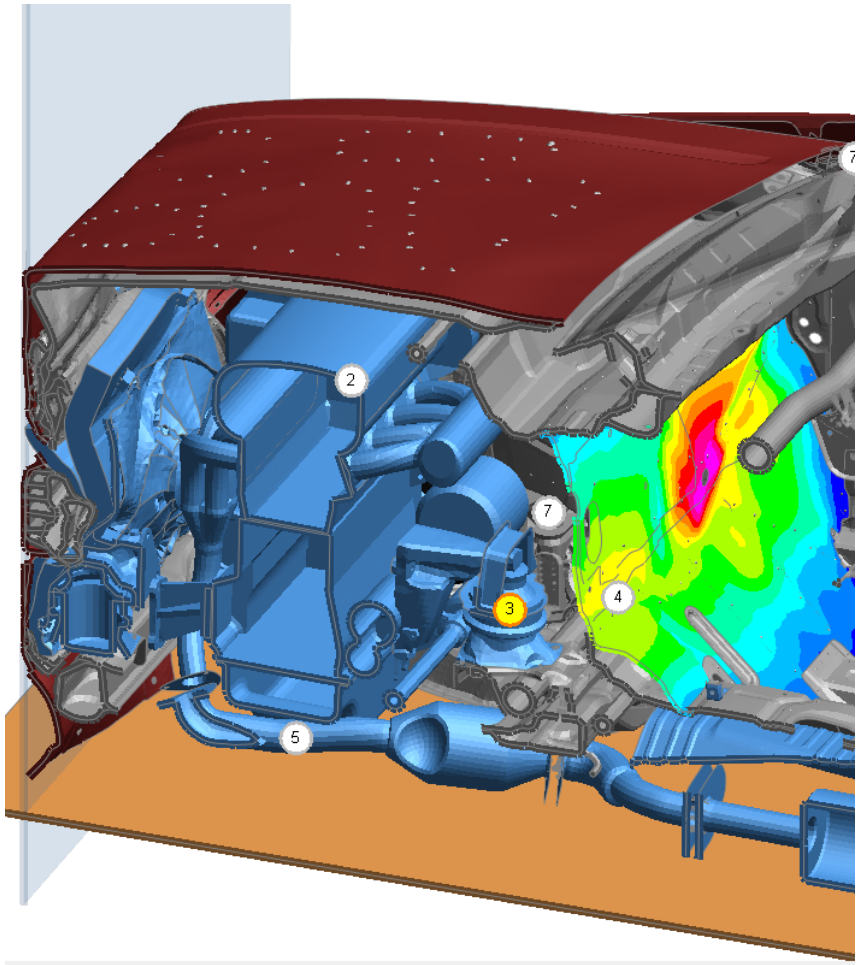
- Additional controls for extra customisation are now available under **Display Options** → **Fonts**, where you can change the format of the footer text (drawn in the bottom left-hand corner).
- New preference **`d3plot*footer_size`** allows you to save your preferred font size.





Annotations

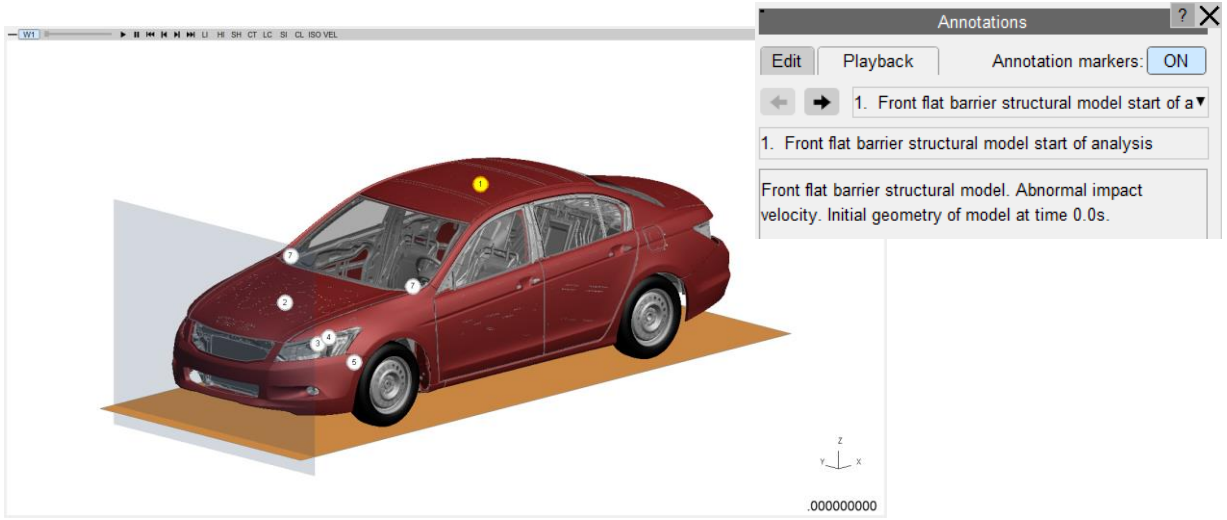
Annotations overview

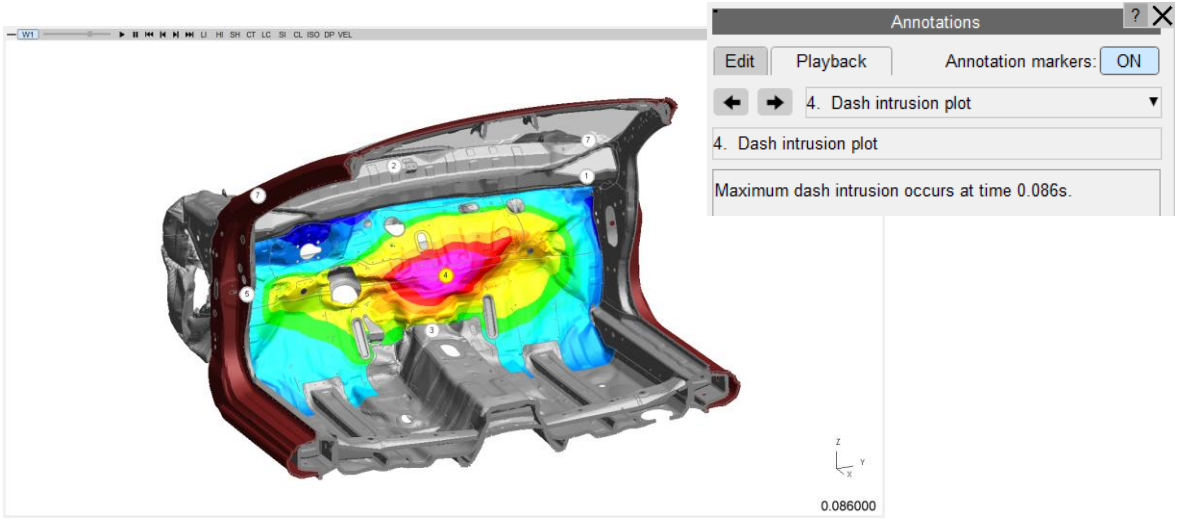


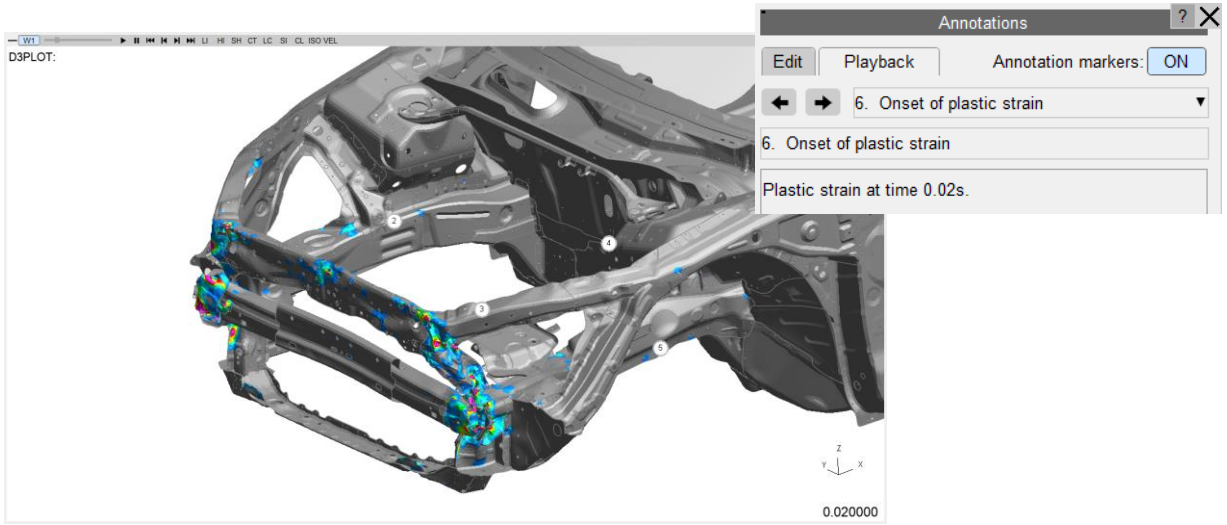
- Capture a series of page views with a title, description and markers that can be simply reloaded
- Save annotations to a file for retrieving in a later session of D3PLOT
- Display annotations in a playback mode for simple presentation to colleagues
- Annotations saved with one set of models can be reloaded with a different set of models allowing annotation ‘templates’ to be created

Note: the crash simulation images in this section are for illustrative purposes only and do not reflect on the actual performance of any vehicle

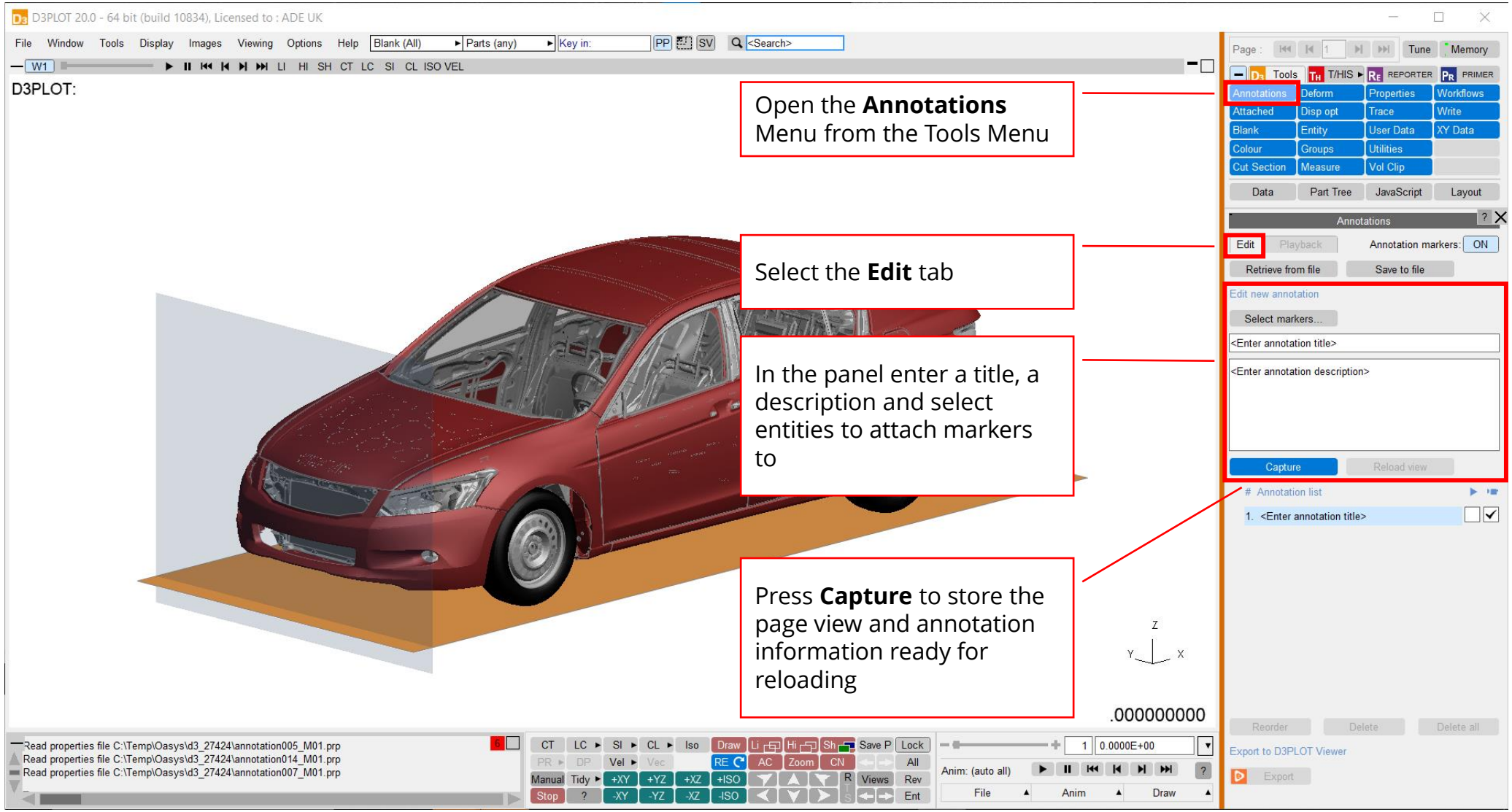
Annotation examples



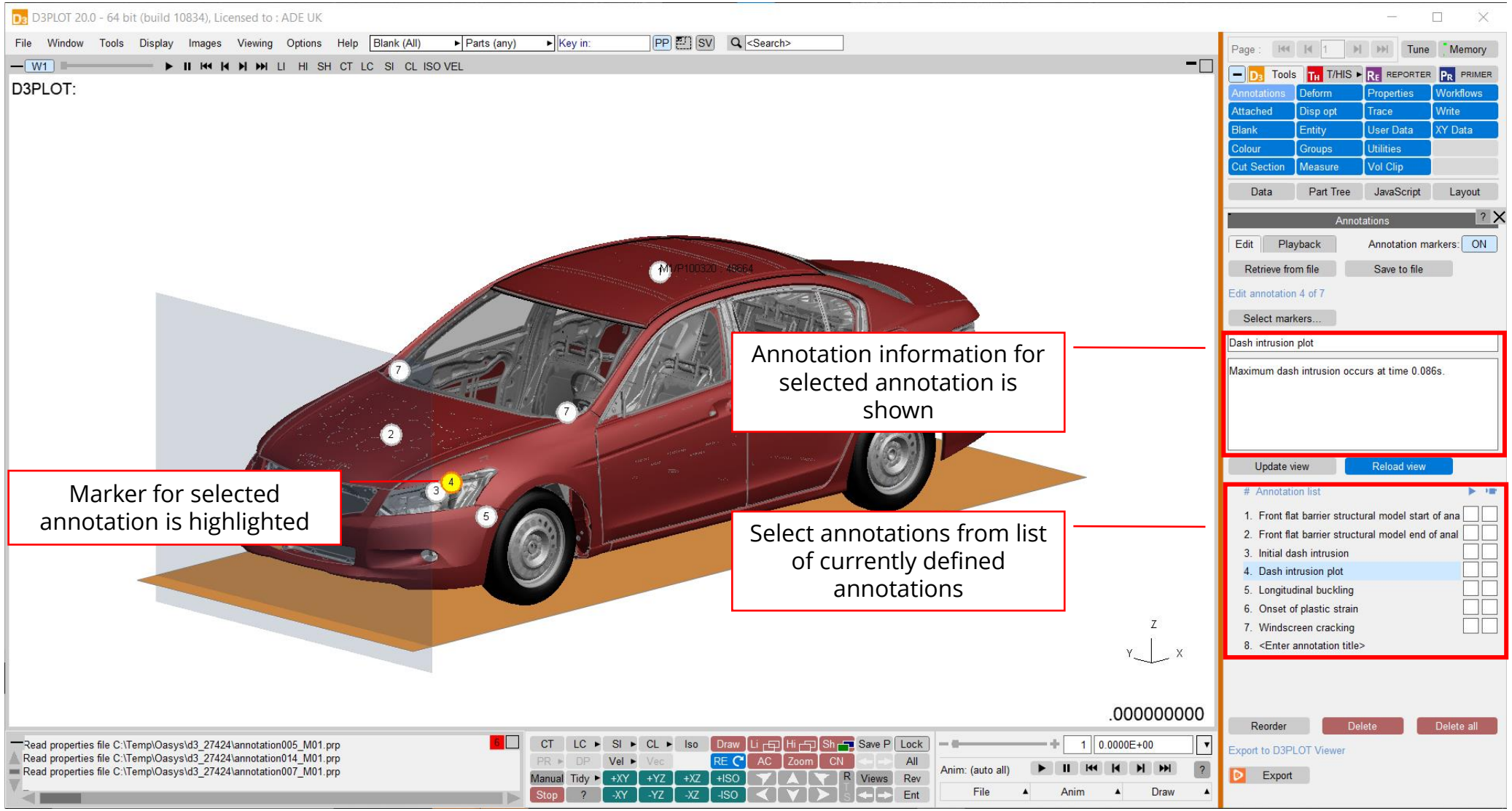




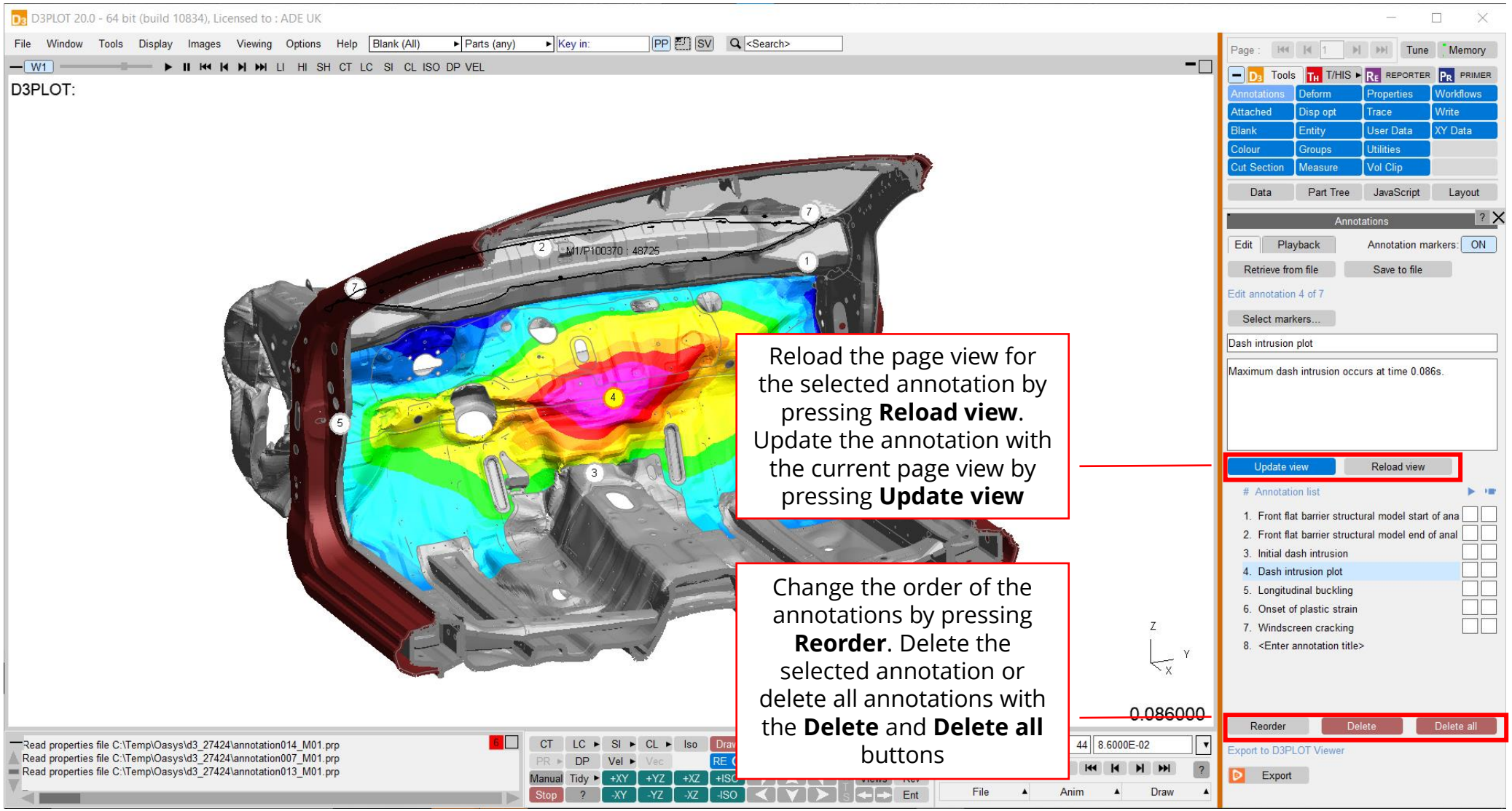
Creating annotations



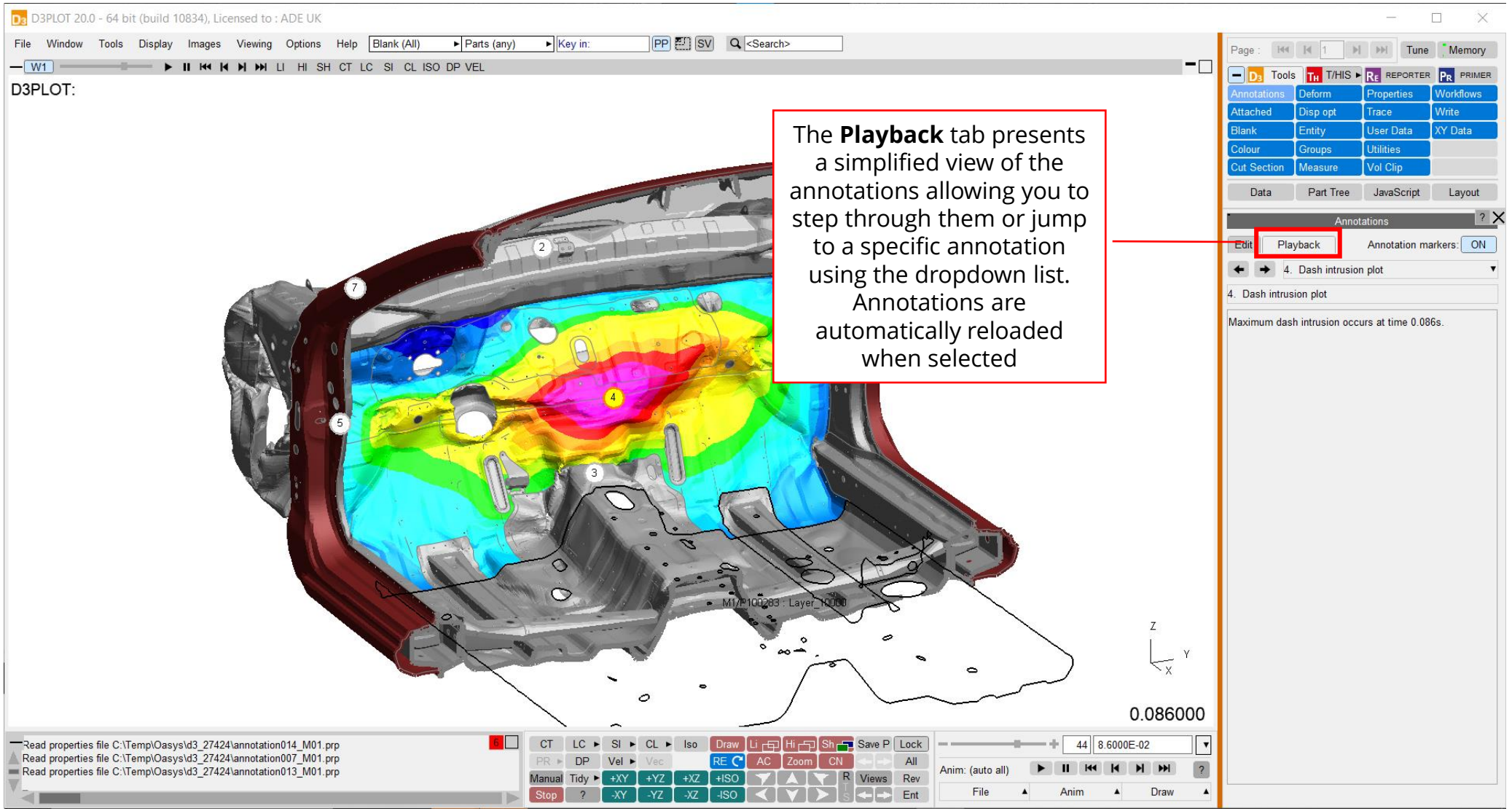
Selecting annotations



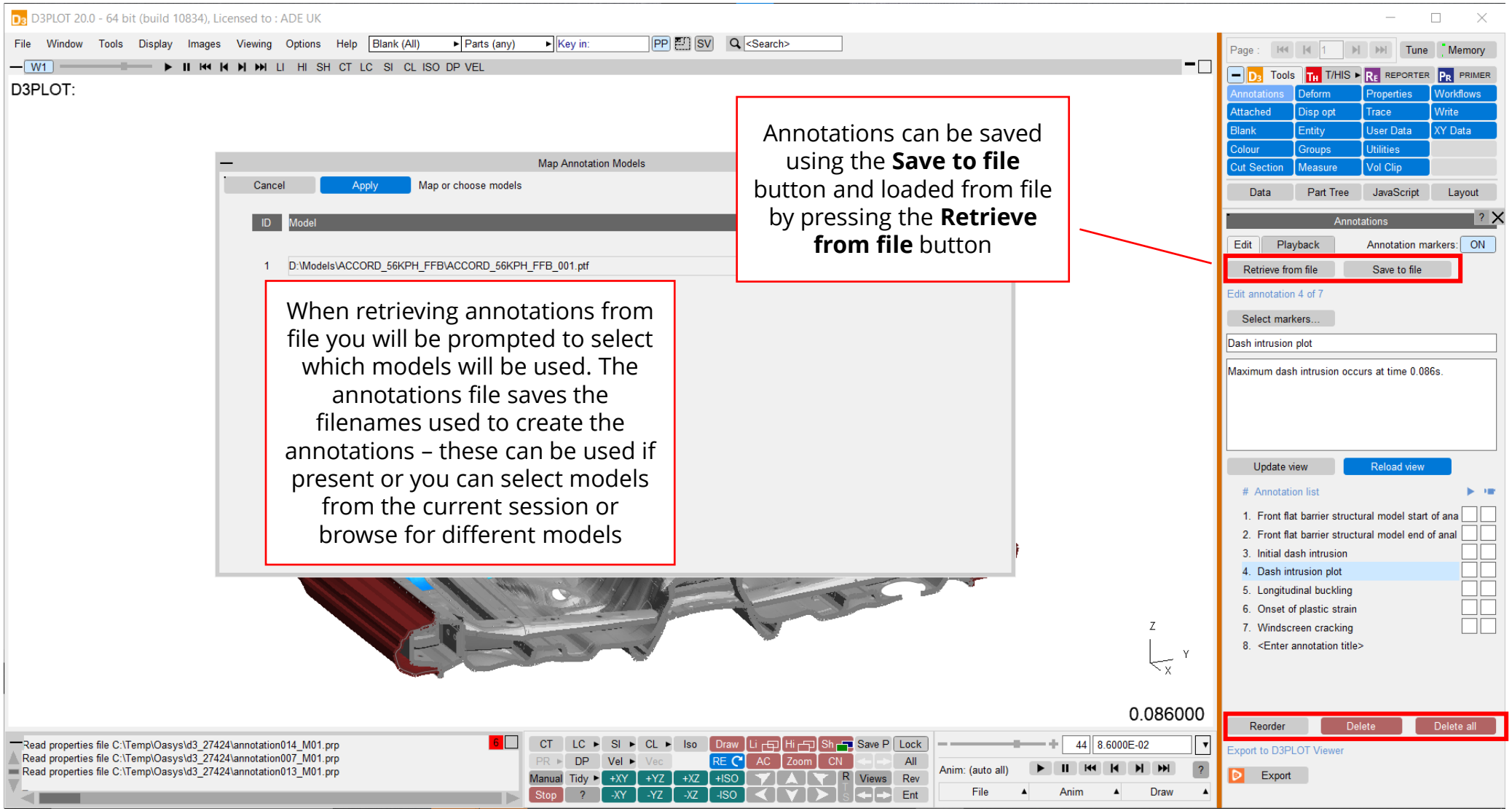
Editing annotations



Annotations playback



Saving and retrieving annotations



Workflows

Workflows

Previous versions of the Oasys Suite contained powerful tools and capabilities that could be used to interrogate and debug your analysis results. However...

1. The tools were not always customised for specific loadcases or tasks
2. You may have needed to manually perform a number of steps to process your results, which could be time-consuming and prone to error
3. The JavaScript API could be used to create tools to automate your post-processing workflow, but this requires time, resource and knowledge, which is not always available

To address this issue, a new **Workflows** feature has been added that provides tools customised for specific loadcases and tasks, and built upon the existing capabilities in the Oasys Suite, to make it easier to interrogate and post-process results.

Workflows

Workflows allow you to tag your model in PRIMER with meta data, e.g.

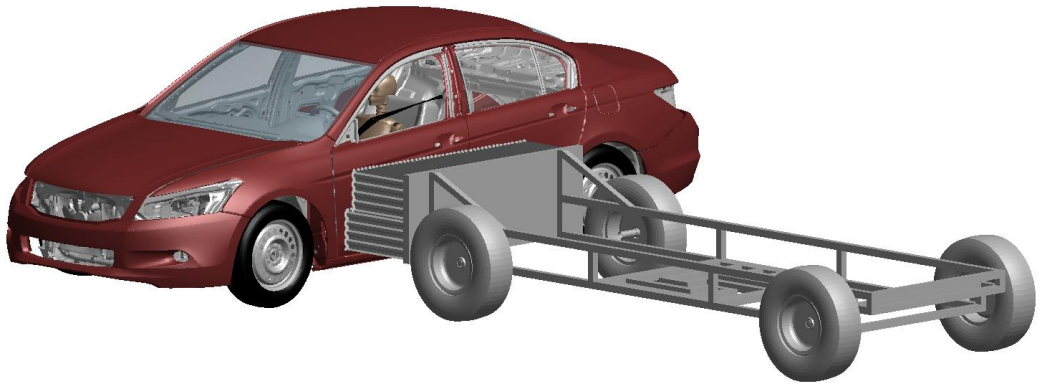
Crash test type

Occupants

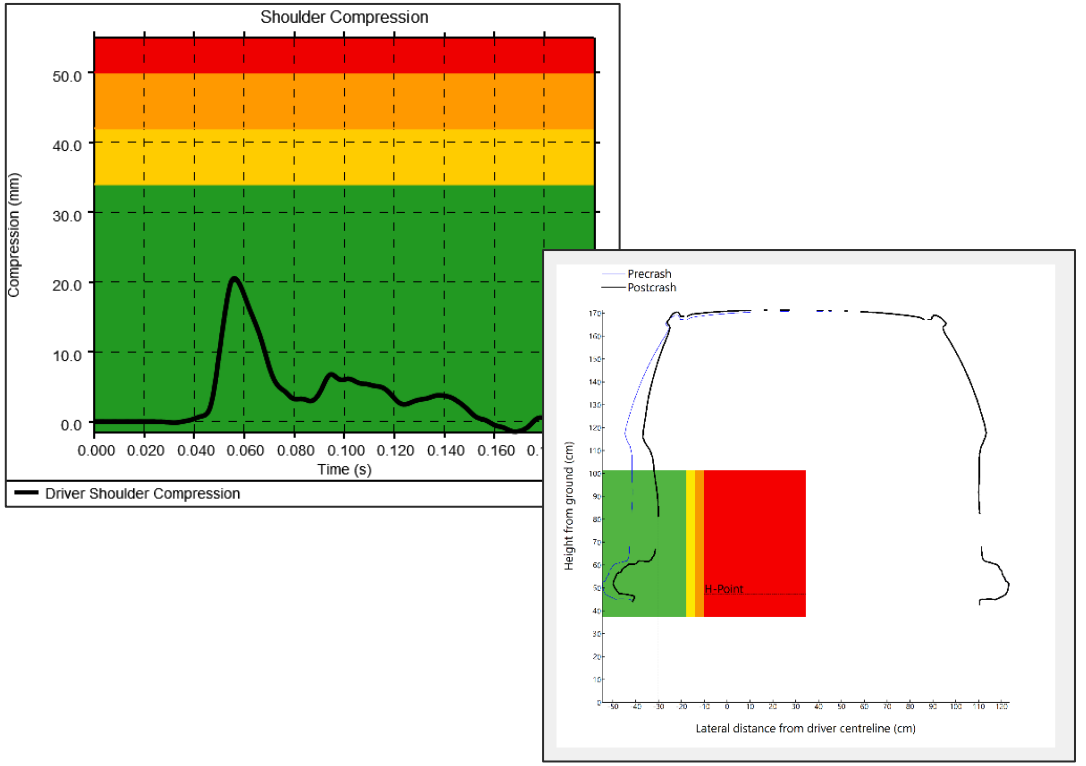
Structures

Unit system

etc.



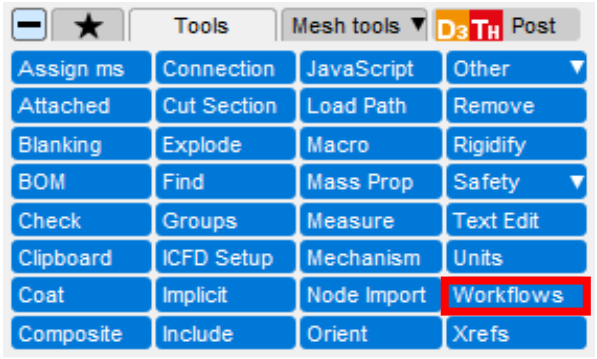
The post-processing software reads this data and provides tools that are relevant to your analysis

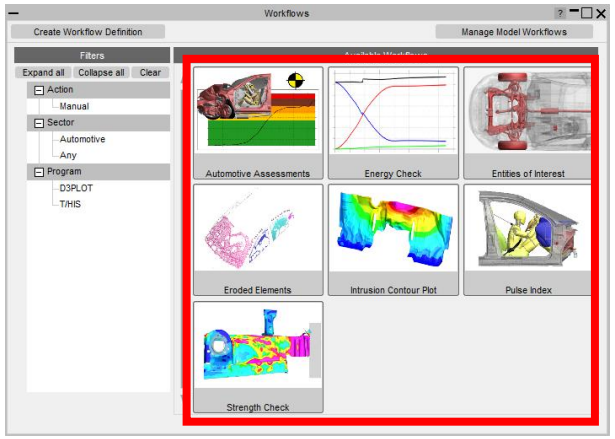


Workflows

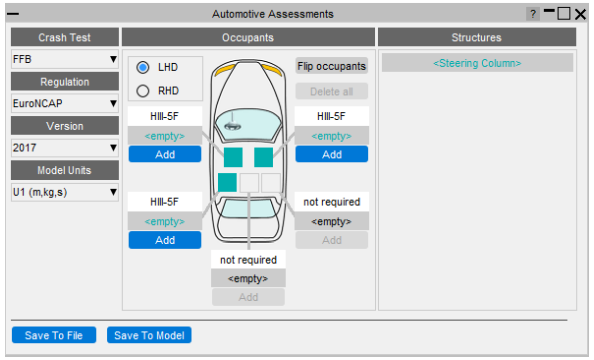
To use a Workflow:

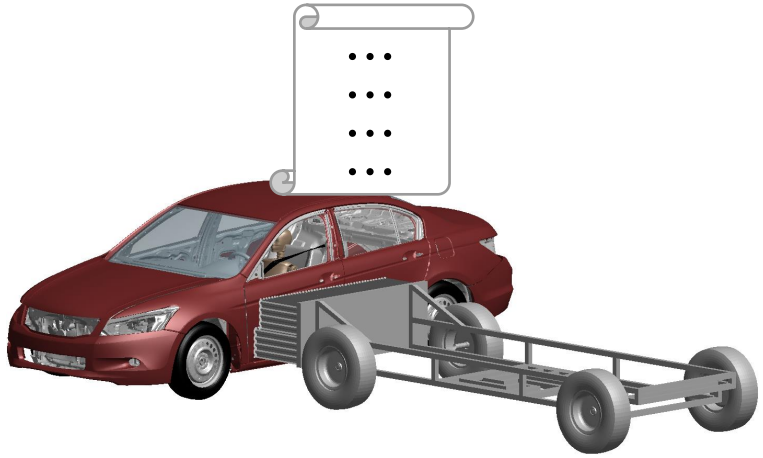
1. Select in PRIMER



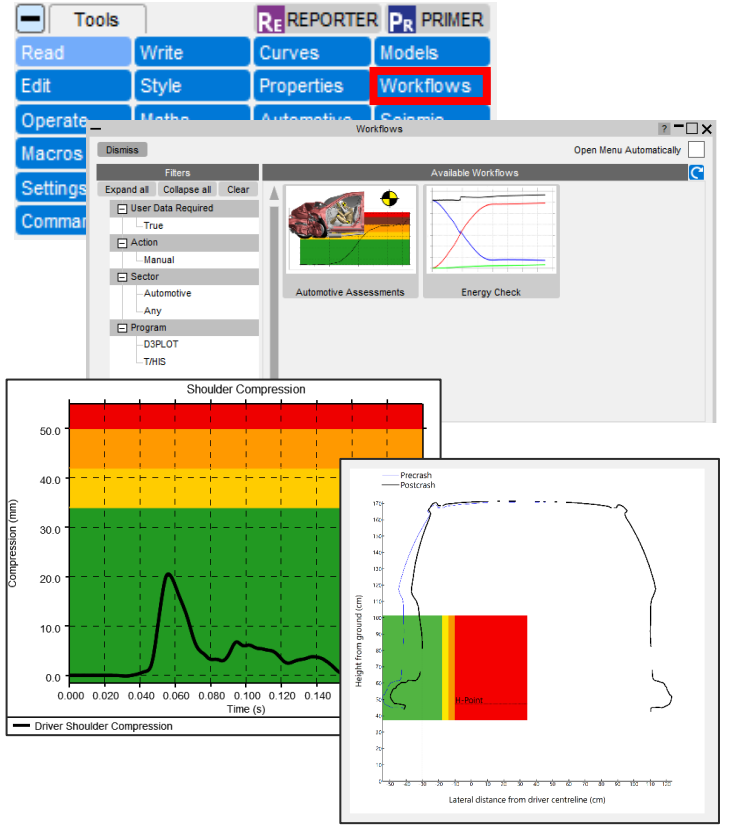


2. Tag the model





3. Use in D3PLOT or T/HIS



Workflows

This release contains a collection of Workflows (described in more detail in further slides):

We plan to update these tools in future releases, as well as adding new tools.

If you have any ideas for additional features you would like to see in the existing tools or any ideas for new tools, please contact us.

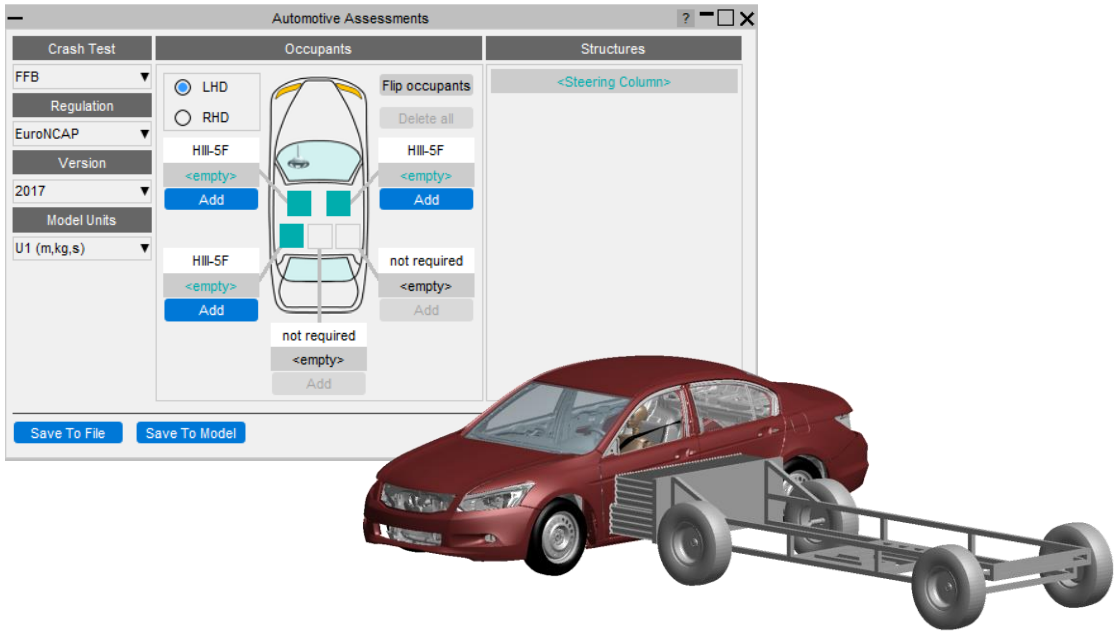
Workflow	Description
Automotive Assessments	Process crash and occupant safety simulations according to legal regulations and consumer safety NCAP protocols
Energy Check	Plot total, kinetic, internal and hourglass energy
Entities of Interest	Show and highlight groups of parts and export them to GLB files to view in D3PLOT Viewer
Eroded Elements	Visualise deleted elements at different states
Intrusion Contour Plot	An intrusion contour plot of selected parts (e.g. vehicle cockpit intrusion)
Pulse Index	Performs a vehicle pulse index calculation
Strength Check	Visualise yielding parts

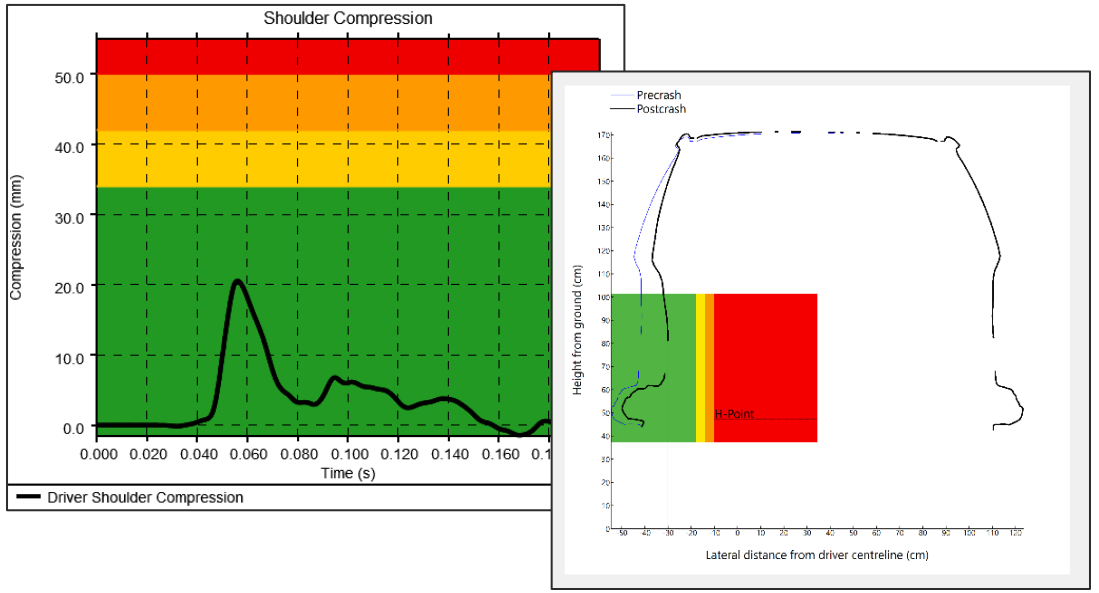
Workflows: Automotive Assessments

The **Automotive Assessments** workflow tool is used to post-process analyses according to various crash test regulations.

1. **In PRIMER**, you select the crash test type, regulation, and the occupants and structures you wish to assess

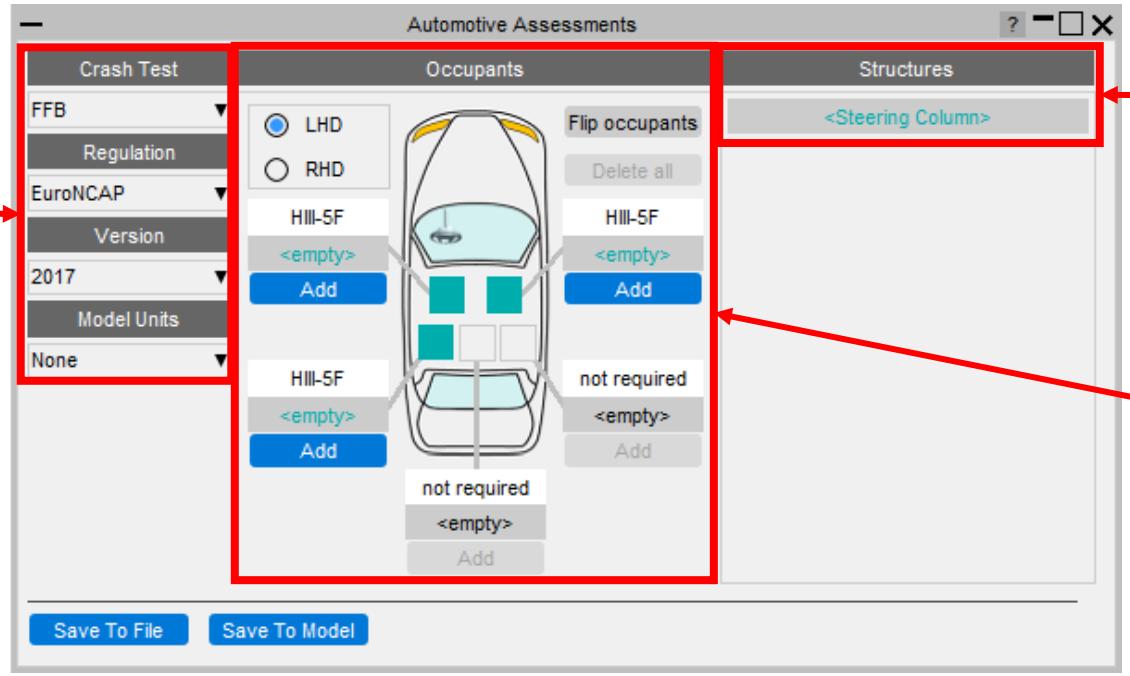
2. **D3PLOT and T/HIS** can then plot results for the different assessments required by the regulation





Workflows: Automotive Assessments

When the Automotive Assessments tool is launched in PRIMER you are presented with a menu that lets you specify the crash test type and the occupants and structures you wish to assess:



Set the crash test type, regulation, version and model units

Define the structures in the model

Define the occupants in the model

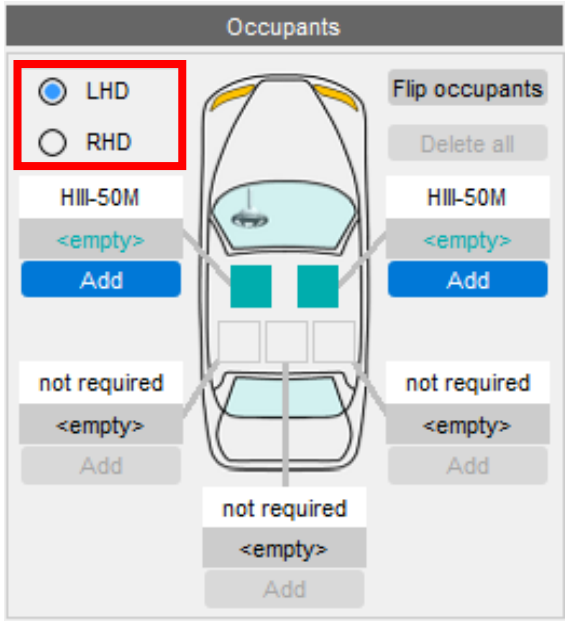
Workflows: Automotive Assessments

The Occupants section is used to select which occupants are in the vehicle, their positions in the vehicle, and the IDs of the entities from which data can be read.

This section updates automatically to show the required occupants in each position for the selected crash test type and regulation.

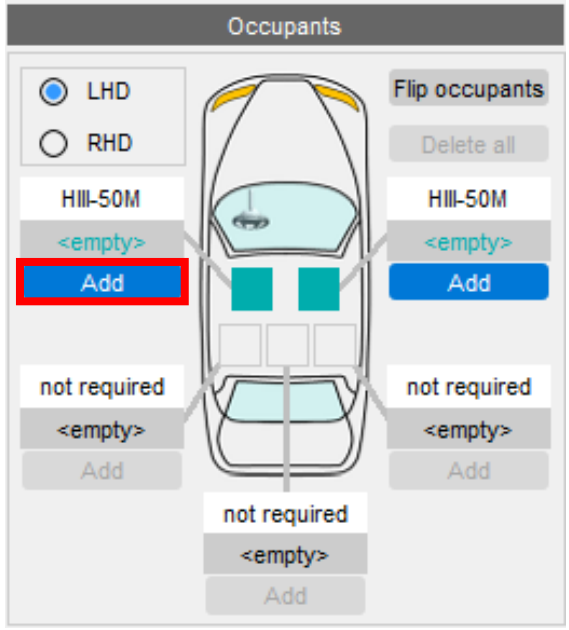
The first thing to do is select whether the vehicle is left hand or right hand drive (LHD or RHD).

The vehicle image will update to show the steering wheel on the correct side and the occupant positions will also update.

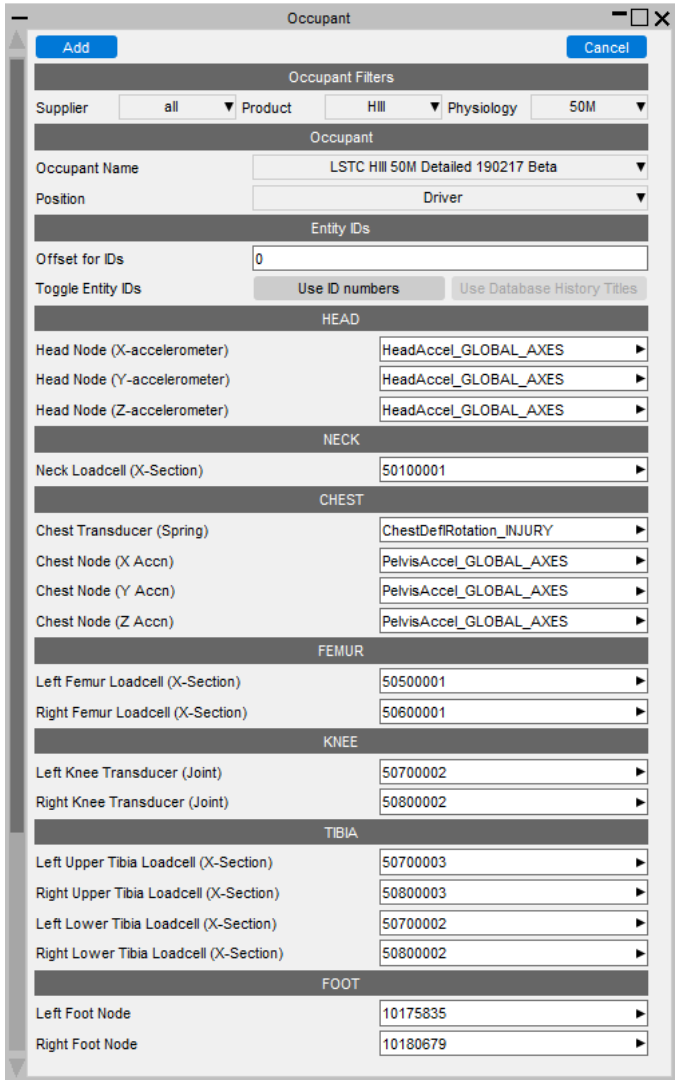


Workflows: Automotive Assessments

1. For each occupant, click **Add**



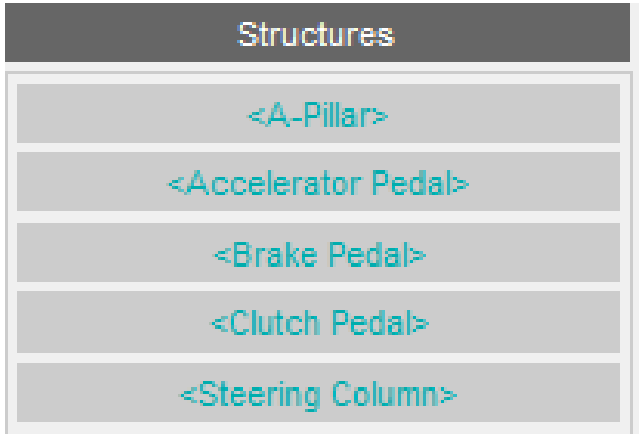
2. This will open a window where you can select the occupant type. Input entity IDs are filled automatically from a list of popular suppliers.

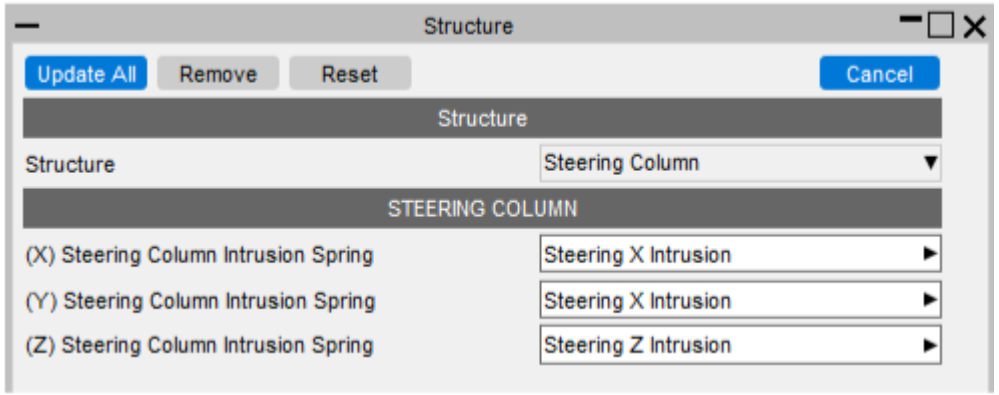


Note that if your model does not have an occupant (or you don't want to carry out an assessment on it) you can leave it empty. T/HIS and D3PLOT will only attempt to process results for occupants that have been added.

Workflows: Automotive Assessments

- The Structures section is used to select the IDs of the entities from which data can be read from structures in the vehicle.
- This section updates automatically to show the required structures for the selected crash test type and regulation.





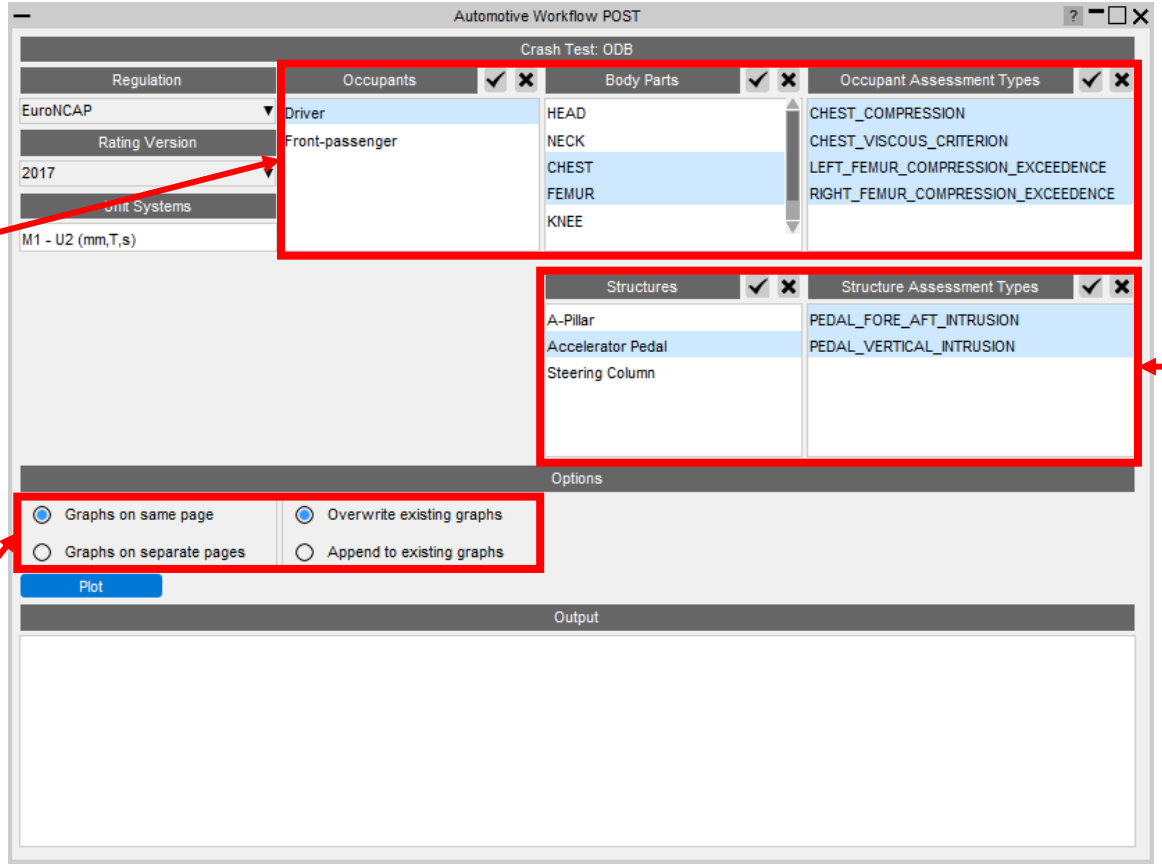
Workflows: Automotive Assessments

When launched in T/HIS, a menu appears, allowing you to select which occupant injuries and which structural checks you wish to perform:

Select which occupant injury assessments to plot.

The list of available occupants will depend on what was selected in PRIMER

Options to control how graphs are created and displayed

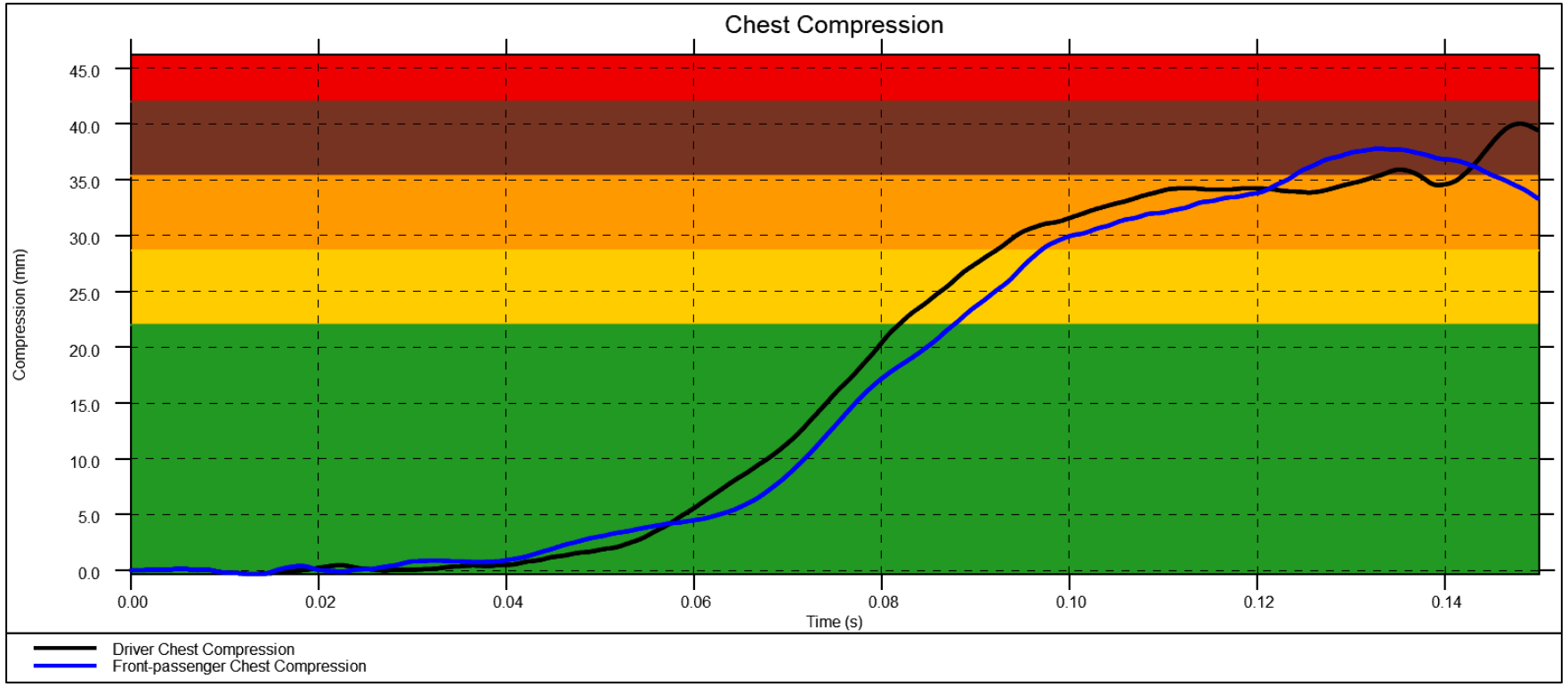


Select structural assessments.

The list of available structures will depend on what was selected in PRIMER

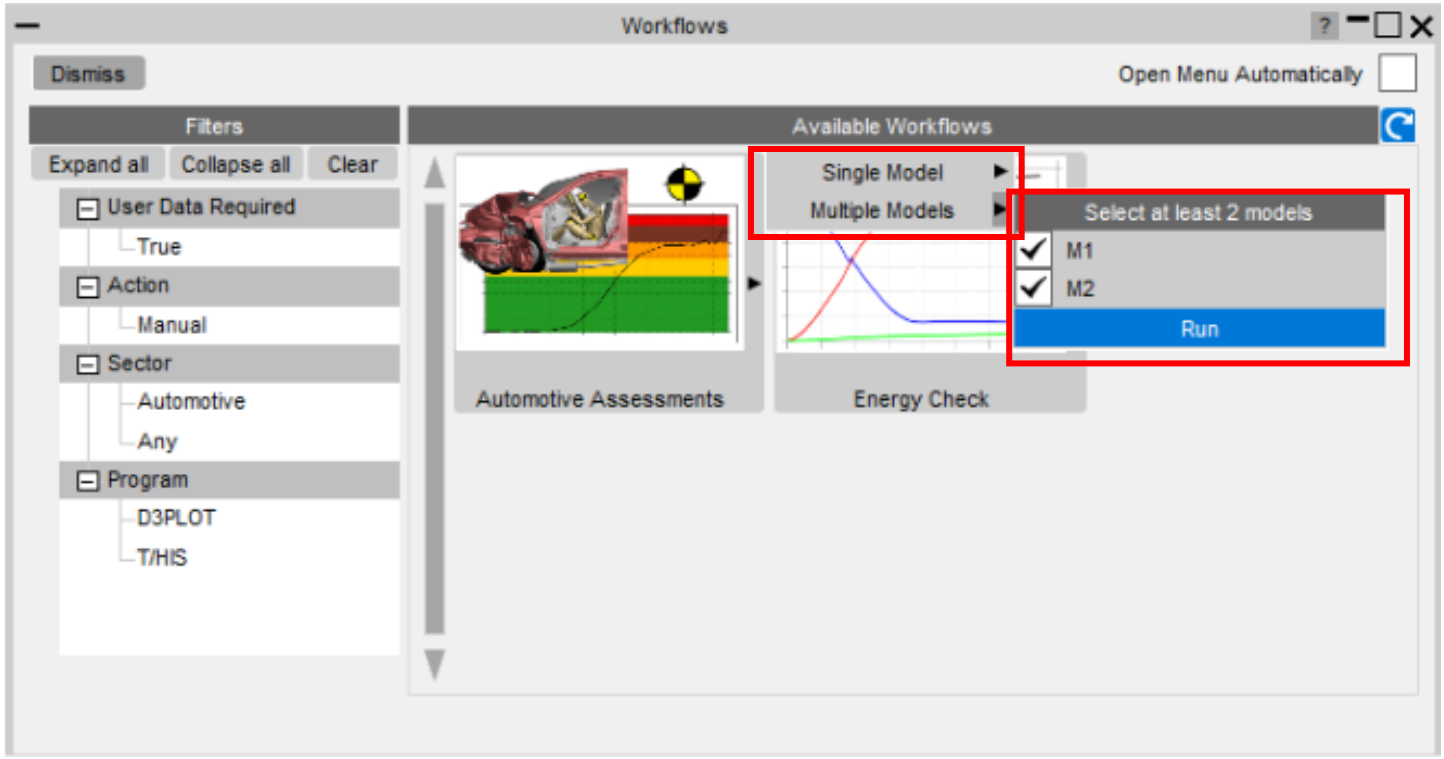
Workflows: Automotive Assessments

T/HIS will extract the data required, process it according to the rules set out in the regulation and plot the results on a graph with datums showing allowable limits:



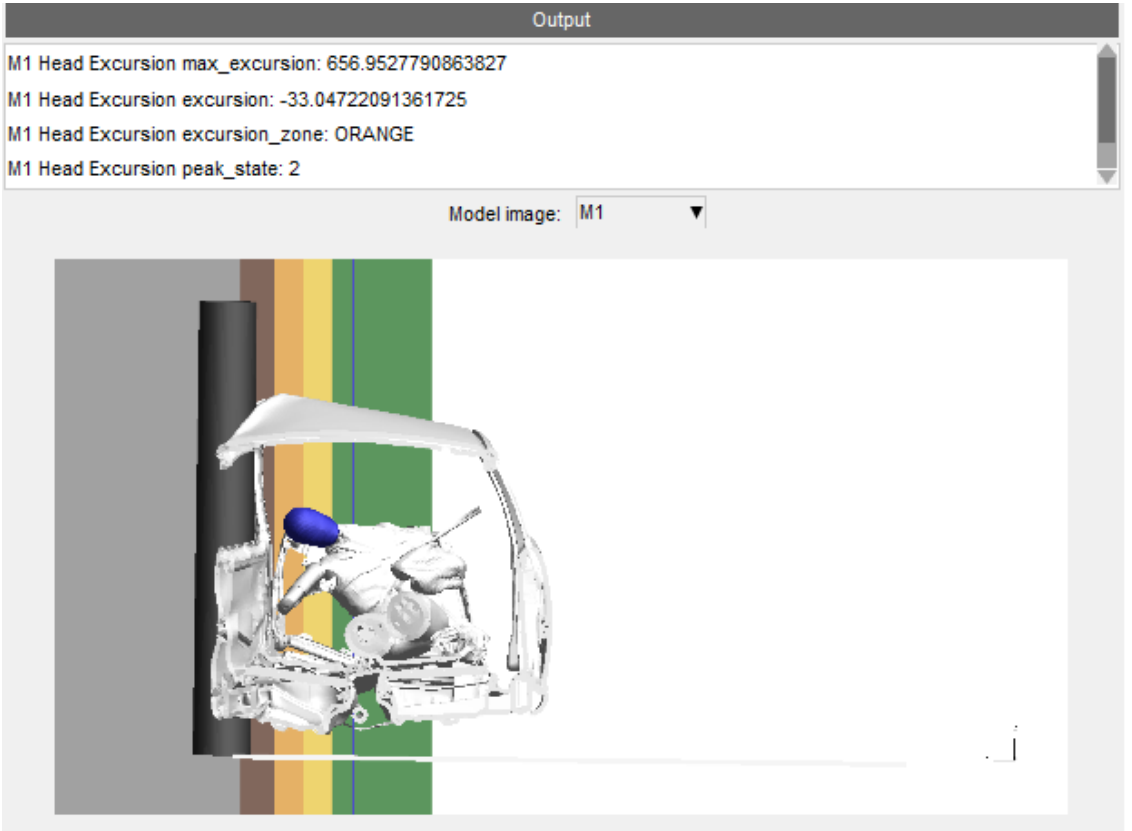
Workflows: Automotive Assessments

The tool allows you to plot results from multiple models. This is useful when you want to compare results between different runs:



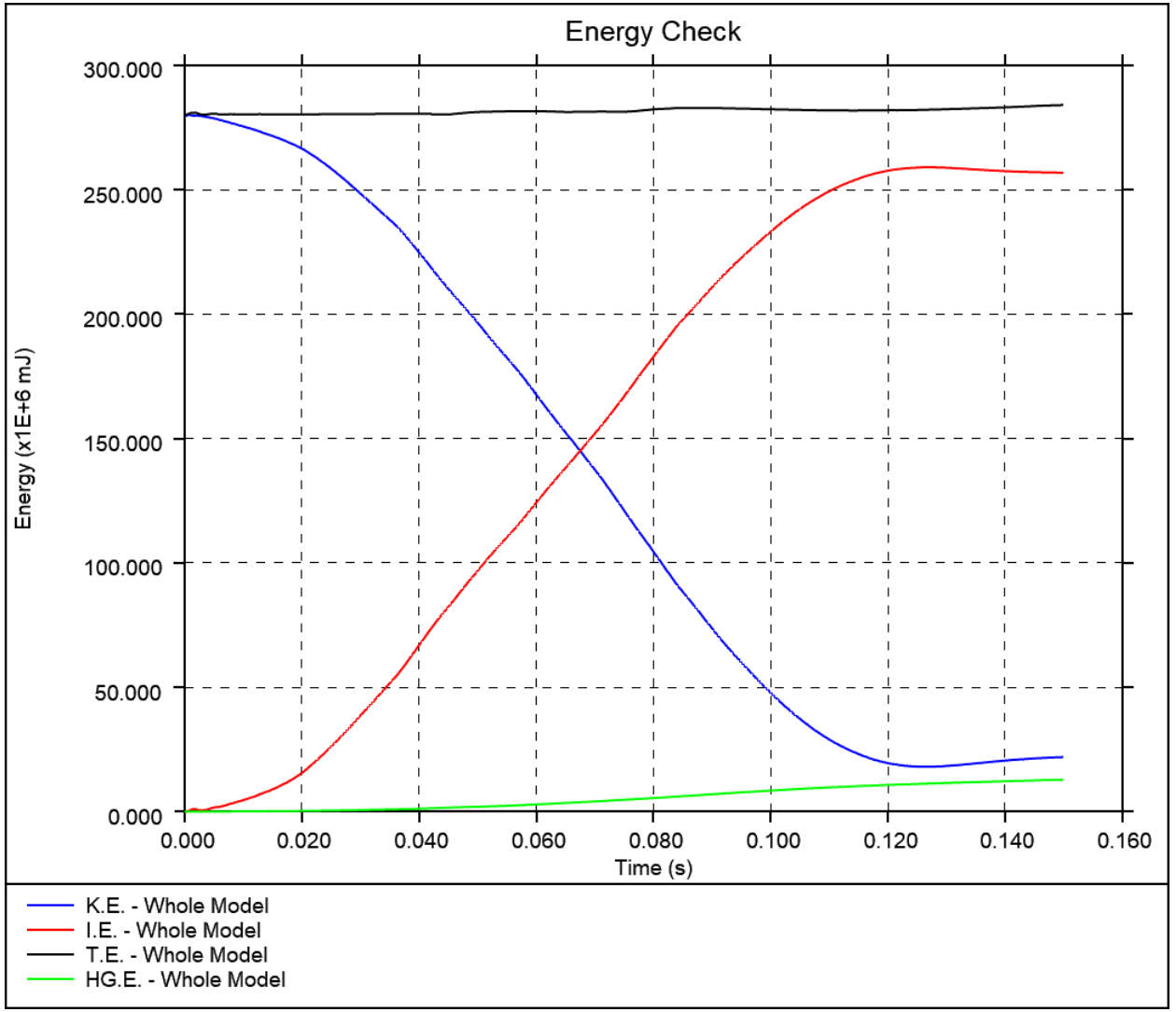
Workflows: Automotive Assessments

- When launched in D3PLOT, the Automotive Assessments Workflow will extract the data required for the assessment and process it according to the rules set out in the regulation.
- Example output from Euro NCAP Far Side assessment:



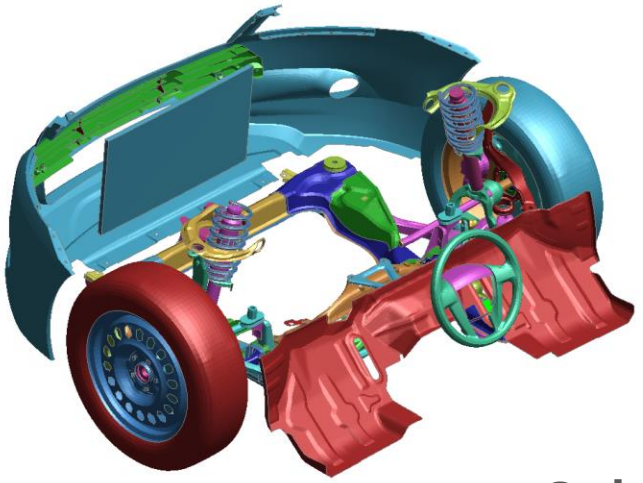
Workflows: Energy Check

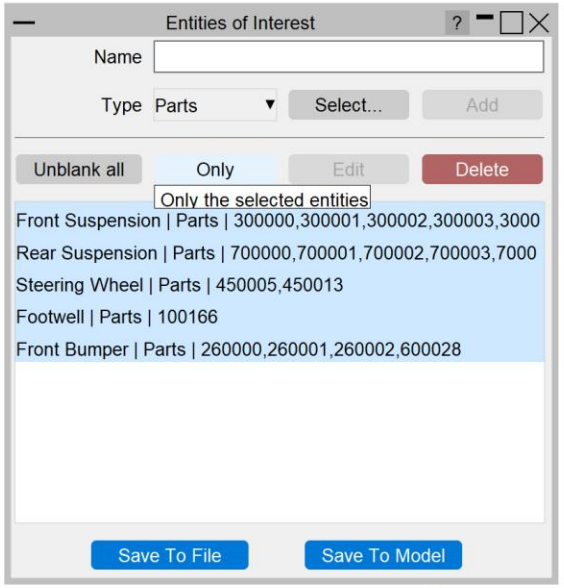
The **Energy Check** Workflow is a quick tool to help plot global energies for your model. In PRIMER, select a unit system (to define the energy units plotted). Then in T/HIS, select the Energy Check Workflow to plot a graph of total energy, kinetic energy, internal energy and hourglass energy for your model.



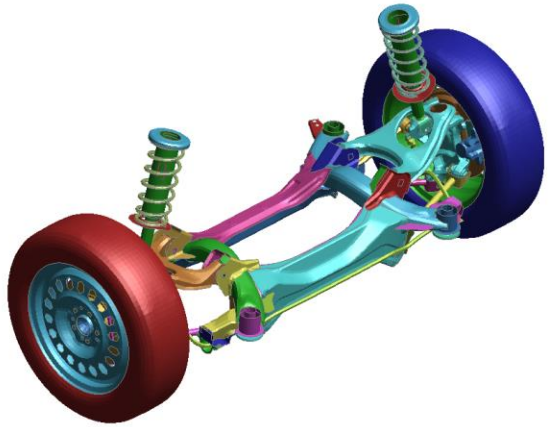
Workflows: Entities of Interest

- The Entities of Interest tool allows you to visualise specific groups of entities quickly in D3PLOT and action them.
- First, create a list of Entities of Interest in PRIMER – the list can comprise Parts and Part Sets.





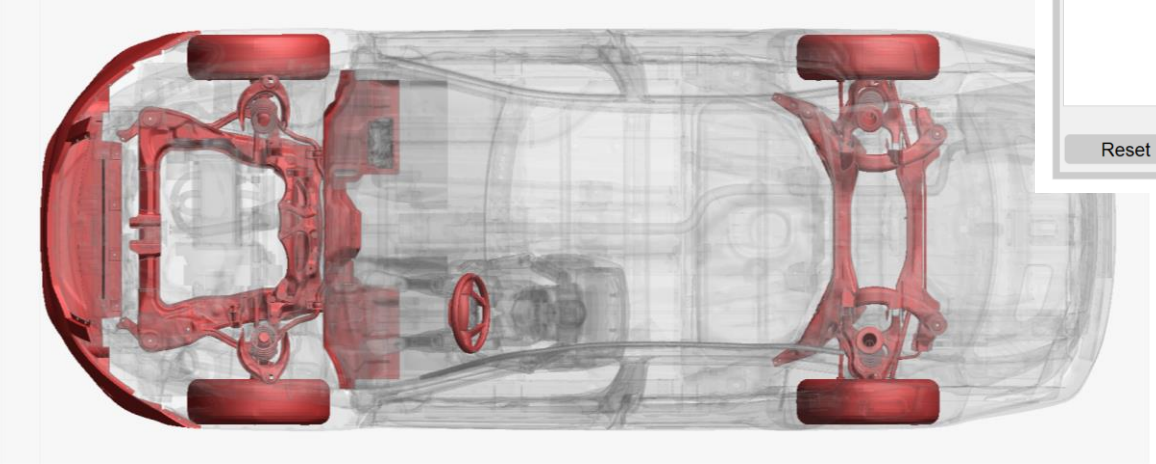
Only

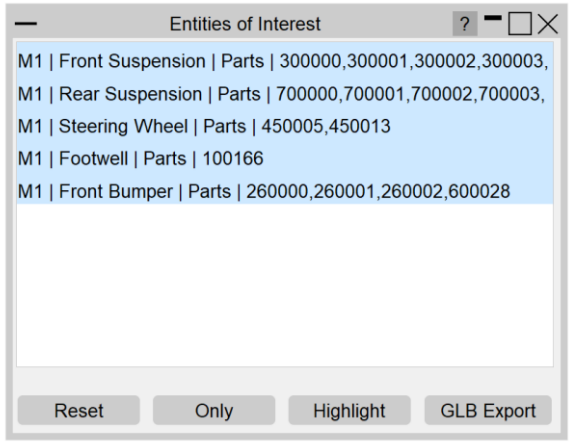


Workflows: Entities of Interest

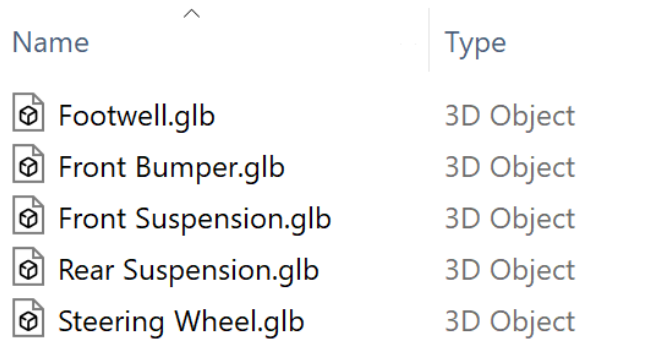
In D3PLOT, you can then execute various actions, including highlighting the selected entities, and exporting them as a set of GLB files for viewing in D3PLOT Viewer.

Highlight





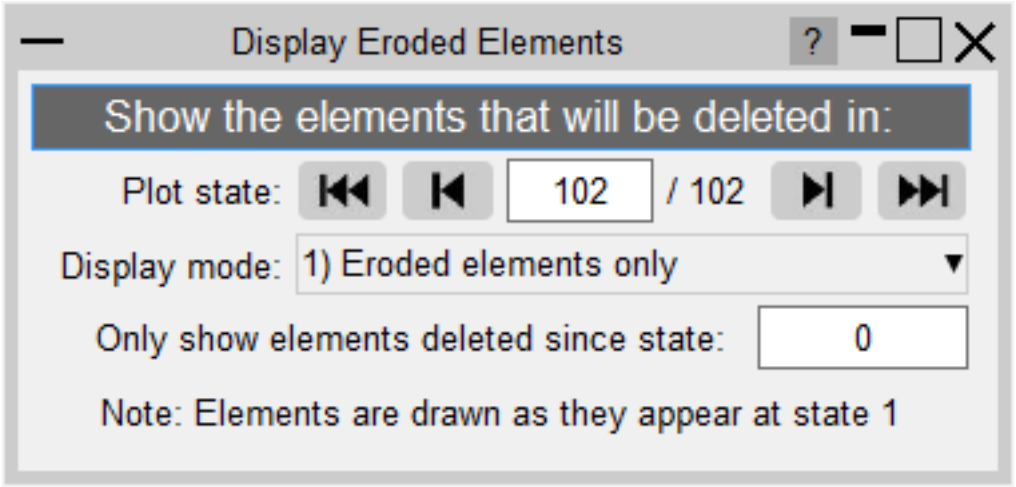
GLB Export

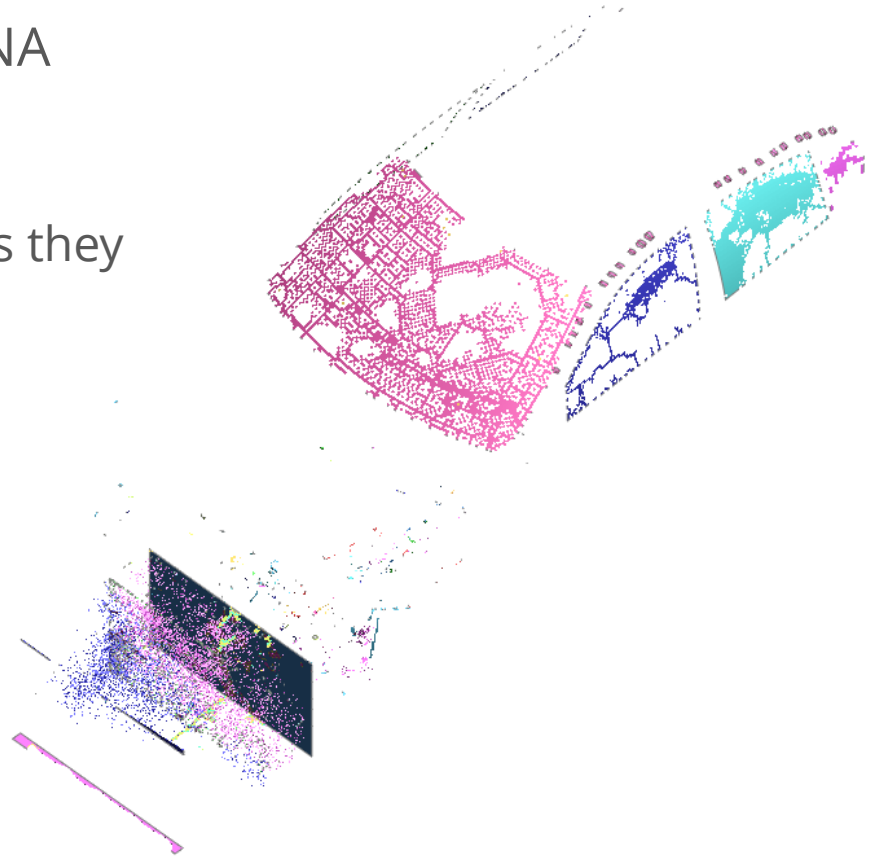


Workflows: Eroded Elements

The **Eroded Elements** Workflow provides a quick method of visualising eroded (deleted) elements in your LS-DYNA simulation.

- Note that while using this tool, elements are drawn as they appear at state 1.

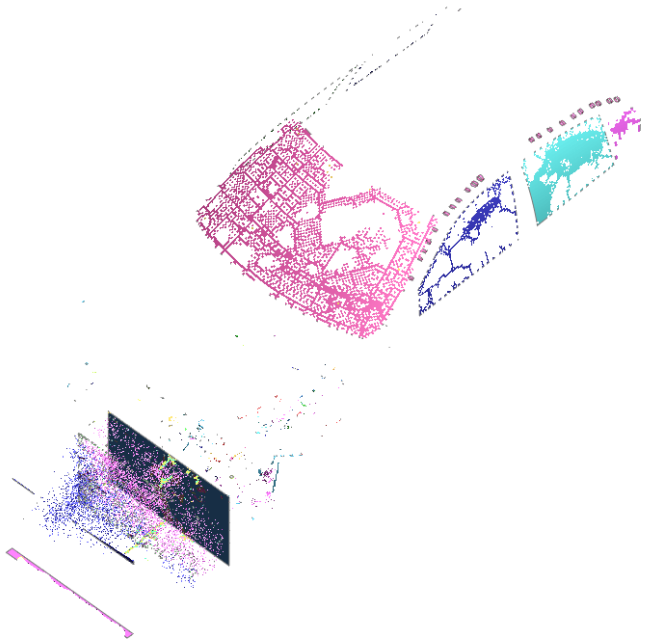




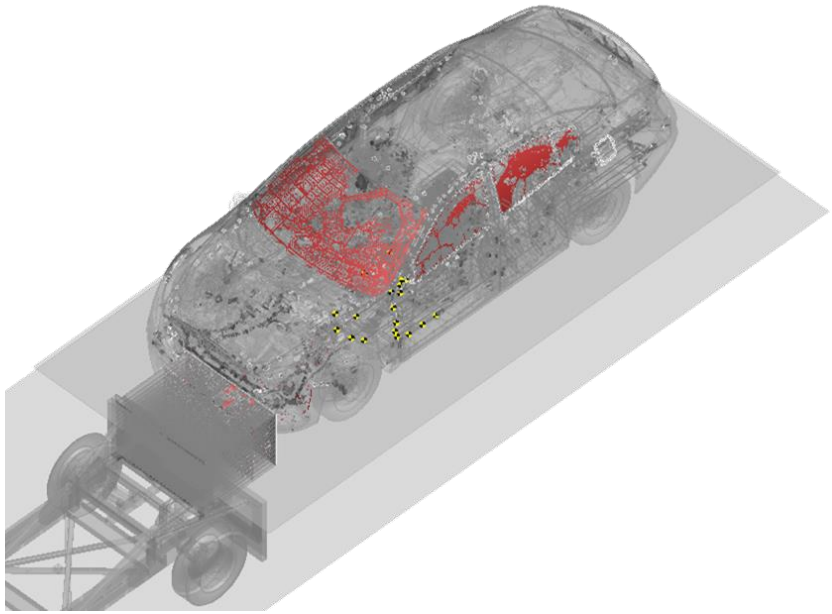
Workflows: Eroded Elements

There are three display modes:

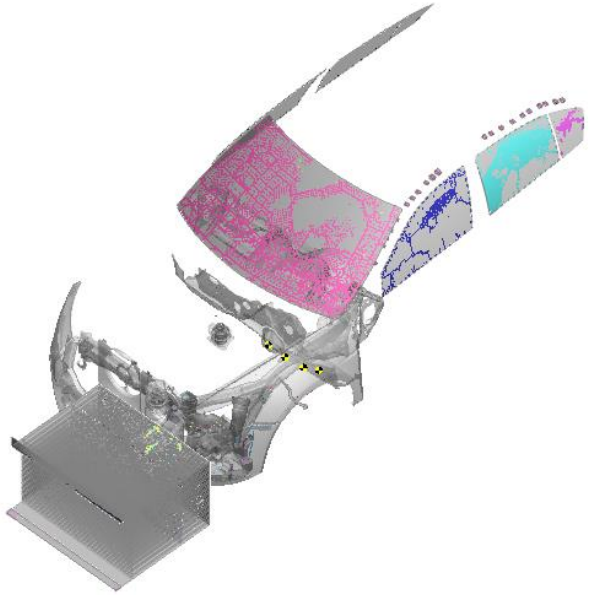
1. **Eroded elements only (default)**



2. **Eroded elements in red**

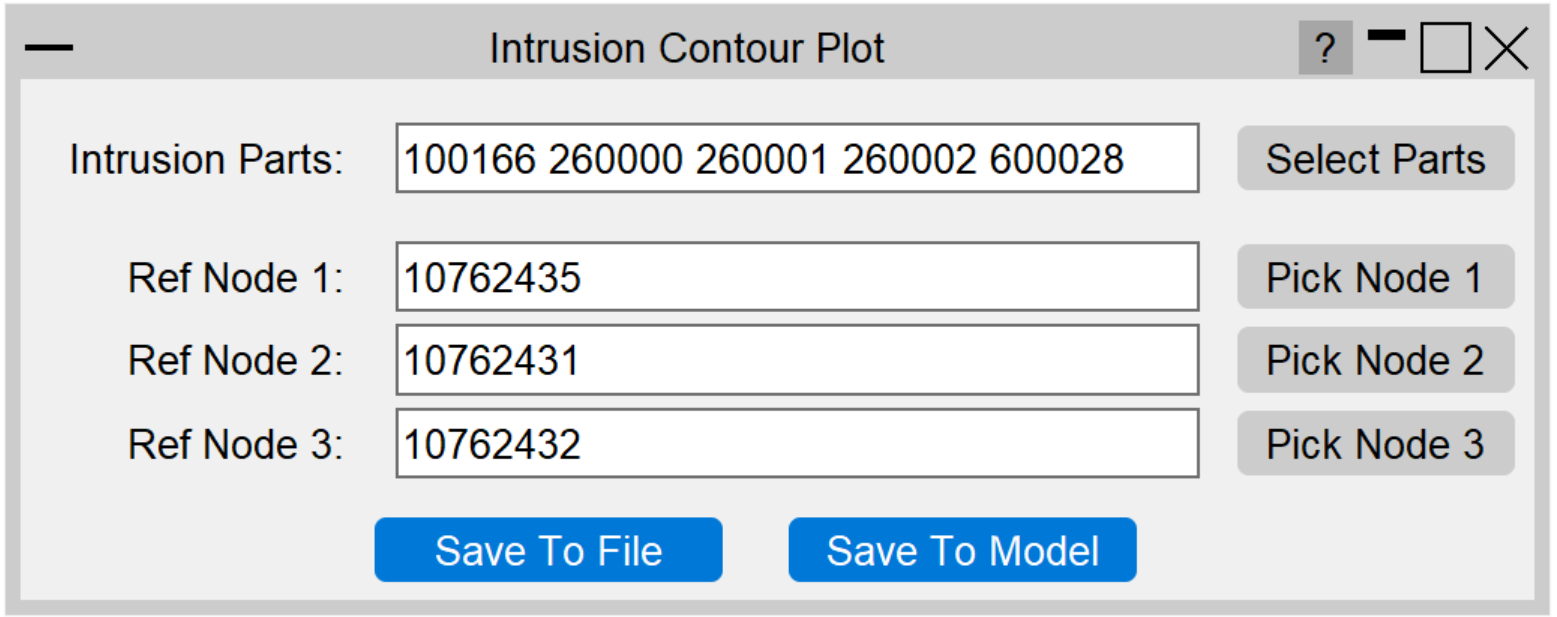


3. **Parts containing eroded elements**



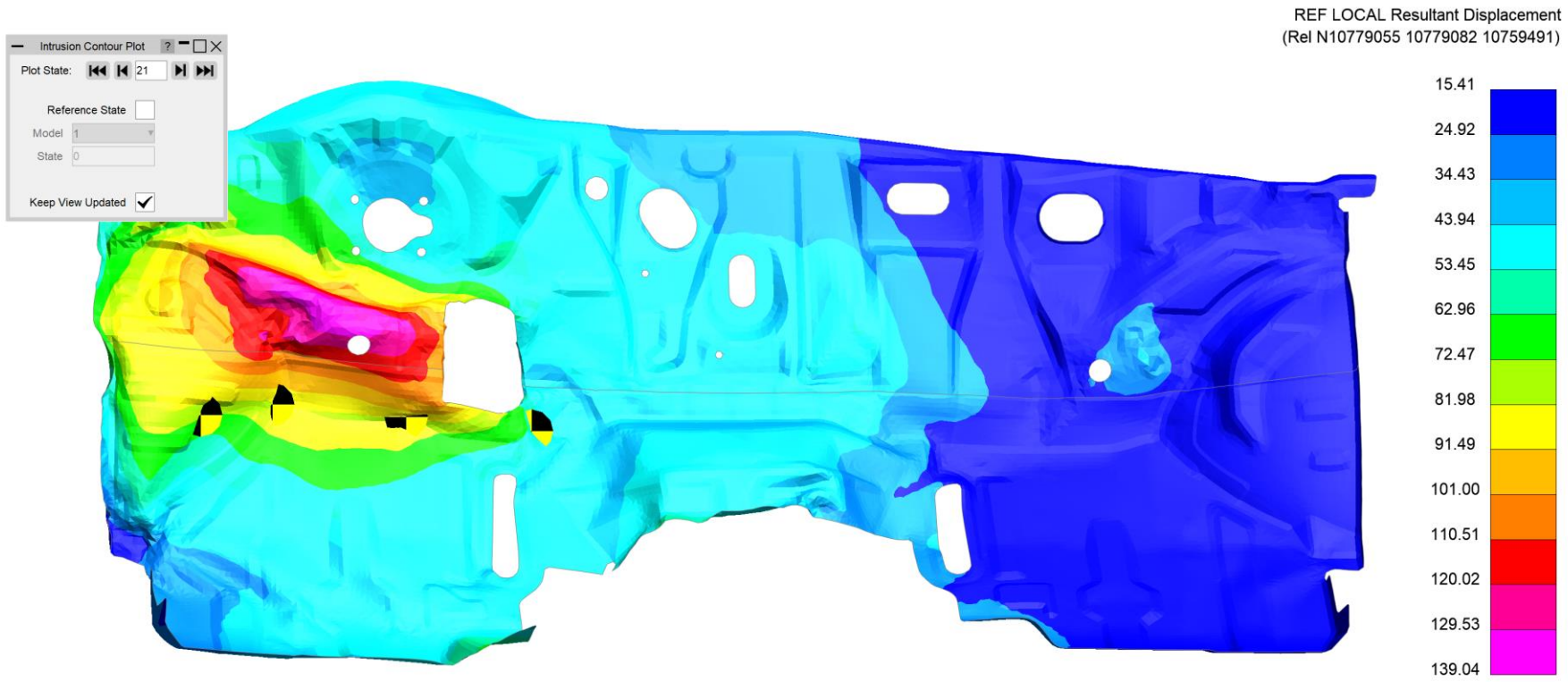
Workflows: Intrusion Contour Plot

- The Intrusion Contour Plot tool creates a contour plot of intrusion displacements for selected parts, relative to specified reference coordinates.
- Configure the plot in PRIMER:

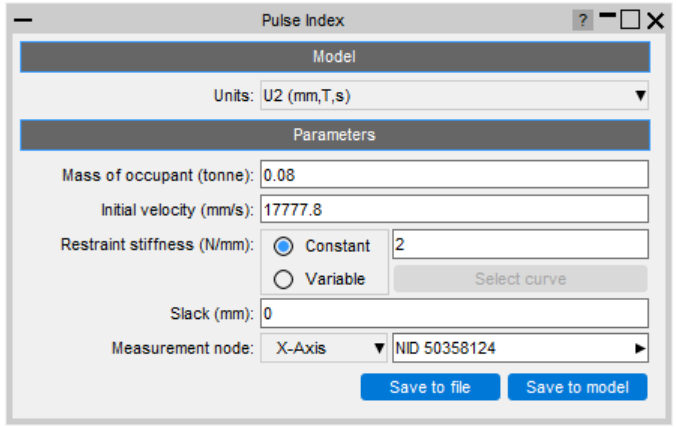


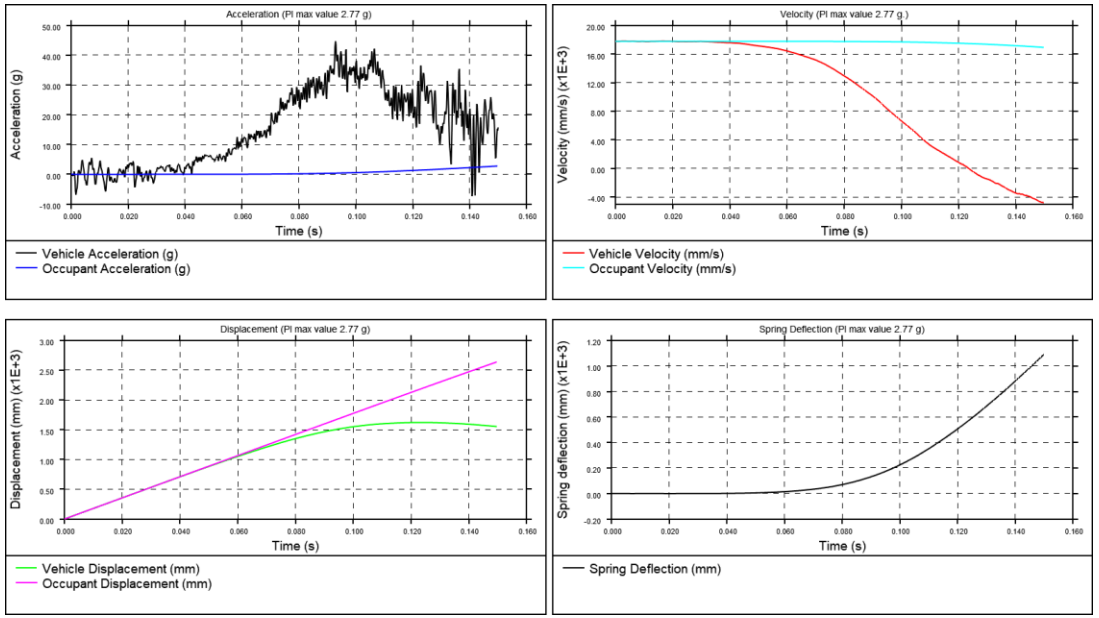
Workflows: Intrusion Contour Plot

In D3PLOT, you can control the plot state, plot the intrusion values relative to a reference state or different model, and control the view. Here is an example plot:



Workflows: Pulse Index

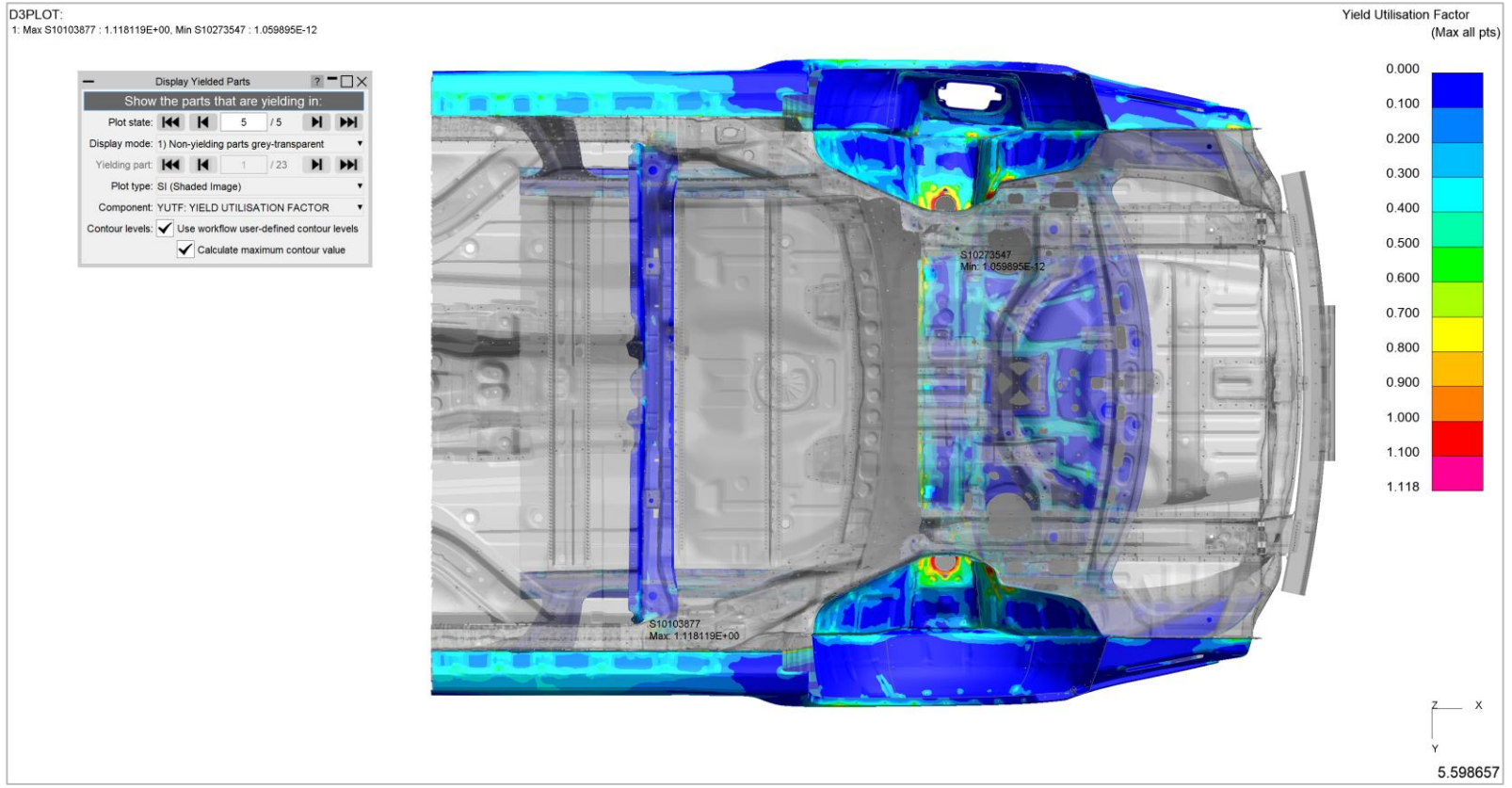




- During the early stages of vehicle development, it can be useful to understand occupant acceleration without needing to include a complex and computationally expensive occupant model.
- The **Pulse Index** Workflow allows you to estimate the acceleration that would be experienced by a vehicle occupant in a crash test scenario.
- The tool assumes a virtual single-degree-of-freedom mass-spring system in which the occupant is represented by a **mass** and the seatbelt is represented by a **spring**.
- This virtual mass-spring system is effectively attached to a selected **node** moving with a set **initial velocity**.
- The tool optionally takes a **slack** input to account for seatbelt engagement.
- Occupant parameters are computed and visualised in T/HIS.

Workflows: Strength Check

The Strength Check tool allows you to visualise *yielding parts in D3PLOT:

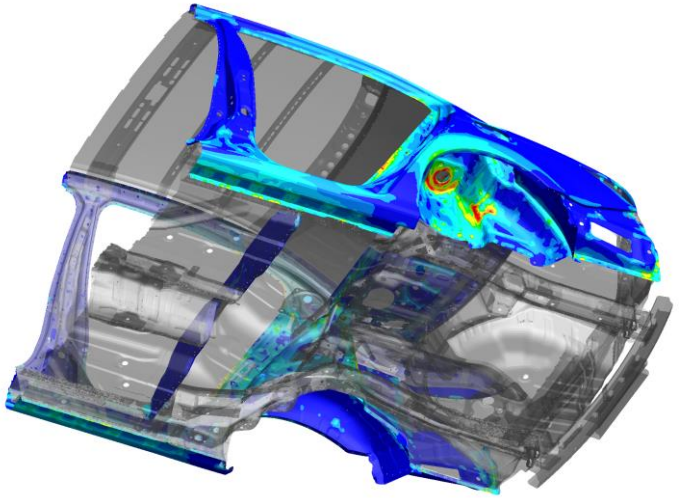


***Note:** Yielding parts are parts containing at least one yielding element, measured as an element with a Yield Utilisation Factor greater than one (or Yield Utilisation Percentage greater than 100%).

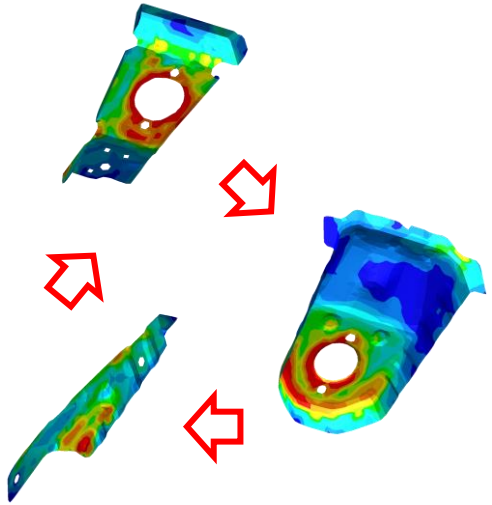
Workflows: Strength Check

There are three display modes:

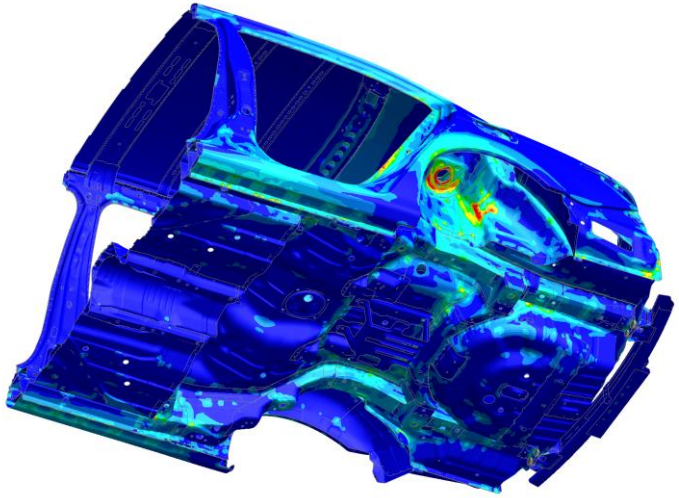
1. **Non-yielding parts transparent-grey**



2. **Cycle through yielding parts**



3. **Plot of entire model**



Workflows: Strength Check

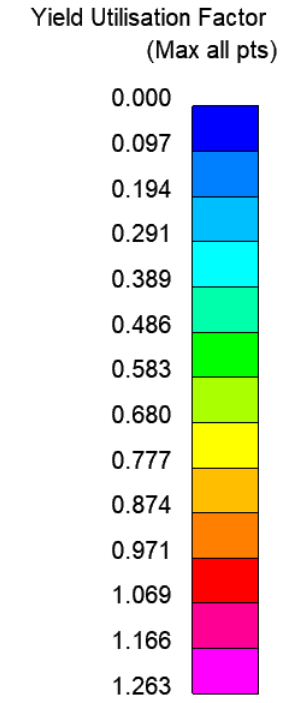
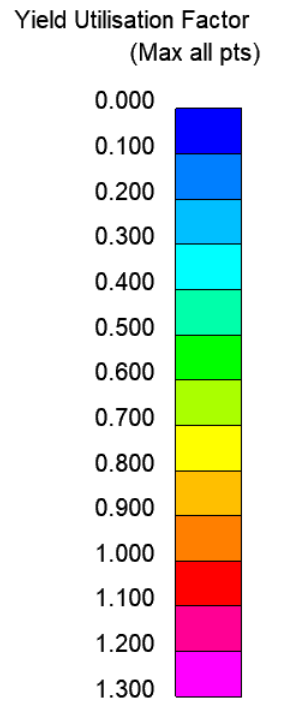
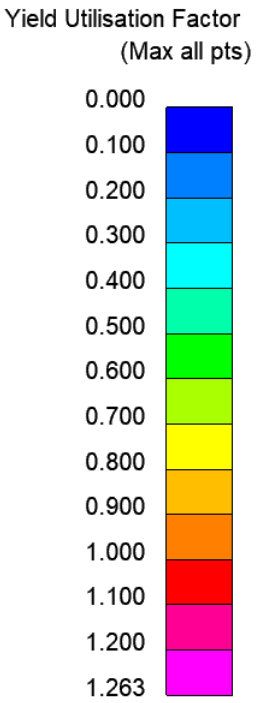
You can also control the contour bar levels:

- **Use workflow user-defined contour levels**

  To better visualise yielding parts, this option is enabled by default. The contour bar has values from 0.0 to 1.0 (blue to dark orange) in increments of 0.1, and then three further contour levels in red and magenta, so that all yielding material is clearly indicated in red/magenta. If this option is unchecked, automatic contour levels will be used.

  - **Calculate maximum contour value**

    With the above option enabled then by default, the actual maximum data value will be calculated for the maximum contour level. For example, if the maximum yield utilisation factor is 1.263 then the contour levels above 1.0 will be 1.1, 1.2 and 1.263. This makes the maximum yield utilisation clearer. You can uncheck this option to speed up the plot (skips the maximum value calculation). In this case, the contour levels above 1.0 will be fixed to 1.1, 1.2 and 1.3.

Non-user-defined	User-defined without maximum calculation	User-defined with maximum calculation (Default)
		

Workflows – Creating Custom Workflows

In addition to the Workflows provided, you can also add your own custom workflows.

Workflows are written in JavaScript with three steps required to create them:

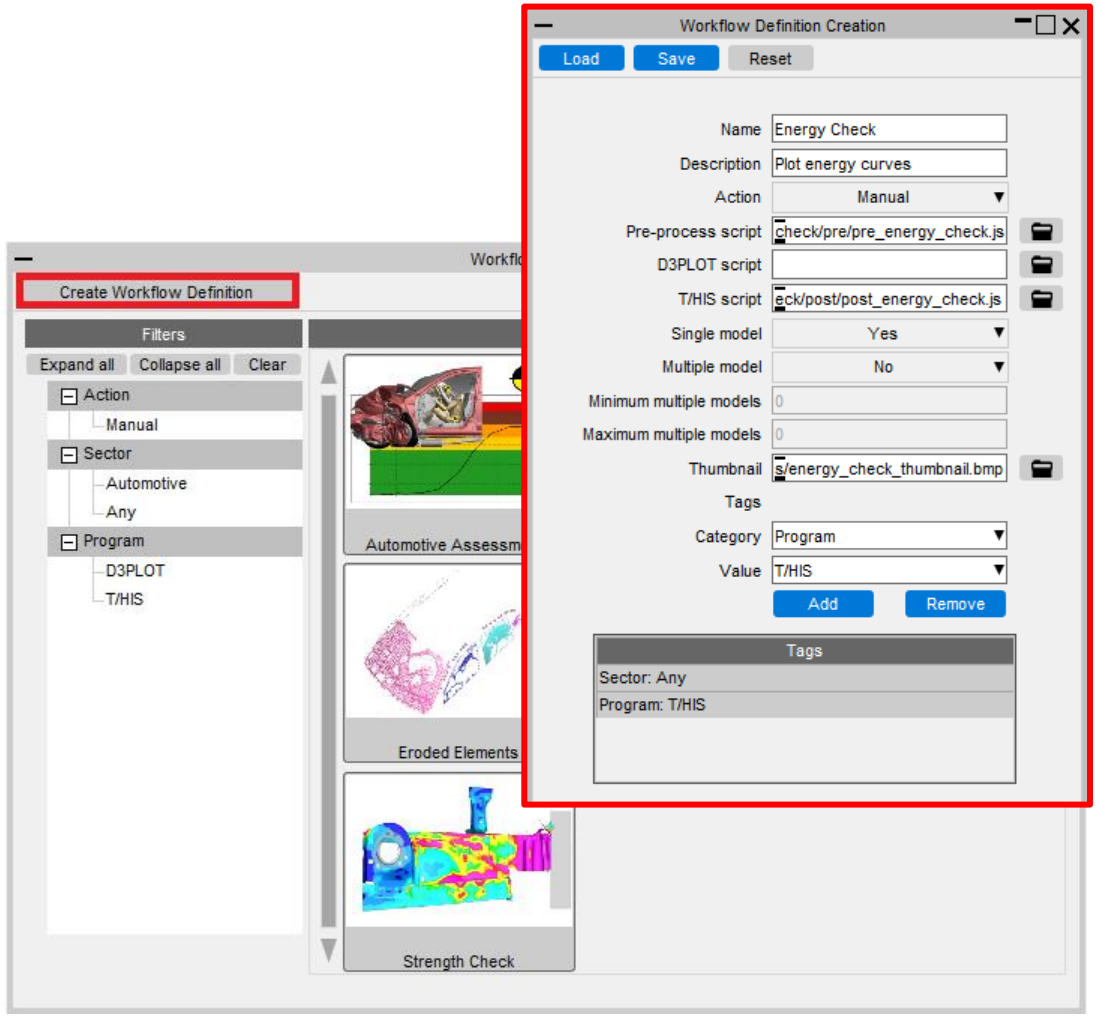
1. Create a **Workflow Definition** file to describe what the workflow does and point to the scripts to run in PRIMER, D3PLOT and/or T/HIS
2. Create a script to run in PRIMER that will collect data from user inputs and write it to a file or save it in the keyword file as post *END data
3. Create scripts to run in D3PLOT and/or T/HIS that will read the data and use it to carry out any appropriate actions

If you have an idea for a tool and would like some help creating it, have a look a the following slides, or please contact us.

Workflows – Creating Custom Workflows

1. Create a Workflow Definition file…

- The Workflow Definition file is a JSON file containing information about the tool and which scripts it should run.
- It can be created by hand or by using the ‘Create Workflow Definition’ function in the PRIMER Workflow menu.

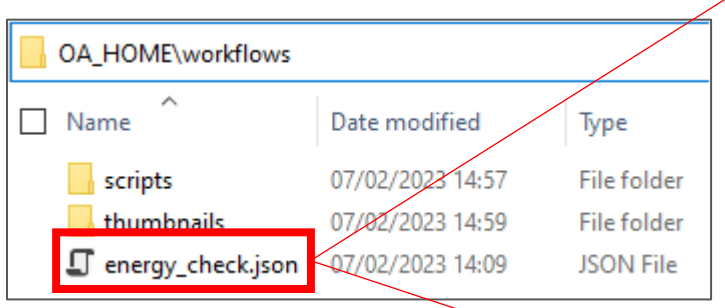


Workflows – Creating Custom Workflows

1. Create a Workflow Definition file…

The Workflow Definition file needs to be saved in one of the following directories:

- The directory set by the ***oasys*workflow_definition_directory*** preference
- ***OA_HOME/workflows***
- ***OA_INSTALL/workflows***
- ***OA_ADMIN/workflows***




```
{
    "name": "Energy Check",
    "description": "Plot energy curves",
    "user_data_required": true,
    "pre_process_script": "scripts/energy_check/pre/pre_energy_check.js",
    "t_his_script": "scripts/energy_check/post/post_energy_check.js",
    "action": "Manual",
    "single_model": true,
    "multiple_models": false,
           "thumbnail": "thumbnails/energy_check_thumbnail.bmp",
    "tags": {
        "Sector": "Any"
    }
}
```

Workflows – Creating Custom Workflows

2. Create a script to run in PRIMER…

The script to run in PRIMER needs to collect data from user inputs and then save it to a JSON file or as post *END data in the keyword file.

The **`Workflow`** JavaScript API class has helper methods to make it easy to save the data:

```
Workflow.WriteToModel()
Workflow.WriteToFile()
```

Please see the JavaScript API manual for further information.

Workflows – Creating Custom Workflows

3. Create scripts to run in D3PLOT and/or T/HIS…

The scripts to run in D3PLOT and/or T/HIS need to read the data saved with the model and then use it to provide the desired functionality.

The **`Workflow`** JavaScript API class has helper methods to make it easy to read the data for the models selected:

```
Workflow.NumberOfSelectedModels()
Workflow.ModelIdFromIndex()
Workflow.UserDataFromIndex()
Workflow.UnitSystemFromIndex()
```

Please see the JavaScript API manual for further information.

If you have an idea for a tool and would like some help creating it, please contact us.

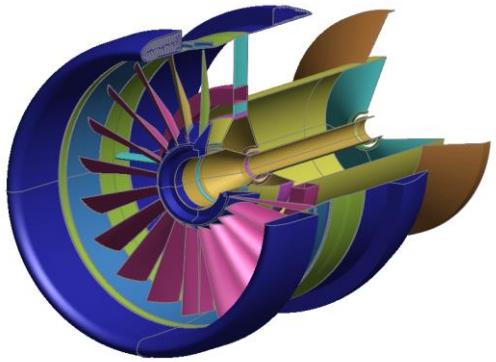
Cut Sections

Multiple Cut Sections

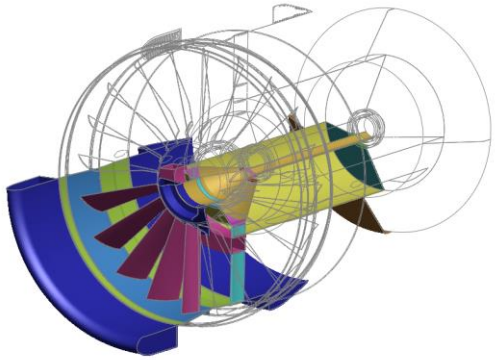
D3PLOT 20.0 now has complete support for multiple cut sections, matching what was added to PRIMER 19.0. You can now choose between Union and Intersection of multiple planes. For example:

- **Union** of constant Z cut plane and constant Y cut plane with positive action as Omit and negative action as Normal.
- **Intersection** of constant Z cut plane and constant Y cut plane with positive action as Outline and negative action as Normal.

Union



Intersection



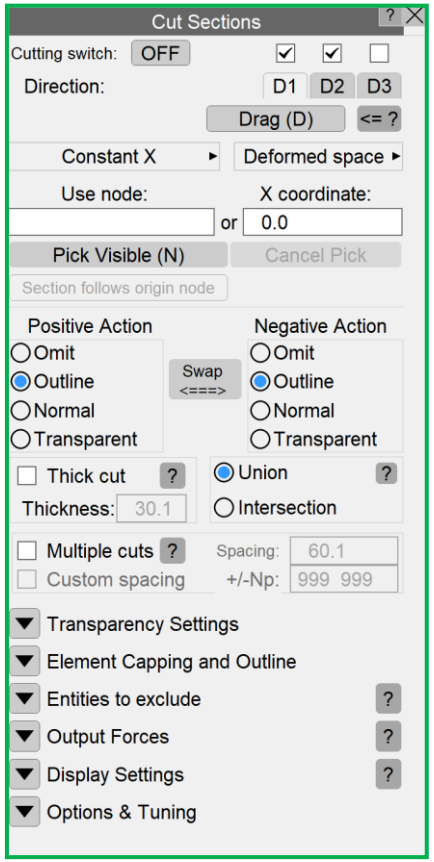
Images from LS-DYNA Aerospace Working Group

Cut section panel redesign

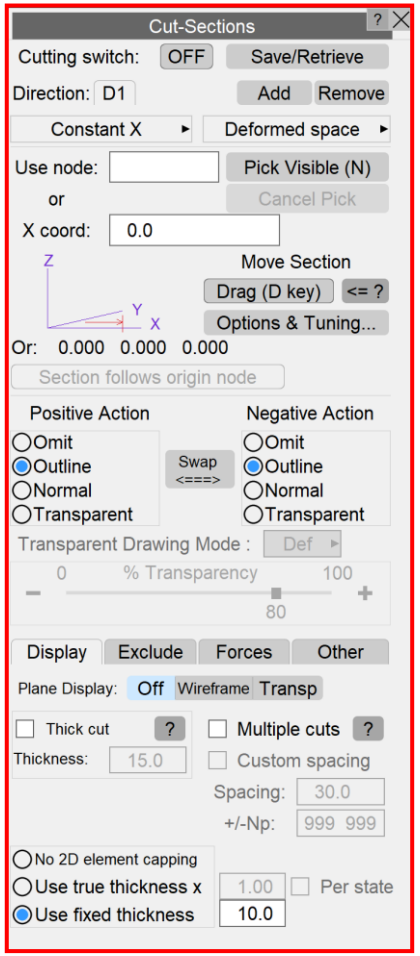
- The cut section panel has been redesigned to be more user friendly.
- All the relevant buttons have been grouped together to reduce effort.
- More frequently used buttons are towards the top and other buttons are included in expanders below.
- Redesign summary:

Old Panel	New Panel
Display tab	Static area (above all expanders)
	Element Capping and Outline
	Display Settings
Exclude tab	**Entities to exclude**
Forces tab	**Output Forces**
Other tab	**Display Settings**
Options & Tuning... button	**Options & Tuning**

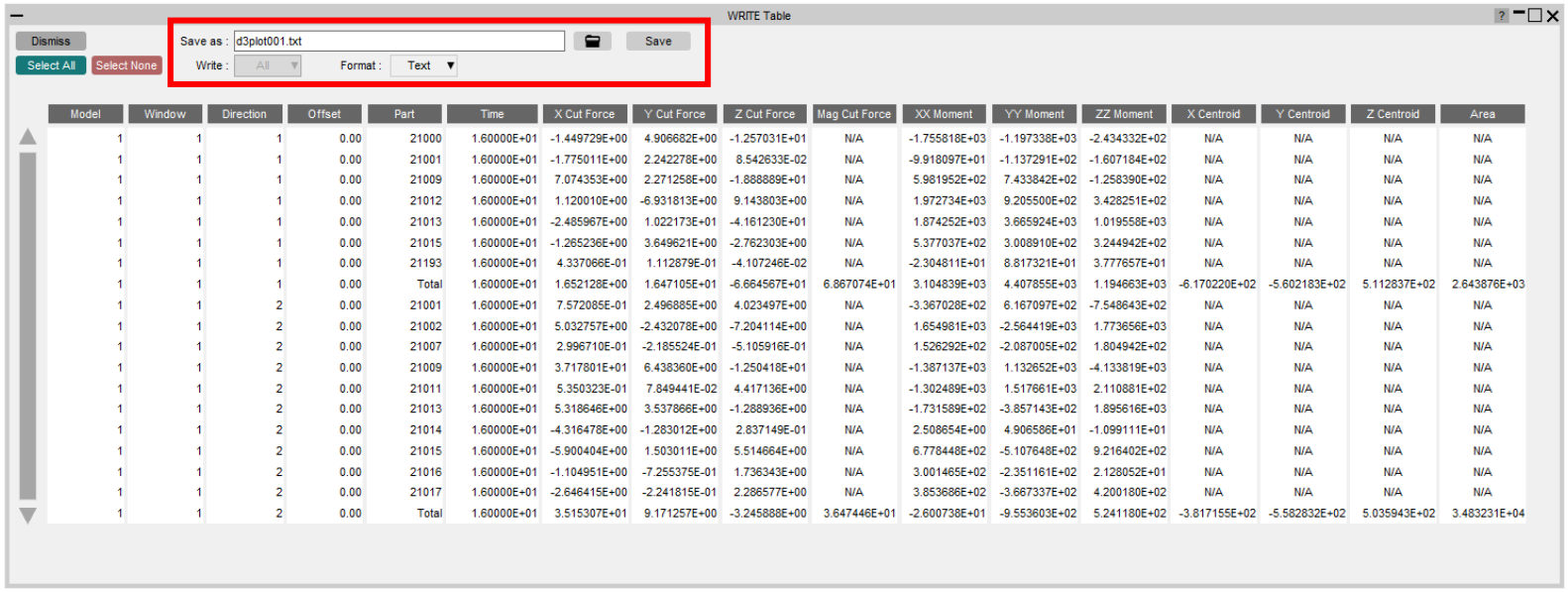
New Panel



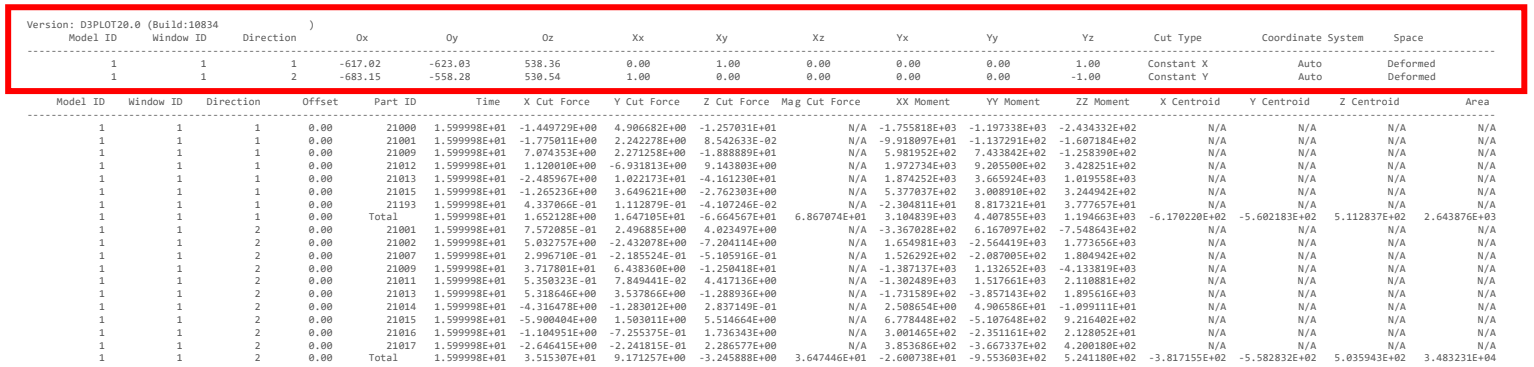
Old Panel



Cut section forces



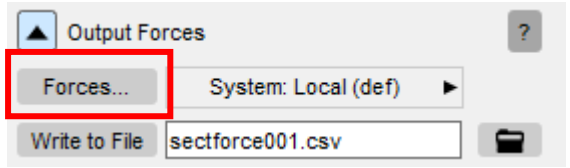
Model	Window	Direction	Offset	Part	Time	X Cut Force	Y Cut Force	Z Cut Force	Mag Cut Force	XX Moment	YY Moment	ZZ Moment	X Centroid	Y Centroid	Z Centroid	Area
1	1	1	0.00	21000	1.60000E+01	-1.449729E+00	4.906682E+00	-1.257031E+01	N/A	-1.755818E+03	-1.197338E+03	-2.434332E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21001	1.60000E+01	-1.775011E+00	2.242278E+00	8.542633E-02	N/A	-9.918097E+01	-1.137291E+02	-1.607184E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21009	1.60000E+01	7.074353E+00	2.271258E+00	-1.888889E+01	N/A	5.981952E+02	7.433842E+02	-1.258390E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21012	1.60000E+01	1.120010E+00	-6.931813E+00	9.143803E+00	N/A	1.972734E+03	9.205500E+02	3.428251E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21013	1.60000E+01	-2.485967E+00	1.022173E+01	-4.161230E+01	N/A	1.874252E+03	3.665924E+03	1.019558E+03	N/A	N/A	N/A	N/A
1	1	1	0.00	21015	1.60000E+01	-1.265236E+00	3.649621E+00	-2.762303E+00	N/A	5.377037E+02	3.008910E+02	3.244942E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21193	1.60000E+01	4.337066E-01	1.112879E-01	-4.107246E-02	N/A	-2.304811E+01	8.817321E+01	3.777657E+01	N/A	N/A	N/A	N/A
1	1	1	0.00	Total	1.60000E+01	1.652128E+00	1.647105E+01	-6.664567E+01	6.867074E+01	3.104839E+03	4.407855E+03	1.194663E+03	-6.170220E+02	-5.602183E+02	5.112837E+02	2.643876E+03
1	1	2	0.00	21001	1.60000E+01	7.572085E-01	2.496885E+00	4.023497E+00	N/A	-3.367028E+02	6.167097E+02	-7.548643E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	21002	1.60000E+01	5.032757E+00	-2.432078E+00	-7.204114E+00	N/A	1.654981E+03	-2.564419E+03	1.773656E+03	N/A	N/A	N/A	N/A
1	1	2	0.00	21007	1.60000E+01	2.996710E-01	-2.185524E-01	-5.105916E-01	N/A	1.526292E+02	-2.087005E+02	1.804942E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	21009	1.60000E+01	3.717801E+01	6.438360E+00	-1.250418E+01	N/A	-1.387137E+03	1.132652E+03	-4.133819E+03	N/A	N/A	N/A	N/A
1	1	2	0.00	21011	1.60000E+01	5.350323E-01	7.849441E-02	4.417136E+00	N/A	-1.302489E+03	1.517661E+03	2.110881E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	21013	1.60000E+01	5.318646E+00	3.537866E+00	-1.288936E+00	N/A	-1.731589E+02	-3.857143E+02	1.895616E+03	N/A	N/A	N/A	N/A
1	1	2	0.00	21014	1.60000E+01	-4.316478E+00	-1.283012E+00	2.837149E-01	N/A	2.508654E+00	4.906586E+01	-1.099111E+01	N/A	N/A	N/A	N/A
1	1	2	0.00	21015	1.60000E+01	-5.900404E+00	1.503011E+00	5.514664E+00	N/A	6.778448E+02	-5.107648E+02	9.216402E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	21016	1.60000E+01	-1.104951E+00	-7.255375E-01	1.736343E+00	N/A	3.001465E+02	-2.351161E+02	2.128052E+01	N/A	N/A	N/A	N/A
1	1	2	0.00	21017	1.60000E+01	-2.646415E+00	-2.241815E-01	2.286577E+00	N/A	3.853686E+02	-3.667337E+02	4.200180E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	Total	1.60000E+01	3.515307E+01	9.171257E+00	-3.245888E+00	3.647446E+01	-2.600738E+01	-9.553603E+02	5.241180E+02	-3.817155E+02	-5.582832E+02	5.035943E+02	3.483231E+04



Version: D3PLOT20.0 (Build:10834)

Model ID	Window ID	Direction	Ox	Oy	Oz	Xx	Xy	Xz	Yx	Yy	Yz	Cut Type	Coordinate System	Space
1	1	1	-617.02	-623.03	538.36	0.00	1.00	0.00	0.00	0.00	1.00	Constant X	Auto	Deformed
1	1	2	-683.15	-558.28	530.54	1.00	0.00	0.00	0.00	0.00	-1.00	Constant Y	Auto	Deformed

Model ID	Window ID	Direction	Offset	Part ID	Time	X Cut Force	Y Cut Force	Z Cut Force	Mag Cut Force	XX Moment	YY Moment	ZZ Moment	X Centroid	Y Centroid	Z Centroid	Area
1	1	1	0.00	21000	1.599998E+01	-1.449729E+00	4.906682E+00	-1.257031E+01	N/A	-1.755818E+03	-1.197338E+03	-2.434332E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21001	1.599998E+01	-1.775011E+00	2.242278E+00	8.542633E-02	N/A	-9.918097E+01	-1.137291E+02	-1.607184E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21009	1.599998E+01	7.074353E+00	2.271258E+00	-1.888889E+01	N/A	5.981952E+02	7.433842E+02	-1.258390E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21012	1.599998E+01	1.120010E+00	-6.931813E+00	9.143803E+00	N/A	1.972734E+03	9.205500E+02	3.428251E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21013	1.599998E+01	-2.485967E+00	1.022173E+01	-4.161230E+01	N/A	1.874252E+03	3.665924E+03	1.019558E+03	N/A	N/A	N/A	N/A
1	1	1	0.00	21015	1.599998E+01	-1.265236E+00	3.649621E+00	-2.762303E+00	N/A	5.377037E+02	3.008910E+02	3.244942E+02	N/A	N/A	N/A	N/A
1	1	1	0.00	21193	1.599998E+01	4.337066E-01	1.112879E-01	-4.107246E-02	N/A	-2.304811E+01	8.817321E+01	3.777657E+01	N/A	N/A	N/A	N/A
1	1	1	0.00	Total	1.599998E+01	1.652128E+00	1.647105E+01	-6.664567E+01	6.867074E+01	3.104839E+03	4.407855E+03	1.194663E+03	-6.170220E+02	-5.602183E+02	5.112837E+02	2.643876E+03
1	1	2	0.00	21001	1.599998E+01	7.572085E-01	2.496885E+00	4.023497E+00	N/A	-3.367028E+02	6.167097E+02	-7.548643E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	21002	1.599998E+01	5.032757E+00	-2.432078E+00	-7.204114E+00	N/A	1.654981E+03	-2.564419E+03	1.773656E+03	N/A	N/A	N/A	N/A
1	1	2	0.00	21007	1.599998E+01	2.996710E-01	-2.185524E-01	-5.105916E-01	N/A	1.526292E+02	-2.087005E+02	1.804942E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	21009	1.599998E+01	3.717801E+01	6.438360E+00	-1.250418E+01	N/A	-1.387137E+03	1.132652E+03	-4.133819E+03	N/A	N/A	N/A	N/A
1	1	2	0.00	21011	1.599998E+01	5.350323E-01	7.849441E-02	4.417136E+00	N/A	-1.302489E+03	1.517661E+03	2.110881E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	21013	1.599998E+01	5.318646E+00	3.537866E+00	-1.288936E+00	N/A	-1.731589E+02	-3.857143E+02	1.895616E+03	N/A	N/A	N/A	N/A
1	1	2	0.00	21014	1.599998E+01	-4.316478E+00	-1.283012E+00	2.837149E-01	N/A	2.508654E+00	4.906586E+01	-1.099111E+01	N/A	N/A	N/A	N/A
1	1	2	0.00	21015	1.599998E+01	-5.900404E+00	1.503011E+00	5.514664E+00	N/A	6.778448E+02	-5.107648E+02	9.216402E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	21016	1.599998E+01	-1.104951E+00	-7.255375E-01	1.736343E+00	N/A	3.001465E+02	-2.351161E+02	2.128052E+01	N/A	N/A	N/A	N/A
1	1	2	0.00	21017	1.599998E+01	-2.646415E+00	-2.241815E-01	2.286577E+00	N/A	3.853686E+02	-3.667337E+02	4.200180E+02	N/A	N/A	N/A	N/A
1	1	2	0.00	Total	1.599998E+01	3.515307E+01	9.171257E+00	-3.245888E+00	3.647446E+01	-2.600738E+01	-9.553603E+02	5.241180E+02	-3.817155E+02	-5.582832E+02	5.035943E+02	3.483231E+04

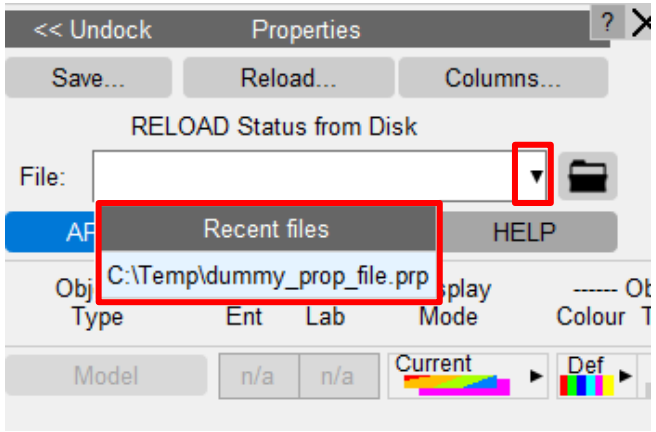


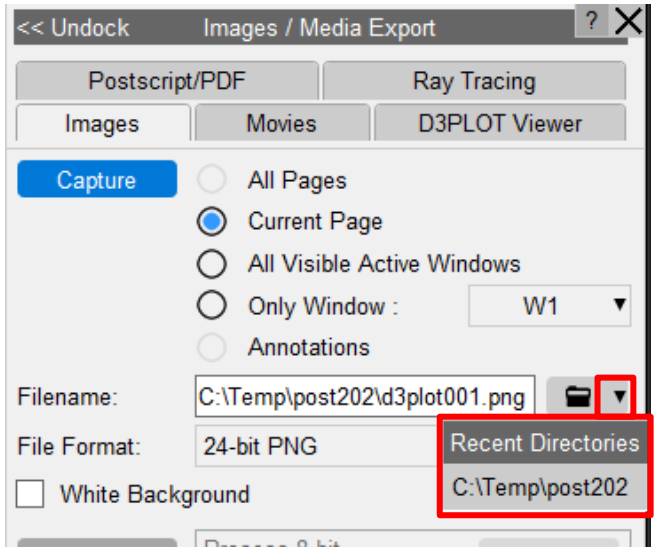
- Extracting cut section forces has been improved in D3PLOT 20.0. Under the **Output Forces** expander, select **Forces...** to launch a Write table with the cut section forces summary, rather than the old listing box in D3PLOT 19.0.
- Force data can be written to **Text**, **CSV** and **XLSX** format from the Write table.
- The output files contain additional header information recording the properties of each cut, as well as the cut section forces data.

Recent Files

Recent Files

- When **reading** files, you will now find a list of **recent files** in the drop-down attached to the input file textbox. This should make it easier to retrieve and read recent files more quickly. This feature is supported in most of the commonly used menus.
- When **writing** files, as well as the recent files list, you will find a **recent directories** list attached to the file selector button. This allows you to select a recent directory without having to re-specify the filename.





JavaScript API

Cut Sections

Number of cut section directions

In order to support the improvements made to Cut Sections in D3PLOT 20.0, several changes have been made to the D3PLOT JavaScript API:

- In **GetNumberOf**, support for **CUT_SECTION** has been removed. Instead, the return object from **GetCutSection** has a new **visible** property.
- In D3PLOT 19.0, visible cut directions were determined by the number of active directions:

    1 direction: only D1 visible

    2 directions: D1 and D2 visible

    3 directions: D1, D2 and D3 visible
- In D3PLOT 20.0 any combination of D1, D2 and/or D3 can be made visible.

Removing cut directions

- In D3PLOT 19.0, removing a cut direction either on the panel or with **RemoveCutDirection** moved remaining directions to different indices. For example, when D1, D2 and D3 were active and D1 was removed, the previous D2 and D3 became the new D1 and D2 respectively.
- In D3PLOT 20.0, a cut direction is deactivated by the checkbox above the direction tab. When D1, D2 and D3 are active and then D1 is switched off, D2 and D3 stay where they are without change of index.
- In D3PLOT 20.0, switching off and back on a cut direction always gives back its original geometric location.

Removing cut directions in scripts

- In D3PLOT 19.0 a call:
  `RemoveCutDirection({ window_id: 1, direction_id: 1 });`
  removed direction D1 from window 1. The previous D2 or D3 became D1 or D2 respectively.
- In D3PLOT 20.0, the same function is deprecated. If still used, it makes D1 inactive, but D2 and D3 remain D2 and D3. Therefore care must be taken when the remaining directions are still referred to later in the same script or elsewhere in the D3PLOT session.
- In D3PLOT 20.0, direction D1 can be made inactive in window 1 by calling:
  `SetCutSection({ window_id: 1, direction_id: 1, visible: OFF });`

Adding cut directions in scripts

- In D3PLOT 19.0, a direction was added (made active) with **SetCutSection** and the first unused direction ID. For example, to add D3 when D1 and D2 are active:
  `SetCutSection({ window_id: 1, direction_id: 3, …[other properties]…});`
- In D3PLOT 20.0, the function **SetCutSection** can be used in the same way. The directions defined do not need to be contiguous, so with only D1 active you can now define D3 without using D2.
- In D3PLOT 20.0, a previously defined cut direction can also be reinstated. For example:
  `SetCutSection({ window_id: 1, direction_id: 3, visible: ON });`

Looping over active cut directions

- In D3PLOT 19.0, a loop over all active directions was:

```
let n = GetNumberOf(CUT_SECTION, { window_id: 1 });
for(let i=0; i<n; i++)
{
    let obj = GetCutSection({ window_id: 1, direction_id: i });
    /* do something */
}
```

- In D3PLOT 20.0 a loop over all active directions can be written as:

```
for(let i=0; i<3; i++)
{
    let obj = GetCutSection({ window_id: 1, direction_id: i });
    if(obj.visible == ON)
    {
        /* do something */
    }
}
```

Thick cuts

- In D3PLOT 19.0, a cut plane with thick cuts and thickness 10.0 could be defined like so:
  `SetCutSection({ attribute: CONST_X, origin: [0, 0, 0], thickness: 10.0 });`
- In D3PLOT 19.0, the same direction without thick cut could be defined by omitting the **thickness** property assignment:
  `SetCutSection({ attribute: CONST_X, origin: [0, 0, 0] });`

In D3PLOT 20.0, fewer properties need to be repeated in **SetCutSection**:

- To switch on thick cuts for a plane already defined, we can simply call:
  `SetCutSection({ thickness: 10.0 });`
- To switch off thick cuts in D3PLOT 20.0 without changing the plane location, set the thickness to zero:
  `SetCutSection({ thickness: 0.0 });`
- To set the plane at constant X with coordinate 100.0 whilst leaving thick cuts and thickness unchanged:
  `SetCutSection({definition: CONST_X, origin: [100, 0, 0] });`
  Note that this syntax switched off thick cuts in D3PLOT 19.0, so in old scripts, **thickness: 0.0** needs to be added to retain old behaviour.

Multiple parallel cuts

- In D3PLOT 20.0, the property **thickness: 0.0** is required to switch off thick cuts, where in D3PLOT 19.0 it could be omitted.
- Similarly, D3PLOT 20.0 now requires **spacing: 0.0** to switch off parallel cuts, whereas in D3PLOT 19.0 it needed to be omitted for the same effect. Therefore old scripts may require updating.
- In D3PLOT 20.0, omitting the **spacing** property means leaving multiple parallel cuts unchanged while for example changing the plane location or thick cuts with **SetCutSection**.
- In D3PLOT 20.0, parallel cuts can be controlled via the **spacing** property:

```
SetCutSection({ spacing: 20.0, npos: 3, nneg: 3 });    /* Uniform spacing */
SetCutSection({ spacing: [-60.0, -20.0, 0.0, 60.0] }); /* Custom spacing */
SetCutSection({ spacing: 0.0 }); /* Switch off parallel cuts */
```

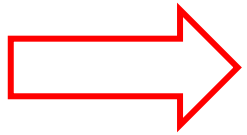
JavaScript

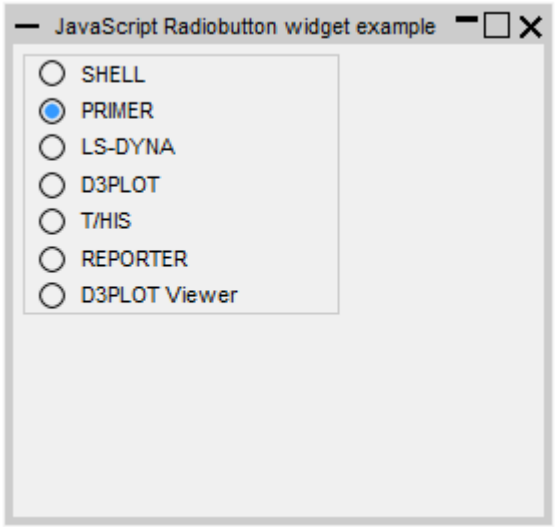
Other Updates

JavaScript widget additions – Radio buttons

- Radio button widgets allow you to choose a single option from a list:

```
Window.Theme(Window.THEME_CURRENT);

let wi;

// Create window
let w = new Window("JavaScript Radiobutton widget example", 0.85, 1.0, 0.75, 1.0);

// Create radiobutton widget
let r = new Widget(w, Widget.RADIOBUTTON, 1, 51, 1, 41);

// Add widgetitems to the radio button
wi = new WidgetItem(r, "SHELL");
wi = new WidgetItem(r, "PRIMER");

// Select the PRIMER widgetitem
wi.selected = true;

wi = new WidgetItem(r, "LS-DYNA");
wi = new WidgetItem(r, "D3PLOT");
wi = new WidgetItem(r, "T/HIS");
wi = new WidgetItem(r, "REPORTER");
wi = new WidgetItem(r, "D3PLOT Viewer");

// Show the window and start event loop
w.Show();
                                                    25,9          All
```

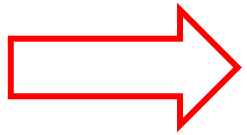


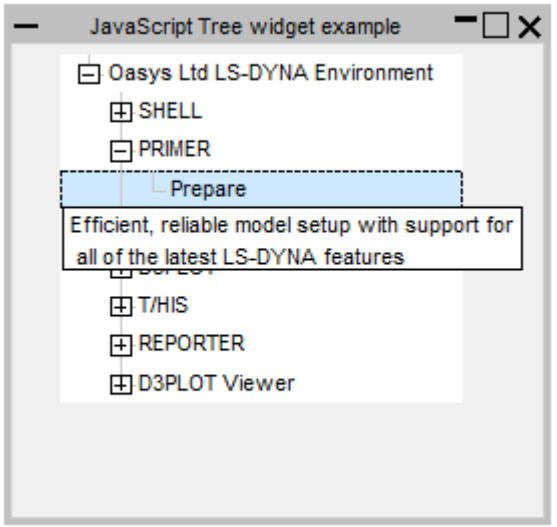


JavaScript widget additions – Trees

- Tree widgets allow you to display data in a hierarchical structure:

```
// Create window
let w = new Window("JavaScript Tree widget example", 0.85, 1.0, 0.75, 1.0);

// Create tree widget
let t = new Widget(w, Widget.TREE, 1, 71, 1, 61, "Suite");

// Add a root node to tree
let env_wi = new WidgetItem(t, "Oasys Ltd LS-DYNA Environment");

// Add a child to the root node
wi  = new WidgetItem(t, "SHELL", Widget.CHILD, env_wi);
// add a child to the child node
cwi = new WidgetItem(t, "Portal to the environment", Widget.CHILD, wi);

wi  = new WidgetItem(t, "PRIMER", Widget.CHILD, env_wi);
cwi = new WidgetItem(t, "Prepare", Widget.CHILD, wi);
// Add a mouseOver callback for the WidgetItem
wi.onMouseOver = wi_onmouseover;
cwi.hover = "Efficient, reliable model setup with support for all of the latest
LS-DYNA features";

wi  = new WidgetItem(t, "LS-DYNA", Widget.CHILD, env_wi);
cwi = new WidgetItem(t, "Analyse", Widget.CHILD, wi);
                                                    18,1          11%
```





Other JavaScript API Updates

- The JavaScript engine has been upgraded (Spidermonkey ESR102)
- Functions Blank() and Unblank() can now accept strings ('ALL', 'ALL_DEL' etc.) and number arrays for the <item> parameter
- The following new functions have been added:

Function	Description
OpenManual(program*[string]*, page*[string]*)	Open an Oasys manual at a specific page
ModelExists(model_id*[integer]*)	Checks whether a model exists in the database
NumDeleted(type_code*[integer]*, state_id (optional)*[integer]*)	Gets the number of deleted elements or segments
GetContourLimit(mode*[integer]*, component (optional)*[string]*)	Returns the maximum/minimum contour plot value of <component> specified for the current window
GetConditionParts(component*[integer]*, value*[real]*, mode*[integer]*, int_pt (optional)*[object | integer]*, extra (optional)*[integer]*)	Returns an object with all parts in current model filtered into two lists (pass_list and fail_list). Passing parts must contain elements that pass the specified condition (indicated by <value> and <mode>) for the specified <component>.

Preferences

New Preferences

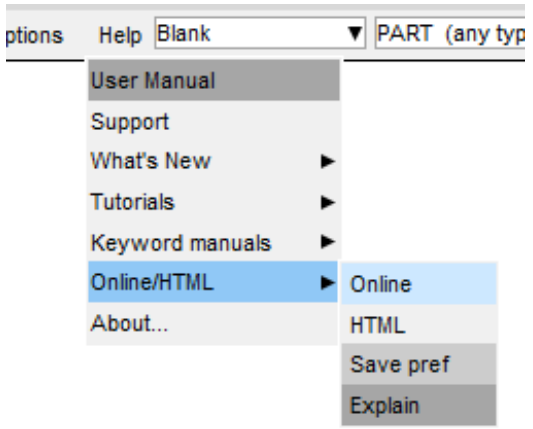
Preference	Description
oasys*online_manuals	Whether to open manuals online or using the local HTML copy
oasys*workflow_definitions_directory	Workflow definitions folder location
oasys*workflow_auto_open_post_menu	Automatically open the **Workflow** menu in D3PLOT or T/HIS when reading in a model that has workflow data
d3plot*cut_section_cap2d	Method of shell element cut section capping (none, true thickness or fixed thickness)
d3plot*cut_section_cap2d_fac	True-thickness factor for shell element cut section capping
d3plot*cut_section_cap2d_val	Fixed thickness value for shell element cut section capping
d3plot*cut_section_per_state	Draw true-thickness shell element capping for each state (rather than using the initial value for all states)
d3plot*cut_section_zero_orig	Use zero coordinates as default cut origin instead of model centre
d3plot*cut_section_capping_colour	Cut section capping colour
d3plot*cut_section_outline_switch	Cut section outline switch
d3plot*cut_section_outline_width_val	Cut section outline width
d3plot*cut_section_outline_colour	Cut section outline colour
d3plot*output_directory	Default output directory for images and other files when multiple models have been read
d3plot*footer_size	Font size for footer (in graphics window)
d3plot*plot_disp_mag	Controls magnification display in graphics window
d3plot*plot_d3plot_prefix	Controls whether D3PLOT prefix is used in graphics window title
d3plot*beam_line_thickness	Line thickness of beams if thick lines are on
d3plot*beam_spwld_end_caps	Beam spotweld end caps added

Help & Documentation

Help & Documentation

- The manuals are now online by default.
  - Powerful search tool.
  - Google translation available.
  - Continuous updates and fixes.
- A local HTML version of the manuals can still be used.
  - Useful if there there is no Internet access.
  - Local or online can be saved via a preference:

    oasys*online_manuals: TRUE/FALSE.



- The new JS API manual combines documentation for PRIMER, D3PLOT, T/HIS and REPORTER.
  - i.e. D3PLOT, T/HIS and REPORTER JS-API documentation is no longer in separate appendices.
  - Local HTML and PDF versions are available.
  - The new JS API manual is not yet online.

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