## **Instrument Panel Pendulum Impact**





- The IP Pendulum function can be used to specify multiple Instrument Panel Pendulum impact models for ECE R21 or FMVSS201.
- This function is accessed under "Safety" -> "IP Pendulum".
- The IPP function supports interactive and batch model processing. Automated positioning and dependeration is available.
- The IPP impactor model for use with this tool can be downloaded using the following link:

http://www.oasys-software.com/dyna/en/downloads/extras/arup\_pendulum.key.gz



## **General Description of the Panel**



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#### **IP Pendulum Impact Panel**

Note: the impactor must be added as an include into the model containing the trim to activate IP Pendulum tool.

- **Contact** A contact must be defined between the impactor and the vehicle dashboard.
- **Velocity** This is the linear velocity at centre of the impactor.
- H-Point Coordinates of H-Point to use in the setup. The base of the IPP pendulum model will be positioned to this point.

[	IP PENDULUM IM	PACT		? X
	Model 1 :: IPP 1 sela	ected		
Title:	IPP impactor			
Contact:	1	►	Create	
velocity:	6694.444	►	Settings	
H-point:	2840.0 0.0 0.0	►		
	target name: n/a	a		
	target coord: n/a		sketch	
contact coord: n/a				
angle to IP normal: n/a				
	theta: n/a			
	beta: n/a			
	alpha: n/a			
	line of flight: n/a			
N	/elocity(at centre): n/a			
	IPP targetting pan	el		
🗆 ECE R21 (	actual)	No	redraw	
□ ECE R21 (	rotated)		draw	
□ FMVSS201			ar avv	
	aim point to target point	oint		
	solution	onit		





#### **IP Pendulum Impact Panel**

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- ECE R21 (actual) The base of the pendulum is located at the H-point.
- ECE R21 (rotated) In rotated mode a subsequent DEFINE\_TRANSFORMATION is applied to rotate the line of flight onto the trim normal.

 FMVSS201 – After achieving a position the base is translated in Y to align with each impact point.





Combined solution





#### **IP Pendulum Impact Panel**

- Converge aim point to target point The aim point of the impactor is aligned with the specified target point.
- Converge contact point to target point The initial contact point between the impactor and the vehicle is aligned with the specified target point.
- Combined solution Take into account both aim point and initial contact point when positioning to the specified target point – this tries to minimize both aim point to target distance and contact point to target distance.



Combined solution



#### **IPP Settings Panel**

- The max/min achievable distance between the H-point and target points are:
  - Rod max extent + head diameter/2
  - Rod min extent head diameter/2
  - Target that fall outside of these bounds are rejected as grossly out of range, as they can never be reached.
- For acceptable target points, the head will be positioned so that the contact point is as close as possible to the target point.
- The rod distance is then measured and the point rejected if it exceeds the max rod extent or is less than the minimum.
- Initial Velocities Defaults are set in the post-end IPP \*VELOCITY card.
- **Max target-contact distance option** When positioning is complete the distance between the target point and the contact node will be measured and the point rejected if it exceeds the given value (default 1e20).

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Combined solution



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### IPP Targeting Panel (Setup Panel)

- The IPP targeting panel displays existing targets within the model.
- A CSV file can be read in using the "Read" button to load new points.
- New target points can also be added using the "select nodes to add/remove targets" buttons – this will automatically determine a cloud of impact points on selected nodes using the "Minimum target separation" value and the pendulum reach specified in the settings on the previous panel.
- Prior to the positioning, target points appear on a light blue background if they are misaligned with the trim normal. This indicates that they probably cannot be contacted by the pendulum.
- A dark blue background shows that the points are not yet positioned, green that they are successfully positioned, red that they failed to position.





#### IPP Targeting Panel (Setup Panel)

- Write Writes the targeting information to a CSV file. This can be used to import at a later date, or for batch positioning.
- **Export** Export detailed information on setup for each point after positioning.
- Sel All Selects all the target points shown in the list.
- Sel None Deselects any target points that are selected in the list.
- **Remove** Removes any selected target points.
- **Sketch** Sketches any selected target points.
- **Reset failed** Resets the target points that have failed to position so you can try again
- **Pick** Allows the user to manually pick the node for target point.
- Label Target Markers will configure sketch so each target point is labelled with the name







#### Automatically Selecting Targets

- Select nodes to add targets By selecting a group of nodes (you can select by part, part set etc.) PRIMER will determine which points within the selection can geometrically be reached. Note the "Min target separation" setting is used to create a suitable cloud of target points. This value can be set by user.
- Select nodes to remove targets By selecting this option you will be able to automatically remove all targets on selected nodes. Selection may be made by part, part set, etc.











#### Dealing with Uncontactable points

- Select Uncontactable points Selects any target points that can not be contacted. You can select by two methods:
  - By range Points are un-contactable by range if the distance from H-point to target point exceeds the maximum allowable. (red background)
  - By angle Points are considered un-contactable by angle if the angle between the trim normal and the line of flight exceeds 45 degrees. Line of flight is taken to be the cross product of horizontal and line between H-point and target point. (light blue background)
- Select if target -> Contact dist > This function allows you to select positioned targets for removal when the distance from initial contact point to target point exceeds the specified value





#### Positioning of targets

- When the "Position" button is clicked, the impactor is positioned at selected target points and de-penetrated.
- Following this process, there may be some targets that the impactor could not reach and these will again be highlighted red or light blue which can then be removed by selecting the points by range and by angle respectively.
- A green background indicates that the targets were positioned successfully in reach of the impactor.

>>>KEYOUT PANEL	Store in Model			Help	
Target file:		Read	Write		export
Sel All Sel None	Remove	Sketch	Position	n re	set failed
Name of Point		Position		Pick	
node_3953821	0.0 0.0 0.0			Pick	Add to lis
Δ					
node_3705253	-1723.9 -44	7.0 815.1		pick	
node_3710621	-1688.7 -58	8.9 859.0		pick	
node_3712746	-1722.0 -23	8.3 865.4		pick	
node_3712753	-1689.5 -23	8.1 904.3		pick	
_ node_3720740	-1774.1 -10	0.3 826.6		pick	
node_3729300	-1744.3 -419.6 752.7			pick	
node_3729320	-1734.2 -579.6 756.4			pick	
node_3739000	-1686.9 -44	2.1 777.5		pick	
node_3739782	-1654.5 -33	37.9 771.2		pick	
V node_3739796	-1656.8 -28	80.9 770.6		pick	
Minimum Target Separation:	50.0	Select Unco	ntactable	Points	
Label Target Markers		☐ by range ☐ by angle	;		
		Select if targ	et->contac	ct dist >	10.0
- Make new target poin select nodes to add tar	its - gets				



#### **Keyout Panel**

- All the positions can now be written to individual models.
- This can be done by switching to the "Keyout Panel".
- File path, sub-directory names, and file names can be modified by users prior to keyout.
- Replace with user impactor?
  - If the pref is set and the switch is active, PRIMER IPP build will be performed in the usual way but before the keyout, the IPP impactor will be replaced with the user impactor as specified by the preference.
  - The initial build may be done in ECER21, ECERR1R (rotated to trim normal) or FMVSS201 (hinge point aligned in Y).
  - The user impactor will be oriented into position and moved to a point of contact along the line of flight (linear dependeration).

#### How to access the Keyout panel >>>KEYOUT PANEL Store in Model Target file: Read Write export reset failed Sel All Sel None Remove Sketch Position Name of Point Position Pick 0.0 0.0 0.0 Pick Add to list pick

>>>SETUP PANEL	Apply Keyout		
Sel All Sel None	Remove Sketch		
Output dir: H:\Gavin_Work\T	UTORIALS\PRIMER\IPP\Exa	ample_model	
Name	Subdir	Filename	
node_3720740	NODE_3720740	node_3720740.key	$\checkmark$
node_3729300	NODE_3729300	node_3729300.key	1
node_3729320	NODE_3729320	node_3729320.key	$\checkmark$
node_3739000	NODE_3739000	node_3739000.key	$\checkmark$
node_3739782	NODE_3739782	node_3739782.key	$\checkmark$
node_3739796	NODE_3739796	node_3739796.key	1
node_3782186	NODE_3782186	node_3782186.key	1
Replace with user impactor?	?		



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