

## FalCon Mov6D: 6D Viewer

### Version 1.08

The **6D Viewer** supports these data types:

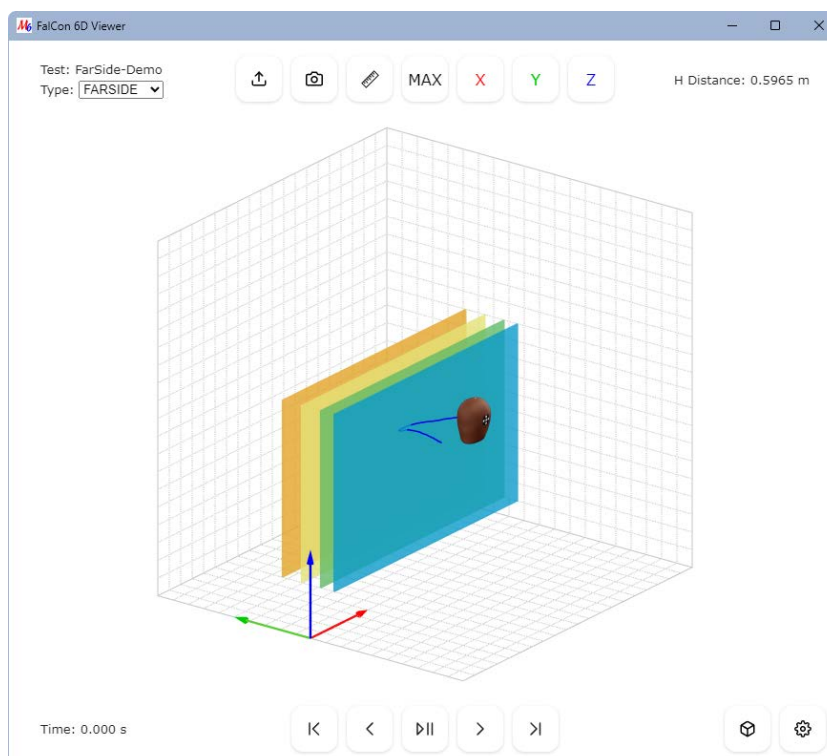
Type	Model	Trajectory	Features
FAR SIDE	default = dummy head WorldSID exchange dynamic model	6D positions(t)	4 selectable y-planes measure maximum y(t) with automatic export
IMPACT6D	default = cube exchange dynamic model import static model	6D positions(t)	measure minimum distance between dynamic and static model or to a plane
IMPACT3D	default = ball cursor import static model	3D positions(t)	measure minimum distance between 3D positions and static model or to a plane

Import trajectory data from a binary 6DoF file \*.p6d (= proprietary format of FalCon) or open the viewer by clicking the 'Show' button in the dialog 'X Diagrams' of the FalCon eXtra analysis.

The \*.glb and \*.stl file types are supported for models.

Install the viewer by the Windows Installer package *FalCon-6D-Viewer\_x.x.x\_x64.msi*.  
This app is an add-on to FalCon eXtra motion analysis software.

### 6D Viewer UI

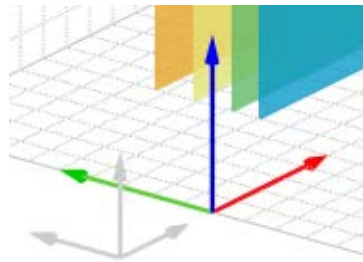
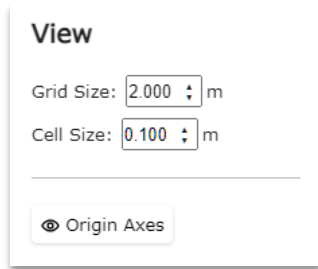


- Viewer with fixed default window size, resizable.
- Fixed orientation of car coordinate system, see "z" from bottom to top = blue axis in axis indicator.
- Units = m, s
- View button:

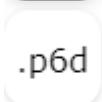


Adapt the default grid size = 1 m, cell size = 0.1 x 0.1 m.

Toggle the true origin (0,0,0) of the coordinate system by grey axis indicator.



- Mouse handling:  
Rotate by left mouse button pressed  
Pan by right mouse button pressed  
Scroll (Zoom) by mouse wheel
- Upload button:



**.p6d** Select binary 6DoF file.

**Dyn** Exchange the default dynamic model by \*.glb or \*.stl file type.

**Stat** Import static model.

- Play buttons:



[AG1]

Play forward or backward, if Ctrl key is pressed, next click = pause

Press space = play or pause

Goto start, end

One step forward / backward

- Auto-orientation buttons:



Select view axis:

X = front view, Y = side view, Z = top view

- Snapshot button:



Take a snapshot of the graphics only and save it to the Downloads directory as a \*.png picture file.

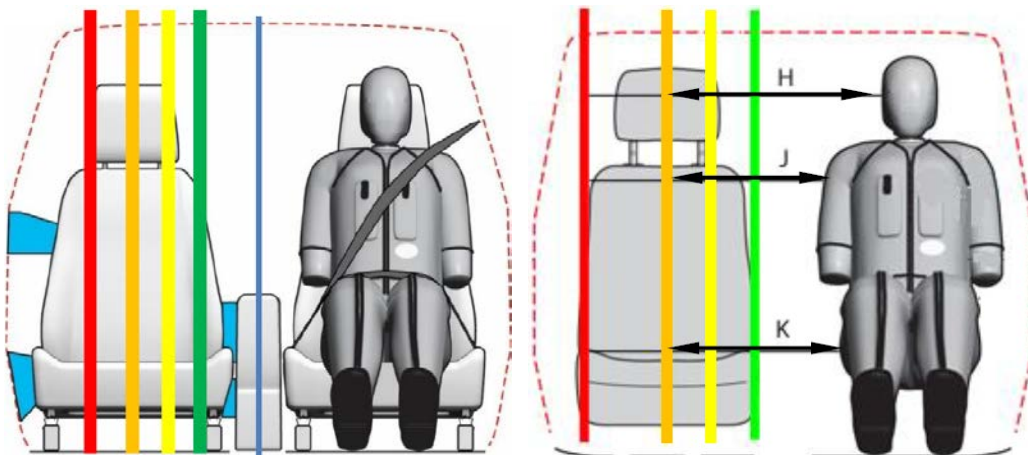
- Press keys Ctrl+R or F5 for reset of all 6DoF trajectory data.

## ***TYPE FARSIDE***

### **1. Application**

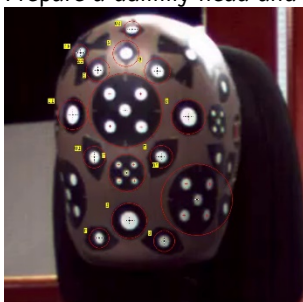
#### **Euro NCAP – Far Side Occupant Test & Assessment Procedure**

- Instrumentation: WorldSID 50th male dummy (ISO 15830)
- Defined excursion limit lines:  
head excursion performance limit (orange, yellow and green)  
vehicle centerline (blue)
- Pre-test measurement: H distance “head side to seat centerline”



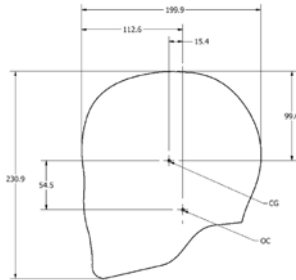
### **2. Analysis by Mov6D**

- Prepare a dummy head and attach many marker stickers of different size and type.



- Measure the centers of the markers best by using a photogrammetric tool or a 3D measuring arm.

- Edit a text file in format FalCon eXtra ASCII \*.apt:  
list all control point data and names of the markers and define them as members of a 6D object.  
See <https://www.dr-gerhard.de/en/faq.html> for specification and sample file.
- Additional requirement: control point data of the center of gravity. Extrapolate from the top point ( $\Delta z = -99.6$  mm) or from the side markers aligned at the z-height of CG (width 160.6 mm).  
See the dimension of the WorldSID head:



Add this point as virtual marker (name = \*CG\*) to the apt file.

- If these coordinates are not relating to the vehicle system add a couple of control points on the BIW. These markers should be distributed in the field of view. If the high-speed video is captured by an onboard camera, they help to compensate shaking. Note, that they need to be visible during the whole impact video.
- Track all markers as long as possible.
- The head is assumed to be a virtual rigid body. The parameters of its 6DoF motion are automatically calculated by a photogrammetric method: standard monocular view (= 1 camera) or stereo views (= 2 cameras).
- The motion can be defined as relative to a reference time or as relative to a (moving) reference coordinate system.
- Check the parameter H distance, which is required for assessment of Far Side tests.  
If the exact value is not available, it can be set by the assumption that the position of CG @ T0 is in the center of the driver's seat.
- Export to ASCII file \*.txt or binary file \*.p6d, which is compliant to the 6D viewer.

## 6D Viewer UI

- Measuring ruler:



The ruler is automatically shifted to the maximum y value in the current time sample. Perform interactive measuring by picking the green arrow with the mouse and dragging in y direction. The measured position is between the right side of the purple plane to the plane @ y=0.

- Maximum button:



The player jumps to the time sample which corresponds to the maximum y excursion of the head. See the numerical value in the settings dialog. While the measuring ruler is switched on, it will be shifted automatically to that maximum y value.

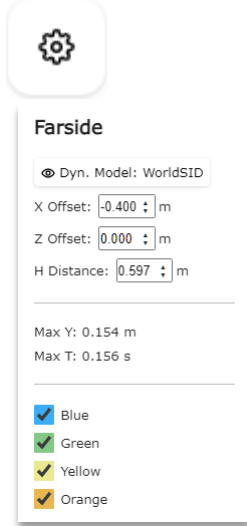
Note:

In case of left-hand drive the head moves in the positive y-direction, therefore the maximum y excursion is evaluated.

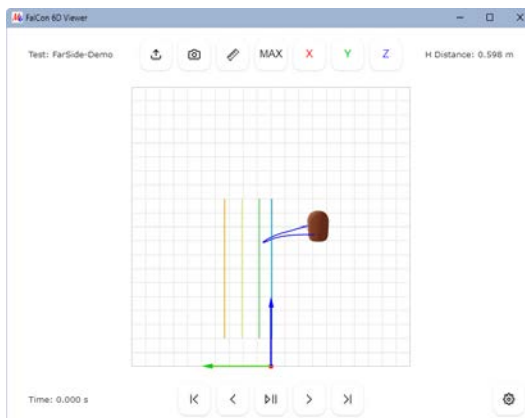
In case of right-hand drive, the head moves in the negative y-direction, therefore the button and diagram

texts are called **MIN** and **ymin**.

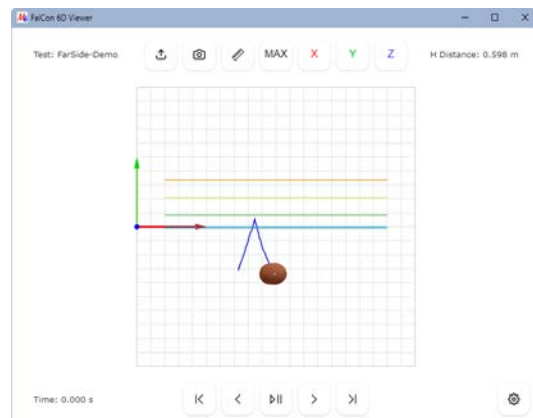
- Note:  
After each import of a trajectory or a new model the maximum y-excursion of the head is written as an ASCII file \*.txt into the Downloads directory.  
If FalCon eXtra is running, the corresponding time diagram is shown.
- Settings:



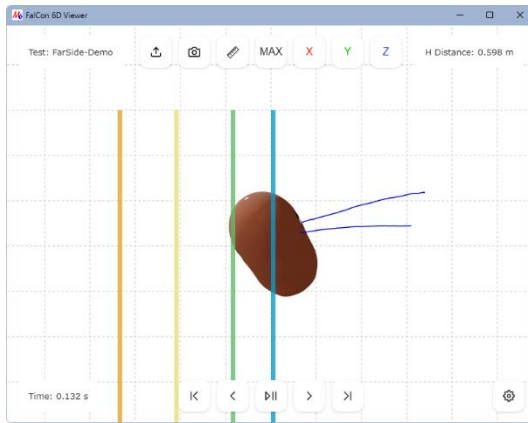
- Show/hide the dynamic model.
- To keep the given data in the viewer volume an *Offset X and Z* is subtracted automatically, in order to keep the start position at  $x, z = 1$  m.
- Adapt the *H Distance* manually, if necessary.
- View automatically calculated maximum excursion *Max Y @ Max T*.
- Deselect colored excursion planes, if they are obstructive.



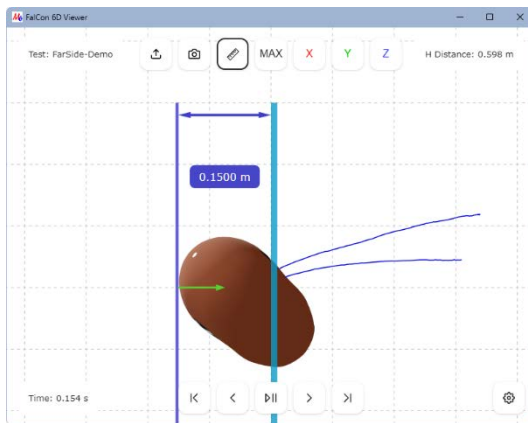
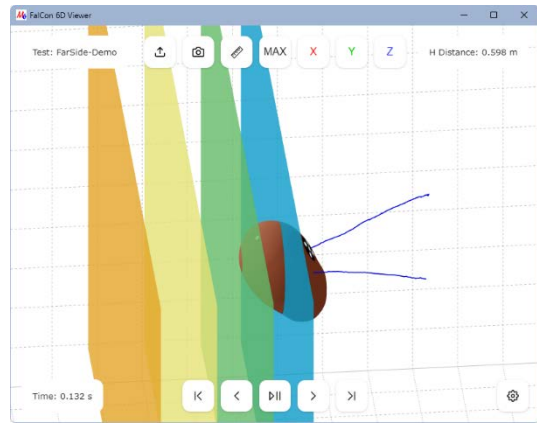
front view



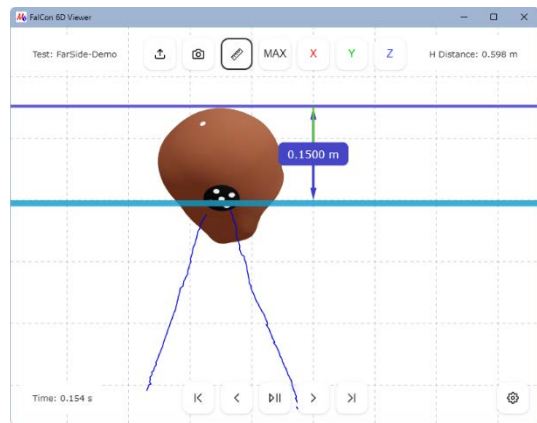
top view



head passing the green excursion limit



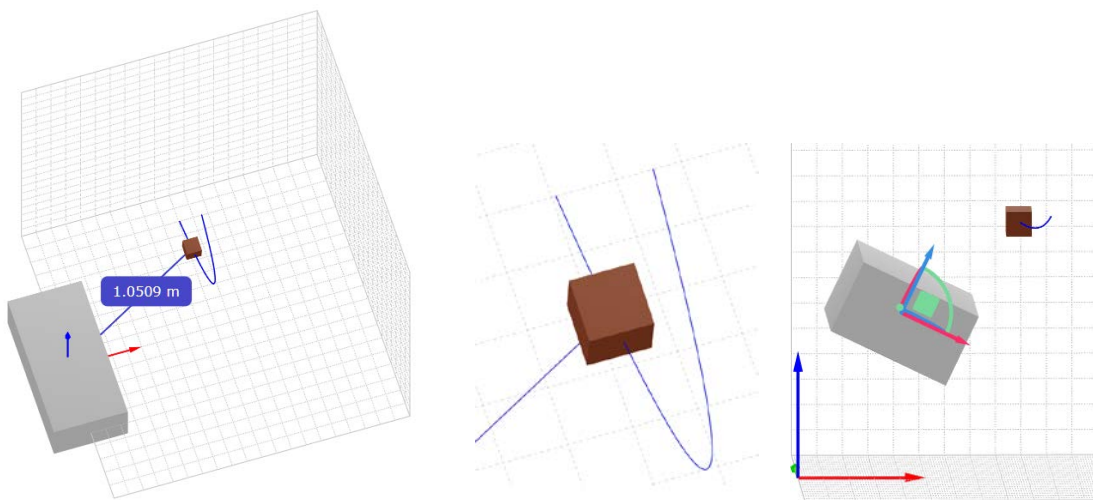
measurement tool:



the y-distance is shown numerically

## TYPE IMPACT6D

- In case that there is no (virtual) marker of the center of gravity defined (name = \*CG\*), the center of gravity is automatically calculated as center of all reference markers.
- After loading a 6D-trajectory a cube (10 cm<sup>3</sup>) is shown as the default dynamic model.
- Exchange optionally the dynamic model and load a static model.
- Measure automatically the minimum distance from the dynamic to the static model:

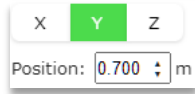


- For testing or debug application double-click on the static model to enable an interactive tool to shift and rotate the model. A second double-click will hide the tool.
- Settings:

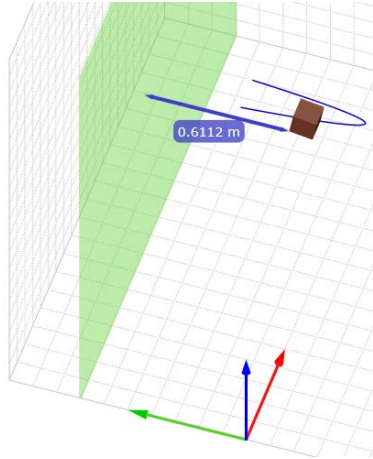


- To keep the given data in the viewer volume an Offset X, Y and Z is subtracted automatically, in order to keep the start position at x,y,z = 1, 0, 1 m.

- Show a plane perpendicular to the x, y or z axis and enter its absolute position vs. (0,0,0).

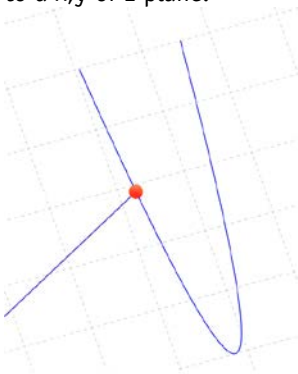


- Measure automatically the minimum distance from the dynamic model to the plane.



## ***TYPE IMPACT3D***

- A standard 3D trajectory can be exported from a FalCon Mov3D analysis.
- Similar handling like IMPACT6D, but after loading a 3D-trajectory a red ball cursor is shown at the current position instead of a model, because the orientation information of full 6DoF is missing.
- The minimum distance is defined as distance from the current position to a static model or to a x,y or z plane.



### ***Outlook to following update***

- Measuring the real minimum distance between dynamic and static model (in mode Impact6D).  
 Warning: currently the center of gravity of the dynamic model is used.
- Improvement of the distance measuring in case of models with many thousands vertices.
- Automatic and editable offset of the static model – currently the model is positioned at the location of the axis indicator.