



Altair Safety Report Manager

Table of Contents

| Altair Safety ReportManager | 1 |
|------------------------------------|----|
| Table of Contents | 2 |
| Altair Safety Report Manager Intro | 3 |
| ASRM GUI Overview | 4 |
| GNCAP Occupant Module | 9 |
| GNCAP Occupant | 12 |



Altair Safety Report Manager Intro

The Altair Safety Report Manager (aka ASRM) is a fully customizable automatic report generation utility for crash & safety regulations. It allows users to create a First Sight Report PPT for the selected impact type & regulation. The PPT report which consists of plots & animations that are generated based on various inputs entered by the user.

A standard report is delivered for each mode with the following info and contents.

- Model information
- Run quality statistics
- Occupant requirements
- Structure requirements
- Structure overview
- User defined plots

In addition, HyperView template & session files are created at the end of report generation which contains all plots/animations for closer analysis. It has the capability to overlay plots from different iterations. It is also possible to overlay plots with test data in HyperView.

The ASRM utility can also be run on HPC after job completion.





ASRM GUI Overview

Below is a snapshot of the ASRM GUI. To understand the ASRM workflow better, the GUI is divided into various sections as highlighted & numbered in the below picture. The main functionality of all the sections is briefly described below.

| | 📕 Altair Safety | Report Manager | | | | | | | | × |
|-----|-----------------------------|--------------------------------------|---------|-------------------------------------|------------|------|----------------|--------------------------------------|---|-------------|
| | Impact Type: Regulation: | Front FMVSS 208 | | Main Overlay 1 Overlay 2 Overlay | | Dura | ♥ ○ Test Data | HDF 🗸 | 6 | © 🔶 |
| 1 | Protocol: | Full Frontal | | Title: | main_iter_ | Dyna | | | 6 | Input Check |
| 0 | Units: # of Overlay: | mm/ms/kg v | | Previous session file: | D | | | | | 1 |
| 2 | | Config same as Main | | Analysis results directory: | 1 | | | | | Search |
| 3 | # of Processes: | 14 ~ | | Config excel file: | | | | | | 🕞 Save As |
| | | More options | | Tracking system nodes (N1, N2, N3): | | * | * | Apply to Modules | | |
| - 1 | Select Module | | Overlay | < Animation > | | | | | | |
| | 🗹 🍥 Anima | ation | false ^ | | | | | | | |
| | 🗆 🍥 Batte | ry Section Force | true | | | | _ | | | |
| | | ion Detection | false | Tracking System | | | $\overline{7}$ | | | |
| | | Intrusion Contour Plot | false | | | | - V | | | |
| | | Intrusion Cross Section | true | N1 | | | Node H | | | |
| | 000 | med Shape | false | N2 | | | Node I4 | | | |
| | +11+ | acement Plot Aperture Deformation | false | N3 | | | Node I | | | |
| 4 | | Aperture Deformation | true | 110 | | | Node | | | |
| | | e Mount Failure | false | | | | | | | |
| | +11+ | ded View | false | Title | | | Vie | ew 🕂 | | |
| | 🗆 🍈 Fuel | Tank Interaction | false | - Com | ponents I | | | * × | | |
| | 🗆 🍈 Fuel | Tank Zone X Assessment | true | | | | | | | |
| | 🗆 🍈 Fuel ' | Tank Zone Y Assessment | true | | | | | | | |
| | 🗆 🍥 Load | | true | | | | | | | |
| | 🗆 🍥 Осси | pant | true | | | | | | | |
| | 1 of 28 selected | | | | | | | | | |
| 5 | Report output dire | ctory: | | | | | | | | iow Now |

Impact Type & Units selection Section

In this section, user will be able to select the Impact Type, Regulation, and the Protocol for which he / she wants to generate the PPT report along with the source units used for running the simulation. Based on this selection the modules list (section #4) gets updated.

| Impact Type: | Front | * |
|--------------|--------------|---|
| Regulation: | FMVSS 208 | * |
| Protocol: | Full Frontal | * |
| Units: | mm/ms/kg | * |

Overlay selection section

In this section user will be able to select the overlay option. Following scenarios are supported.

• When you want to generate report for a single run then you would set overlay option to 0. Therefore, overlay tabs (in section #6) is disabled.

| # of Overlay: | 0 | * | Main | Overlay 1 | Overlay 2 | Overlay 3 | Overlay 4 | |
|---------------|--------|--------|--------|-----------|-----------|-----------|-----------|--|
| | Same a | s main | Title: | | | | | |

• When you want to run in overlay mode, then you must pick appropriate number of overlay runs. The overlay tabs get enabled based on the number selected. User can select up to 4 iterations for overlay.

| # of Overlay: | 2 | • | | Main | Overlay 1 | Overlay 2 | Overlay 3 | Overlay 4 | |
|---------------|--------------|---|---|--------|-----------|-----------|-----------|-----------|--|
| | Same as main | | - | Title: | | | | | |

Please note that only those modules which run in HyperGraph (that create curves / graphs) are supported for overlay mode. There is a specific overlay status column next to modules list that indicates the overlay support for each module.

No. of Processes selection & save session file section

This section allows user to enter the no. of processes to be used when executing the utility. ASRM has the capability to run the report generation in parallel based on the no. of processes selected.

It also saves TPL files and session files at the end of the report generation. Users can also choose to export curves (curves created from the respective plotting modules) into **Excel** format. Click on the **More options...** button to select these options.

| # of Processes: | 14 | * |
|-----------------|--------------|---|
| | More options | |

Modules list

This section allows users to select the modules to be run for report generation. User must make sure to select the module that he / she wants to include in the report generation.

Output directory selection

In this section user will select the output directory path. This is where all the output files such as the session files, images, animations, PPT & log files from the ASRM run will be created.

Main section

Input directory & configuration section

In this section, user should select the following.

- Type of data being used for generating the report. It could be CAE simulation data or physical test data.
- Title for the report which will be used for creating results directory as well as prefix for curve names & summary tables



- Results directory path where the solver input file, results files such as animation & time history files or test data are located.
- Config file path (if it exists already)
- Define global tracking system using 3 nodes (requests from Time history file). This is an optional input. Once the global tracking system is defined, it can be easily applied to other modules where tracking system is an input. Click on **Apply to Modules...** button, a selection dialog pops up, select the modules to apply the 3 nodes, and click **Apply&Close** button.

| Main Overlay 1 Overlay 2 Overlay | 73 Overlay 4 |
|-------------------------------------|--------------------------------------|
| | O CAE Data Dyna ♥ ○ Test Data HDF ♥ |
| Title: | |
| Previous session file: | |
| Analysis results directory: | |
| Config excel file: | |
| Tracking system nodes (N1, N2, N3): | Apply to Modules |

Input Validation check

Input Check button would run a quick validation check to verify if the inputs defined for various modules selected is valid. The verification is done on the results files available in the input directory specified. Any invalid inputs and missing input found from validation check will be highlighted in RED in the ASRM GUI as shown below.

| Run Module | Overlay | Configuration | | | |
|------------------------------|---------|-------------------------------|---------------|--------------------------|------|
| Animation | false | ^ | | | |
| Dash Intrusion Contour Plot | false | Tracking_System | | | |
| Dash Intrusion Cross Section | true | N1 | | Node | L IA |
| Deformed Shape | false | | | Houe | 1.4 |
| Energy Distribution | true | N2 | 8000000 | ✓ Node | 14 |
| Engine Mount Failure | false | N3 | 15838433 | ✓ Node | If |
| Exploded View | false | 145 | 13030433 | Node | 14 |
| Load Path | true | Body Side Type | Components | | |
| 🗐 🍚 Occupant | true | Body Side Assembly/Components | 150364 150365 | v Components | 14 |
| Pedal Column Motion | true | DASH Assembly | | | |
| Run Statistics | false | Туре | Assemblies | | |
| 2004 CUTNET | | Assembly/Comp Name/ID | | ✓ Components | 14 |
| E 🌍 Structural Assessment | false | v | | | |
| 1 of 21 selected | | | | | |

Search function

Search button will let users to select and import the 2D time history file (CAE (T01 / binout) or physical test data (HDF / ISO MME)) as well as main solver input file into the current session. This is required for defining the inputs for all the modules. An additional dialog called **files to load** will be displayed to select the files as shown below.







| earch here | | | | (|
|--------------------------------|-----------------|-------------------|----------|---------------|
| Name | Size | Date modified | Туре | |
| 🗎 testT01 | 253198 KB | 27/01/23 03:42 PM | File | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | selected 1 of |
| AE Data> Radioss> Solver Input | t File: | | | |
| earch here | | | | (|
| | | | | |
| Name | Size | Date modified | Туре | |
| Name | Size 1216449 | | | |
| | 1216449 | | RAD File | |
| test_0000.rad | 1216449 | 27/01/23 03:37 PM | RAD File | |
| test_0000.rad | 1216449 | 27/01/23 03:37 PM | RAD File | |
| test_0000.rad | 1216449 | 27/01/23 03:37 PM | RAD File | |
| test_0000.rad | 1216449 | 27/01/23 03:37 PM | RAD File | selected 0 of |

Change curve attributes & publish session

This section is mainly used for the overlay scenario.

The change curve attributes option is brings up an overlay setting dialog as shown below. This will allow to change various curve & note related attributes for the overlay session per layer basis.

| Noverlay Setting | | | × |
|------------------|------------------------|--------|------------------------|
| ✓ m1_hq | Isolate Only Sho | w Hide | Show All |
| m2_hg | | _ | avertine Thickness |
| | Layer Color | | Layer Line Thickness 👻 |
| | Symbol Color | | Symbol Size |
| | Symbol | On | © Off |
| | Notes Font | Α | |
| | Notes Position | * | |
| | Legend | On | © Off |
| | Legend Font | Α | |
| | BarGraph Category Font | A | BarGraph Gap |
| | | | |

After changing the curve & note related attributes using the overlay setting dialog, user can click on Publish session icon <a> which would publish a report for the overlay session.

Configuration section

This is the section wherein the inputs required for all the modules will be entered & displayed. For defining the inputs, firstly make sure to load both the 3D (solver input file) file as well as Time History file using the Load button. Then start defining the inputs for the modules.

FE entities such as nodes, components or assemblies can be selected from graphics screen from the loaded solver input file.



| Tracking System | | |
|----------------------|--------------------------|---------|
| N1 | 15849041 👻 Node H | |
| N2 | 15839164 v Node H | |
| N3 | 15838433 👻 Node 🖂 | |
| | | |
| Title | | View 🕂 |
| 7 Y Assemblies H | | Top 👻 🗙 |
| 9 Components I4 | | Iso 👻 🗙 |

Inputs from the Time History files (subcases, requests & components) can be selected from the drop-down context dialog as shown below.

| <occupant></occupant> | | | | | | |
|---|---|--------------------|--|---|--|-----|
| Driver Passenger | | | | | | |
| Dummy Model 50th | * Dur | nmy Version Config | * Res | et | | |
| i+¿Driver Restraint Type | | w | | | | |
| Driver ID | | | | | | |
| Driver Injury Criteria | Subcase | Datatype | Request | Component | Filter | |
| HEAD_ACC_X | hodout | | 4 | | | |
| HEAD_ACC_Y HEAD_ACC_Z HEAD_ACC_RES NECK_UPPER_MOMENT_Y | abstat abstat_cpm deforc disbout elout gistat pritorc matsum | | H3-50TH_DU H3-50TH_DU H3-50TH_DU H3-50TH_DU H3-50TH_DU H3-50TH_DU H3-50TH_DU | WMY-1_HEAD_ACCELEROM MMY-1_HEAD_ACCELEROM MMY-1_HEAD_ACCELEROM MMY-1_CHEST_ACCELEROM MMY-1_CHEST_ACCELEROM MMY-1_CHEST_ACCELEROM MMY-1_FELVIS_ACCELEROM MMY-1_FELVIS_ACCELEROM | ETER_Y 2000002 ETER_Z 2000003 #ETER_X 2000004 #ETER_Y 2000005 #ETER_Z 2000006 #ETER_X 2000007 | |
| NECK_UPPER_FORCE_X | sodout | ×. | 1 | M | Y | (v) |
| NECK_UPPER_FORCE_Z | | + |)+[|)+ [| | v |
| CHEST_DEFLECTION | | + |)• [|)+ [| | |
| CHEST_ACC_X | | + |)+ [|)~ [| | |
| CHEST_ACC_Y | | + | + |)~ [| | |
| CHEST_ACC_Z | | 4 I | 1 | (-) | - | * |

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GNCAP Occupant Module

Introduction

The Global New Car Assessment Program (Global NCAP) is designed to provide a fair, meaningful, and objective assessment of the impact performance of cars and provide a mechanism to inform consumers. This protocol is based upon those used by the European New Car Assessment Program for adult occupant protection and child occupant protection ratings.

Method of Assessment

The starting point for the assessment of adult occupant protection is the dummy response data recorded in the frontal impact. Initially, each relevant body area is given a score based on the measured dummy parameters. The assessment also considers the structural performance of the car by taking account of such aspects as steering wheel displacement, pedal movement, foot well distortion and displacement of the A pillar.

For Adult occupant protection, the overall rating is based on the driver data, unless part of the passenger fared less well. It is stated that the judgement relates primarily to the driver. The adjusted rating for the different body regions is presented in a visual format of colored segments within a human body outline for the driver and passenger.

Points Calculation

A sliding scale system of points scoring has been adopted for the biomechanical assessments. This involves two limits for each parameter, a more demanding limit (higher performance), beyond which a maximum score is obtained and also a less demanding limit (lower performance), below which no points are scored. For the adult rating, the maximum score for each body region is four points. Where a value falls between the two limits, the score is calculated by linear interpolation.

For all tests that are part of the adult occupant protection assessment, capping limits are maintained for criteria related to critical body regions: head, neck and chest. Exceeding a capping limit generally indicates unacceptable high risk at injury. In all cases, this leads to loss of all points related to the tests. Capping limits can be equal to or higher than the lower performance limit, depending on the test.





Scoring & Visualization

The protection provided for adults for each body region are presented visually, using colored segments within body outlines. The color used is based on the points awarded for that body region (rounded to three decimal places), as follows:

- Green 4.000 points
- Yellow 2.670 3.999 points
- Orange 1.330 2.669 points
- Brown 0.001 1.329 points
- Red 0.000 points

For frontal impact, the body regions are grouped together, with the score for the grouped body region being that of the worst performing region or limb. Results are shown separately for driver and passenger. The grouped regions are:

- Head and Neck,
- Chest,
- Knee, Femur, Pelvis (i.e., left and right femur and knee slider)
- Leg and Foot (i.e., left and right lower leg and foot and ankle)

The contribution of the frontal impact test to the Adult Occupant Protection Score is calculated by summing the body scores for the relevant body regions, taking the lower of the driver and passenger scores. The total achievable score is 17.00 points, and the overall scores are then used to generate star ratings as follows.

Frontal Impact:

- 14.00 16.00 points + 1-point SBR + 4ch ABS + ECE95* 5 stars
- 11.00 13.99 points 4 stars
- 8.00 10.99 points 3 stars
- 5.00 7.99 points 2 stars
- 2.00 4.99 points 1 star



• 0.00 – 1.99 points 0 stars



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GNCAP Occupant

The GNCAP Occupant module generates following summary report based on user selected info.

- 1) Occupant protection summary
- 2) Adult & child occupant protection detailed summary table that includes various injury criteria, high & low performance limits, actual result obtained and the corresponding point value
- 3) Occupant performance plots

| Run Module | Overlay false | < Occupant> 1st Rw Lft 1st Rw Rght 2nd | D Rwl # 2nd Rw Roht Safe | ty Parameters | | | | |
|---|------------------|---|-----------------------------|---------------------|------------------------------|---------------------------------------|-------------|---|
| Dash Intrusion Contour Plot | | | | | | | | |
| Deformed Shape | false | Dummy Model H3 50th | ♥ Dummy | Version LSTC_130528 | · (4) | | | |
| Engine Mount Failure | false | 1st Rw Lft Restraint Type | v | (5) | | | | ^ |
| Exploded View | false | | | | | | | |
| Fuel Tank Interaction | false | | | | | | | |
| Cccupant | true | 1st Rw Lft Injury Criteria | Subcase | Datatype | Request | Component | Filter | |
| ODB Intrusion | true | | | | | | | |
| George Plastic Strain George Plastic Strain | false | HEAD_ACC_X (6) | nodout * | nodout | * 52500001 | x_acceleration | ✓ 60 | × |
| George Structure Plastic Strain George Wheel Kinematics | false false | HEAD_ACC_Y | nodout v | nodout | 52500001 | y_acceleration | ✓ 60 | ~ |
| | laise | HEAD_ACC_Z | nodout + | nodout | × 52500001 | z_acceleration | ∀ 60 | ¥ |
| | | HEAD_ACC_RES | nodout ~ | nodout | v 52500001 | v resultant_acceleration | ∀ 60 | * |
| | | NECK_UPPER_MOMENT_Y | jntforc v | Joint Stiffness | v 50100001 | v theta_moment_total | ¥ 60 | ٣ |
| | | NECK_UPPER_FORCE_X | secforc | secforc | v 50100001 | v x_force | ¥ | ٣ |
| | | NECK_UPPER_FORCE_Z | secforc v | secforc | v 50100001 | v z_force | ¥ | ٣ |
| | | CHEST_DEFLECTION | deforc | Force | v 52500010 | relative rotation | ¥ | ٣ |
| | | LEFT_KNEE_DISP | ~ | | * | ¥ | ¥ | ٣ |
| 1 of 11 selected | | RIGHT_KNEE_DISP | • | | ¥ | * | * | * |

Inputs:

- 1) **Tabs** allowing users to define 1st row left & 1sr row right **adult** dummy info as well as 2nd row left & 2nd row right **child** dummy info independently
- 2) Safety Parameters tab allows to select various parameters to be included in rating calculation
- 3) **Dummy model** selection option. Currently following dummy types are supported for different occupant positions as per the regulation.
 - For the 1st row left & 1st row right positions, Hybrid 3 50th dummy type is supported.
 - For the 2nd row left position, Q1.5 dummy type is supported.
 - Similarly, for the 2nd row right position, Q3 dummy type is supported

4) **Dummy version** selection. Users can either select a particular version number from the drop down or set it to config option. When selecting a version number, all the subcase, datatype, request & component types along with filters are predefined for the user based on defaults config file. When user selects the config option then it is user's responsibility to define all the inputs. This is especially needed when using a newer dummy version.

5) **Restraint type** selection. For each of the occupant, user is allowed to select the restraint type Belted or Unbelted.



6) **Driver / Passenger Injury Criteria selection**. This option is enabled only when the dummy version is set to config. User should first make sure to load the Time History file (binout) by clicking the Load



button. After loading the file, user can start defining the appropriate subcase, datatype, request & component types for each of the injury criteria.



GNCAP Occupant Report details

A detailed report is generated for each of the occupant with the following info. A number of plots are created for each of the occupant injury criteria.

Adult Occupant Protection Summary



| ADULT FRONTAL IMPACT OCCUPANT PROTECTION ASSESSMENT | H3 50th - LSTC_130528 - t1 |
|---|-------------------------------|
| Head-Neck | 0 |
| Chest | 0.736 |
| Femur-Knee | 4 |
| Tibia-Foot | 3.806 |
| Seat Belt Reminders(SBR) | 1 |
| Max (17) | 9.542 |

| AOP Total Points | 9.542 Points |
|------------------|--------------|
| AOP Star Rating | 3 Stars |



Adult Occupant Protection Detailed Summary

| | Title | Higher Performance Limit | Lower Performance Limit | Driver - H3 50th - | Points |
|------------|-------------------------------|--------------------------------------|--------------------------------------|--------------------|--------------|
| | | - | | LSTC_130528 - t1 | |
| Head | HIC 15 | 500 | 700 | 490.238 | 4 |
| | Resultant Acc. 3 msec (G) | 72 | 88 | 68.175 | 4 |
| Neck | Shear (N) | (0,25,35,45,1000) | (0,25,35,45,1000) | 340.003 | 4 |
| | | (1900.0,1200.0,1200.0,1100.0,1100.0) | (3100.0,1500.0,1500.0,1100.0,1100.0) | | |
| | Tension (N) | (0,35,60,1000) | (0,35,60,1000) | 260.659 | 4 |
| | | (2700.0,2300.0,1100.0,1100.0) | (3300.0,2900.0,1100.0,1100.0) | | |
| | Extension (N.m) | 42 | 57 | 34.960 | 4 |
| Chest | Deflection (mm) | 22 | 42 | 38.322 | 0.736 |
| | Viscous Criterion (mm/s) | 500 | 1000 | 223.512 | 4 |
| Knee | Left Knee Disp (mm) | 6 | 15 | err | err |
| | Right Knee Disp (mm) | 6 | 15 | err | err |
| Femur | Femur Axial Force - Left (N) | 3800 | 7560 | 1129.302 | 4 |
| | Femur Axial Force - Right (N) | 3800 | 7560 | 1514.367 | 4 |
| | Tibia Axial Force - Left (N) | 2000 | 8000 | 2291.104 | 3.806 |
| | Tibia Axial Force - Right (N) | 2000 | 8000 | 2182.596 | <u>3.878</u> |
| | Left Tibia Index | 0.4 | 1.3 | 0.435 | 3.844 |
| | Right Tibia Index | 0.4 | 1.3 | 0.385 | 4 |
| Foot-Ankle | Pedal dislacement (mm) | 100 | 200 | err | err |





1st Rw Lft Tibia Left

