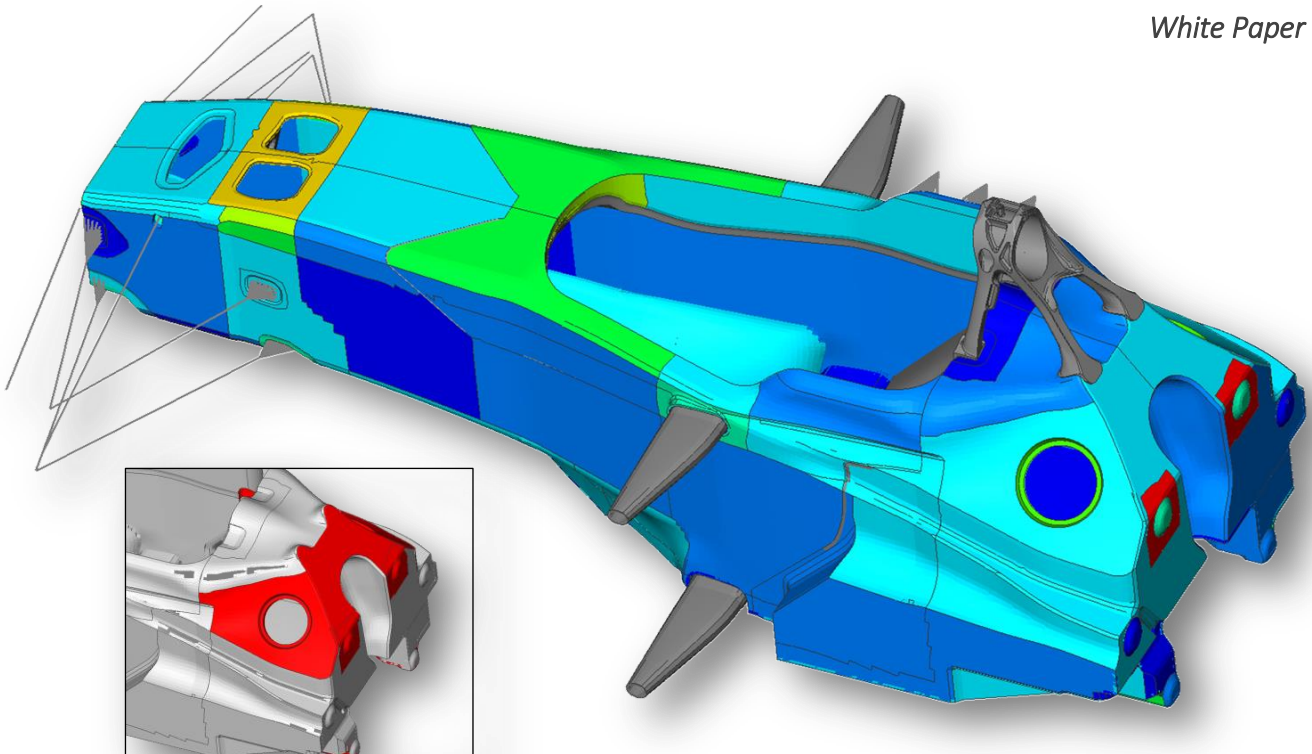


## CAITO® Software – OptiAssist

# Composite Analysis, Interrogation, Testing & Optimisation

White Paper



### SUMMARY

The feedback from our customers is that GRM's composite software tools have been developed by people who clearly understand the day-to-day challenges of efficiently analysing and developing composites. For over 15 years, GRM have developed the OptiAssist product, combining the analysis & optimisation capabilities of VR&D Genesis with a composite focussed user interface. OptiAssist provides a complete FEA suite of tools to laminate, analyse, optimise, understand and communicate your developing composite designs.

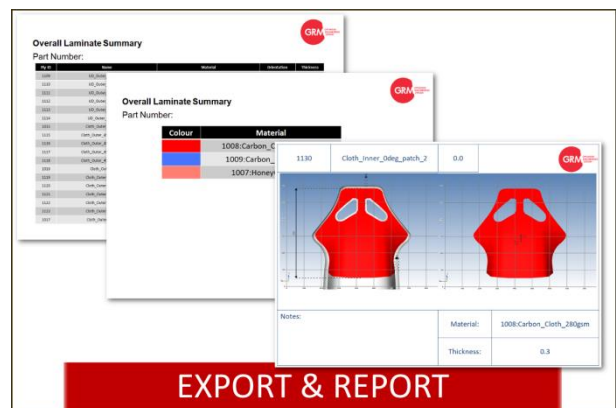
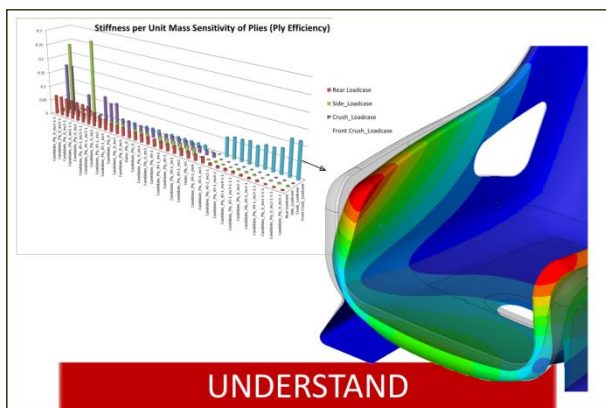
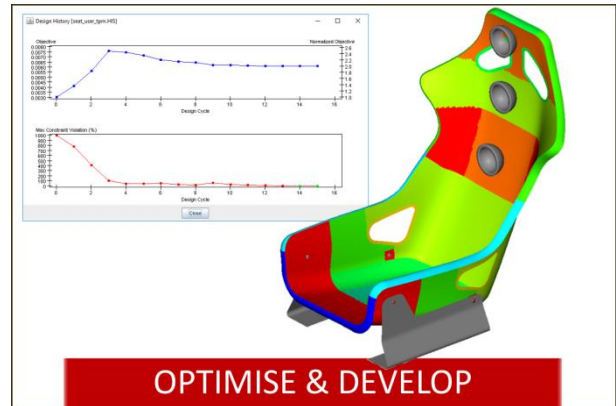
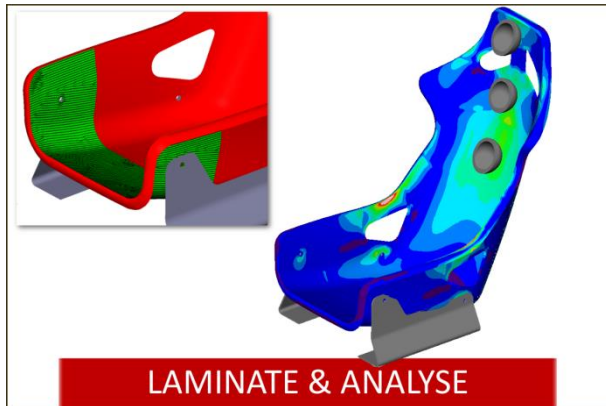
### OptiAssist Improves What Engineers Can Deliver:

– “GRM are very proud to have supplied GENESIS & OptiAssist to the Formula 1® Team winning the driver's Championship for 13 of the last 14 years.”

– **Martin Gambling, Managing, Director, GRM**

# Key Software Processes

CAITO's enterprise software toolset, OptiAssist, provides composite engineers with a complete FEA analysis, laminate development and manufacturing reporting suite of tools. At its core, is the industry leading structural analysis and optimisation code, VR&D GENESIS.



Through the OptiAssist interface, composite engineers are able to efficiently develop laminates, working through the following key stages:

**Laminate & Analyse** – Using the Composite Modeller, develop your laminates in the FEA environment. Automatically manage the creation of complex analysis property data and manipulate plies using efficient functions; split, merge, map & duplicate. Using the GENESIS FEA solver, analyse and interrogate the performance of your designs.

**Optimise & Develop** – Utilise ply shape and detailed laminate optimisation tools, seamlessly integrated into the analysis and laminate development environment. OptiAssist's unique strength is its combination of powerful optimisation tools with an engineer-led laminate development process, harnessing optimisation whilst creating manufacturable layups.

**Understand** – OptiAssist's Sensitivity Plotter tool automatically manages the assessment of your laminate construction, identifying and ranking the importance of plies for each of your analysis load cases.

**Export & Report** – Allowing direct communication of analysis generated laminate to composite designers and manufacturing, Composite Reporter automatically generates PowerPoint and HTML plybooks, allowing markup, dimensioning and annotation of each ply.

## A Pedigree of Success in Formula 1®

Developed through 15 years of continual work with leading Formula 1® teams, OptiAssist's laminate optimisation and development techniques have been refined to be robust and efficient. Working with teams such as Red Bull<sup>1</sup>, Renault F1<sup>2</sup>, Force India<sup>3</sup> and Caterham F1<sup>4</sup>, OptiAssist has been used by the Formula 1® Team winning the driver's Championship for 13 of the last 14 years.

- 1 - *Development Of Composite Laminate Optimisation Techniques Using Topometry Optimisation In Genesis*, Lewis Butler, Red Bull Racing Ltd, 2006
- 2 - *Optimised Roll Hoop Design Methods*, Richard Whilte, Renault F1, 2016
- 3 - *A Comparison Of Optimisers In The Application Of Formula 1 Monocoque Design*, Dr. Simon Gardner, Force India, 2008
- 4 - *Case Studies in Composite Laminate Optimisation*, Adam Moore, Caterham F1, 2013



OptiAssist, Design Studio & GENESIS provide complete composite and non-composite analysis functionality, supporting the following analysis solutions:

- Statics
- Dynamic Modal and Frequency Responses
- Linear Buckling
- Heat Transfer
- Random Vibration Response

When analysing composites, the post-processing tools allow rapid identification and understanding of structural issues through review of:

- Identification of maximum failure index and layer of maximum failure index
- Through thickness failure index review
- Plotting of normalised fibre stress components to determine causes of high failure index

## Maturing Technology in the OEM Environment

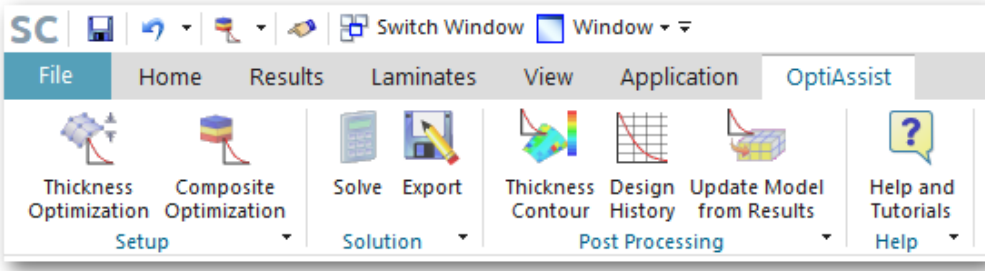
Through working on award winning engineering projects with OEMs such as Ford and Jaguar Land Rover, CAITO® software tools have been refined to work with the differing demands of volume production. Considering the design drivers of cost and manufacturing simplicity, OptiAssist has been developed to provide control for the user in the way the optimiser can evolve ply shapes.



## OPTIASSIST SIMCENTER

OptiAssist Simcenter is a new product to the CAITO® software range that brings unique laminate optimisation methods to Siemens Simcenter users. Developed as a fully embedded toolset, empowering the NX/Nastran Design Optimisation (SOL200) module, OA SC allows Simcenter & Nastran users to take advantage of ply shape and detailed laminate optimisation workflows, eliminating the time consuming iteration stage of composite laminate development.

**OptiAssist Simcenter Feature Summary**



The screenshot shows the OptiAssist Simcenter software interface. The ribbon is divided into several sections: 'Setup' with 'Thickness Optimization' and 'Composite Optimization'; 'Solution' with 'Solve' and 'Export'; 'Post Processing' with 'Thickness Contour', 'Design History', and 'Update Model from Results'; and 'Help' with 'Help and Tutorials'.

- Composite Optimisation
  - Ply shape optimisation
  - Sizing optimisation of existing laminates
  - Support of Simcenter Laminate Composites Global Layup data and standard Simcenter PCOMP/PCOMPG data
  - Automatic update of layup/property data based upon optimisation results
- Short Fibre Composite and Non-Composite Optimisation
  - Rapid sizing optimisation trails
  - Distributed shell thickness optimisation for casting/moulding design

## BENEFITS OF USING CAITO® OPTIMISATION SOFTWARE PRODUCTS

- Shorten laminate development times and reduce engineers iteration overhead
- Maximise potential of composite materials through optimisation
- Understand the performance of your laminates
- Report and communicate your CAE developed designs

## COMPATIBILITY

Recognising that companies often have several, established tools for analysing and developing composite laminates, OptiAssist provides the following interfaces:

- Nastran PCOMPG native data
- Laminate Tools/CATIA Layup File Import and Export
- Simulia Abaqus .inp file import