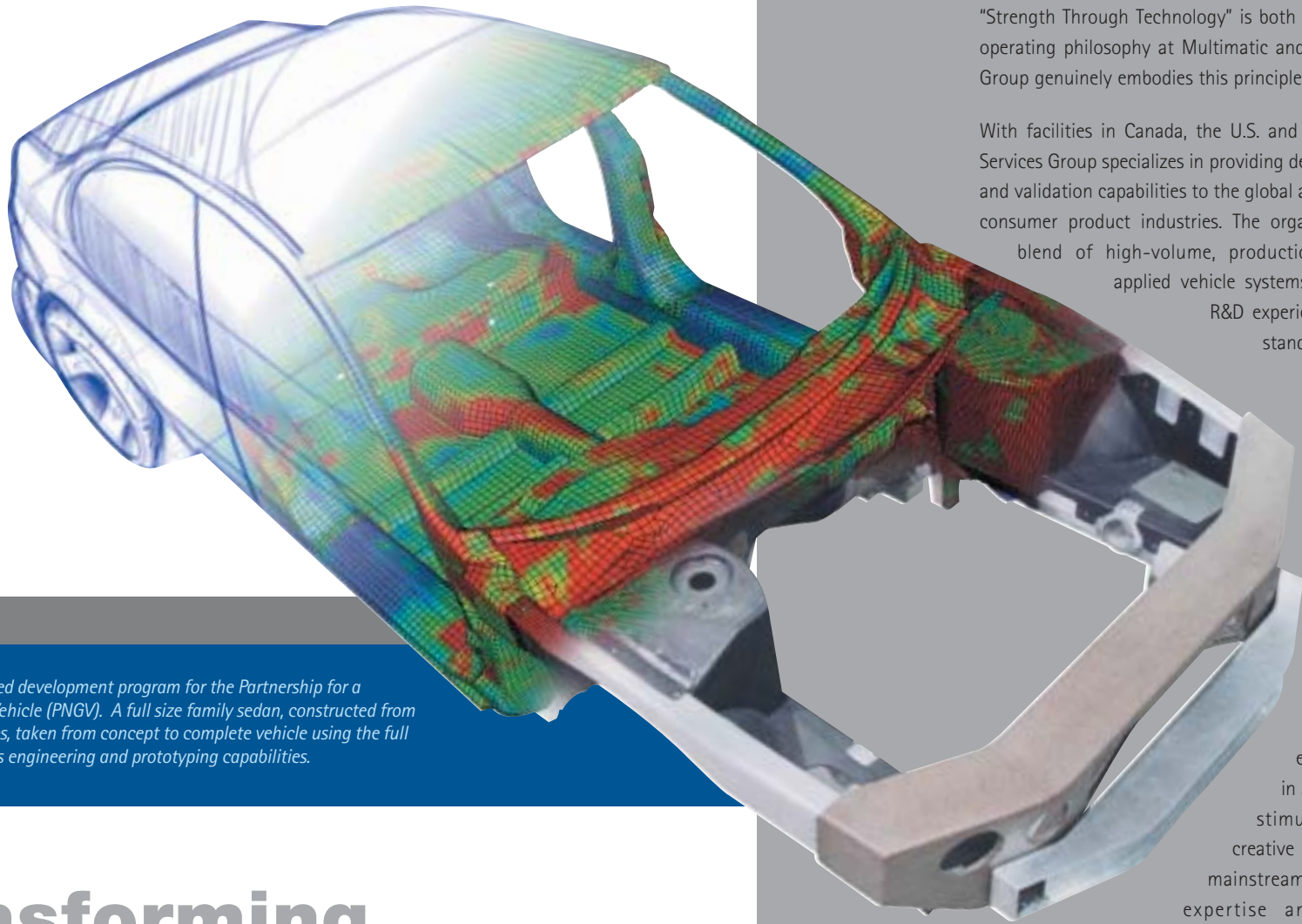


Multimatic Engineering Services





A complete, integrated development program for the Partnership for a New Generation of Vehicle (PNGV). A full size family sedan, constructed from aerospace composites, taken from concept to complete vehicle using the full range of Multimatic's engineering and prototyping capabilities.

Transforming ideas into reality

"Strength Through Technology" is both a company motto and an operating philosophy at Multimatic and the Engineering Services Group genuinely embodies this principle.

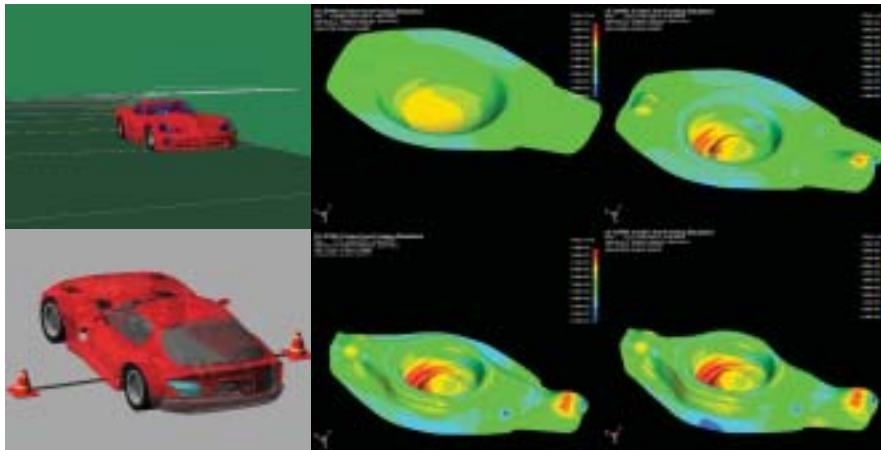
With facilities in Canada, the U.S. and the U.K., the Engineering Services Group specializes in providing design, analysis, prototyping and validation capabilities to the global automotive, aerospace and consumer product industries. The organization offers a unique blend of high-volume, production focused engineering, applied vehicle systems expertise and advanced R&D experience. Projects range from standalone structural analyses through completely integrated, "art to part" development programs.

Multimatic's competitive advantage is its people. The very best talent in the industry appropriately matched to their job. Multimatic's team works with the most technically advanced engineering tools available, in a results driven and highly stimulating environment. A creative mix of motorsports and mainstream automotive engineering expertise and experience allows Multimatic to excel within extremely challenging project timescales.

The Engineering Services Group has generated a high profile list of international repeat customers due to a proven track record of consistently meeting its clients' engineering and product development needs.

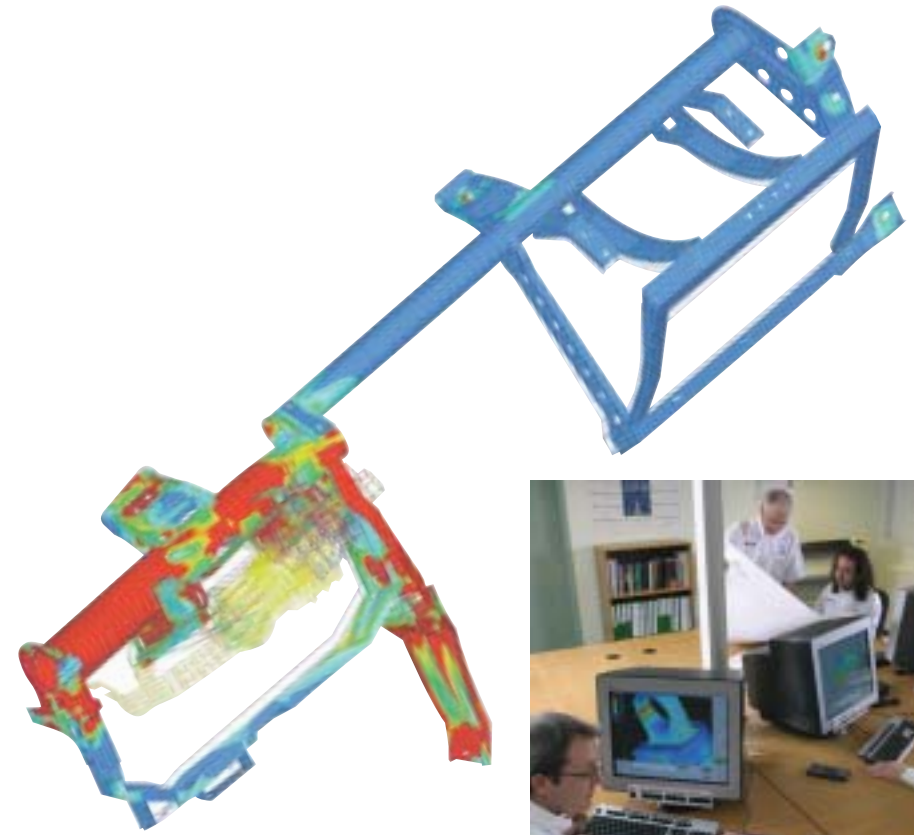
Predictive Methods

Multimatic has provided cutting-edge predictive analysis services since 1989, aiding a wide range of customers in the development of optimized product designs. Customers of the Predictive Methods organization benefit from the vast range of practical experience it has acquired from the tightly coupled relationship it enjoys with the testing, design, motorsports, composites and prototype departments of the Engineering Services Group. Modelling and simulation techniques are continually refined via an integrated program of ongoing correlation testing, assuring that predicted results are accurate and relevant.



Full vehicle track simulation provides an indication of how a car will perform before it is built.

Advanced multi-step forming simulation is used to develop and refine production tooling before steel is cut.



Excellent correlation between the simulated and actual full vehicle crash events is achieved through extensive component /subsystem testing and meticulous model definition.

The Predictive Methods organization provides a comprehensive range of simulation capabilities including:

- Structural Analysis
 - linear, non-linear, modal etc.
 - conventional and composite materials
- Impact and Crash Simulation
 - complete vehicle, subsystem and component
 - road and competition vehicles
 - full library of certified barrier models for all jurisdictions
- Metal Forming
 - one-step
 - complete tooling development using multi-step, incremental simulation
- Optimization
 - size, shape, topography, and topology
 - design of experiments (DOE)
- Kinematic and Dynamic Simulations
- Full Vehicle Dynamics Simulations
 - road car ride and handling assessment and optimization
 - competition vehicle lap simulation
- Process Automation
- Computational Fluid Dynamics
 - vehicle aerodynamic assessment and optimization
 - generalized fluid flow simulation

Multimatic uses industry leading software including:

- HyperWorks*
- ABAQUS*
- NASTRAN*
- LS-DYNA*
- ADAMS*
- MSC Fatigue*
- DATAS RaceSim*

* Registered trademarks of their respective companies



Testing

Closing the loop on the engineering development process, Multimatic's in-house test facilities can validate the performance of a component, system or entire vehicle to its target performance specifications.

Multimatic's in-house testing capabilities include:

- Material characterization
- Component, subsystem and full vehicle static and dynamic stiffness measurement
- Component strength assessment
- Component, subsystem and vehicle modal response
- Single and multi-axis fatigue
- Key life



Large surface plates support a wide range of test classes and magnitudes. Purpose built fixturing assures accurate and consistent results.



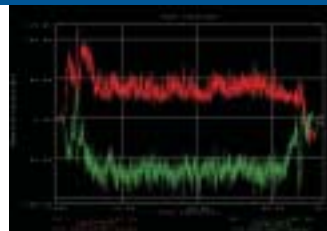
Multimatic's well-equipped laboratories conduct tests ranging from base material characterization to component/system durability testing.



With in-house designed and built multi-post rigs in Europe and North America, Multimatic can service the global automotive OEM and racing communities.

On-road and on-track evaluation and development can be undertaken at a number of facilities around the world.

- Environmental (hot, cold, humidity, dust, salt etc.)
- Corrosion
- Component road loads development; instrumentation and vehicle data acquisition
- Proprietary four-post rig vehicle dynamics characterization and development methodology
- Motorsports data acquisition and analysis
- Design and build of test fixtures and test machines
- Ongoing practice of development and correlation between CAE and physical test data and methods



Years of testing experience provide quick and accurate data reduction in order to isolate specific or relevant performance characteristics of a part or system.

Multimatic's unique four post rig characterization technique offers an easily interpreted objective based methodology for assessing a vehicle's ride and handling performance. Using in-house developed servo-hydraulic actuators in conjunction with a proprietary controller and software suite, a vehicle's dynamic signature is identified. The analysis returns data on the dynamic characteristics of the vehicle's structure, suspension and tires as well as an overall assessment of performance. The hardware and approach have been designed to facilitate expedient parametric testing of a large number of vehicle variables in a controlled (lab) environment.

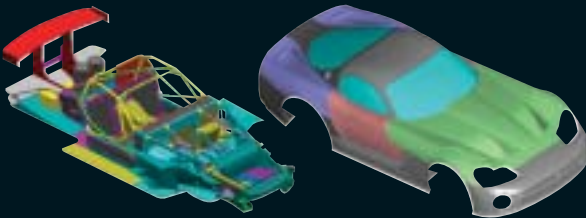


The four post methodology offers an excellent link between virtual simulation and subjective testing. Exceptional correlation between Multimatic's calculated Performance Index and actual road and track behaviour is regularly observed.

Design Engineering

Multimatic's design engineering organization is staffed by a team of experienced and dedicated professionals with a wide range of expertise. Capabilities include:

- Conceptual industrial design and styling
- Vehicle packaging and layout
- Body, chassis and suspension systems design and development
- Detailed system and component engineering
- Alternative structural materials usage (aluminum, composites etc.)
- High volume production component development
- Competition vehicle design and engineering
- Vehicle integration for alternative fuel applications
- Specialized hydraulic device engineering
- Electro-mechanical power mechanism design
- Complete niche vehicle development



Multimatic CAD Systems:

- CATIA*
- I-DEAS*
- Unigraphics*
- PDGS*
- CGS*
- Pro-Engineer*
- CadKey*

*Engineering data transfer is achieved through direct data links to all major OEMs.
* Registered trademarks of their respective companies*

The group excels in cascading system and program level targets down to well defined design deliverables and performance specifications which are then rigorously met through a disciplined engineering approach. State of the art design tools are utilized, including all major CAD packages; a unique, integrated PDM system; a comprehensive suite of in-house developed calculation tools; an on-line technical library and a proprietary automotive benchmarking database. Optimized product designs are achieved through the usage of an integrated development approach, tightly coupled with analysis, testing and prototyping.

A high-speed telecommunications network connects design offices in Canada, the U.S. and Europe, facilitating seamless collaborative engineering and the advantage of an "extended working day". In this way appropriate resources can be applied to projects free of geographic or time constraints.

Recognizing the confidential nature of the work being performed, Multimatic employs the latest network and database security technologies, strictly enforces confidentiality agreements with its personnel and suppliers and utilizes card access zone control in all of its facilities.



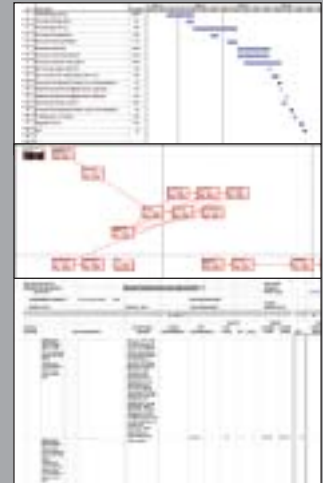
Multimatic's Engineering Services Group is responsible for developing a growing portfolio of patented products and technologies that span a wide range of applications. These include:

- Plastic Encapsulated Door Check
- Integrated Needle Check Doorhinge
- Integrated Pivot Pin Doorhinge
- Pivotless Door Hinge
- Door Module
- Structural I-Beam Suspension Arm
- Suspension Module
- Power Sliding Door System
- Throughbolt Fastening System
- Replaceable Ice Skate Blade
- Paint Hold Open Clips
- Tailgate Lift Assist



Design Process

The Engineering Services Organization embraces automotive industry APQP disciplines such as: DVP&R, DFMEAs, Open Issues Reporting & Resolution and fully integrated Timelines with resource planning. This helps ensure that quality designs are delivered on-time, fully validated and suitable for high volume manufacturing.



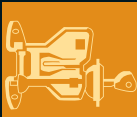
Multimatic utilizes advanced collaborative engineering tools such as Vis Mockup*, a dedicated network video conferencing system and NetMeeting to facilitate interactive, multi-site design and program reviews.

This provides immediate feedback and ensures input from all affected parties throughout the design and development process.





**Engineering
SERVICES**



**Hinge
SYSTEMS**



**Stamped, Welded
ASSEMBLIES**



**Suspension
SYSTEMS**

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