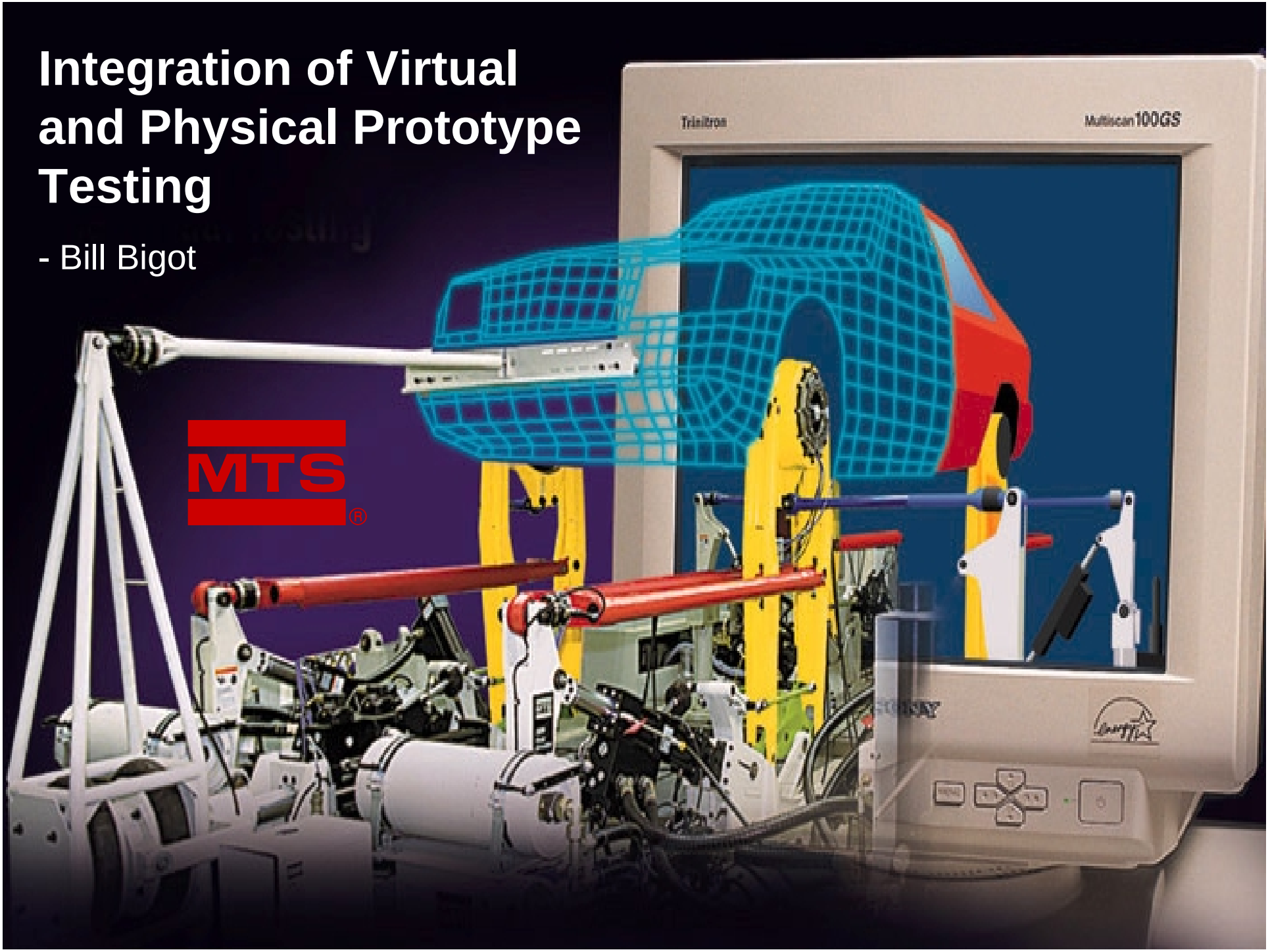
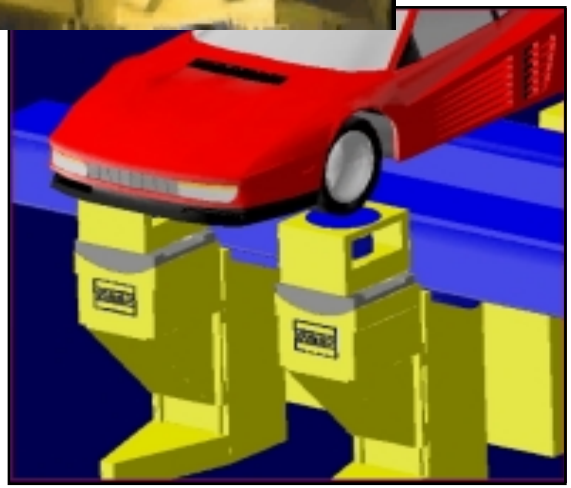
Integration of Virtual and Physical Prototype Testing

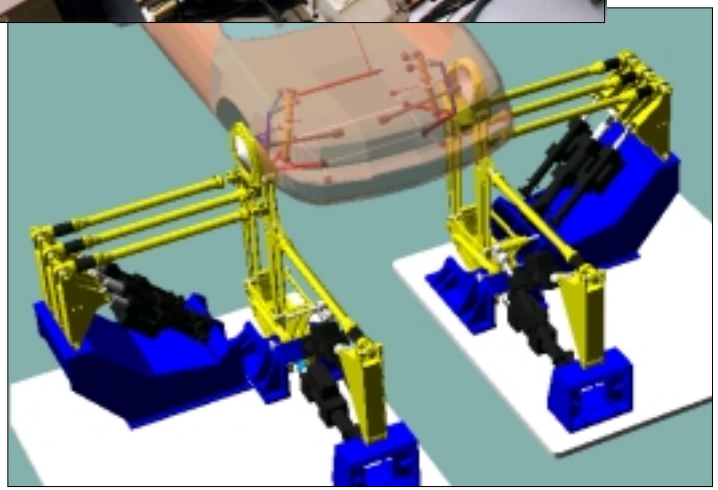
- Bill Bigot



Virtual TestLab(TM)

“Bridging the gap between Testing & Analysis”





New MTS Virtual Test Lab Software Provides Testing Validation Path to Correlate Virtual Prototype Development With Physical Testing

Benefits

- Integrates physical testing with CAE prototyping tools and analysis methods
- Predictive analysis creates a path for physical validation
- Works with components, subassemblies, full vehicles
- Uses industry standard RPC software for virtual-physical test correlation

The Role of Virtual Test Lab Software

Automotive manufacturers seek new technologies and tools to shorten product development cycles and reduce time to market. Validation of vehicle and component models is one area where tremendous effort and funds have been expended trying to correlate the physical vehicle response to modeling methods predicting similar responses. In this area the integration of physical testing and ADAMS® virtual prototyping tools provided by Mechanical Dynamics, Inc. significantly reduces product development cycles.

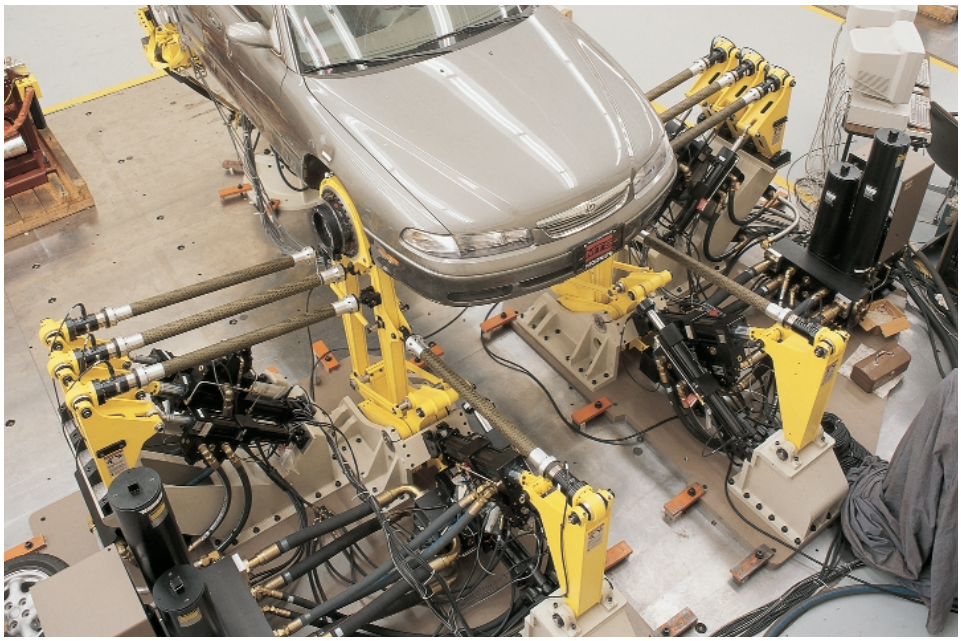
New Virtual Test Lab (VTL) tools developed by MTS Systems in cooperation with Mechanical Dynamics allow designers to "test" their models before physical prototypes or physical test systems are available. By using the same user interfaces and analysis techniques employed with physical testing, evaluations can now be performed in a predictive mode earlier in the design process. Combining MTS VTL tools with MTS Empirical Dynamics™ Model (EDM™) methods provides you with two very valuable tools for accelerated development of virtual prototypes.

VTL tools are validated, dynamic, ADAMS/Car models of the standard mechanical test systems designed and built by MTS Systems. The models of MTS mechanical systems and customer models are connected quickly and easily. The test can be executed using the MTS RPC® graphical user interface allowing the test configuration and operational issues to be preserved for easy validation once physical testing can be accomplished. The results of a VTL test are returned in industry standard RPC format for ease of use with standard analysis applications. This allows predictive analysis to be performed and easily validated once physical test results become available.

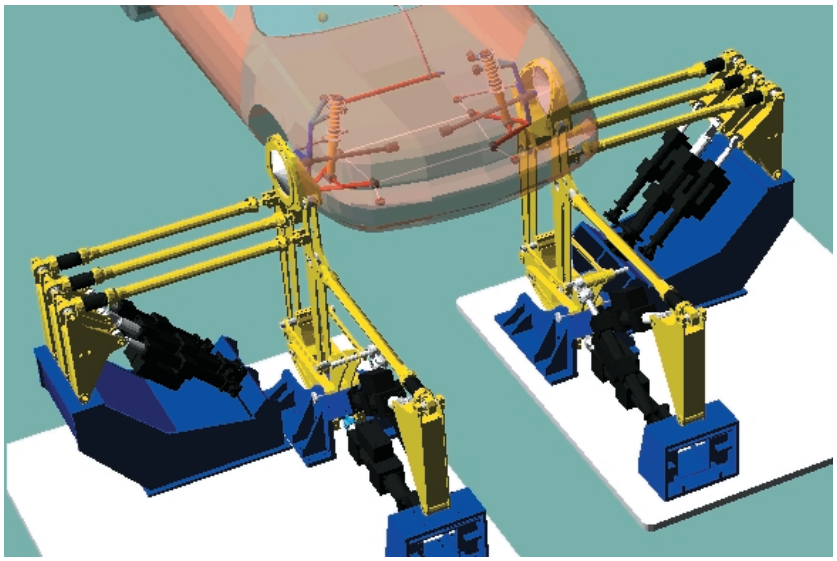
Application of VTL Tools in Vehicle Development

The first step in speeding up time to market is to reduce time in the development process. This is achieved by evolving virtual prototyping to create a higher fidelity model earlier in the analytical design process. By incorporating EDM software, you can achieve a big step towards achieving that goal. Next, VTL software gives you the second step in the process because incorporating VTL tools into the design and validation process allows predictive evaluation of fatigue, vehicle dynamics, handling, ride/comfort, and noise and vibration.

By executing full vehicle, subassembly, or component models with MTS VTL systems, you create a validation "path." It consists of a set of predicted results that



will eventually be validated by physical test results. By using the same control user interface and data formats used in the virtual tests as in the physical test, many of the unknowns that make today's validation process so difficult are eliminated. Virtual sensors can be placed in the same location on the model as on the physical test article. The same analysis techniques are then used to validate the model. A validated model is a powerful tool as explained below.



Whenever tests are performed in the laboratory, test articles need to be supported or restrained in some fashion to prevent excessive movement or uncontrolled damage. These restraints can alter vehicle or component response slightly. If these restraints are not properly modeled, comparing a laboratory test to a free-body model is almost impossible. This causes the design engineer to go forward with significant risk of design errors because products may be over-designed or under-designed. If the virtual and physical test provide correlated results, then an infinite number of "what-if" scenarios can be investigated on a number of different vehicle configurations using the validated model. Populating predictive Design of Experiments (DOE) sensitivity matrixes is one potential application for the results provided by VTL tools.

Too often design errors or test setup problems go undiscovered until prototypes and test machines are assembled. Only at this time are interferences or improperly designed fixtures detected causing days and weeks of delay in testing. Using VTL models before physical prototypes or mechanical test configurations are made will reduce potential delays. The use of VTL models also gives the designer, analyst, or test engineer confidence that the test will perform as specified. In this scenario, VTL software also provides a valuable training tool for new operators or for proving out drive file compatibility with system limitations without risk of prototype damage.

As vehicle designs evolve, engineering changes are rapidly occurring which can raise questions about the trade-off between fatigue and comfort or handling requirements. A validated model will provide an informative, reduced risk solution and can save trips back the test lab or the test track. Additional sensors can easily be placed on the model and tested against initial design criteria.

Combining EDM technology with VTL tools and analysis allows you to perform more predictive analysis that will be validated by physical tests results later in the development process.

For More Information

MTS EDM technology is described in another data sheet. We welcome your technical discussion of these new and powerful predictive development technologies. Contact your local MDI or MTS field sales engineer. Or call, write, fax or e-mail (info@mts.com) for more information.

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