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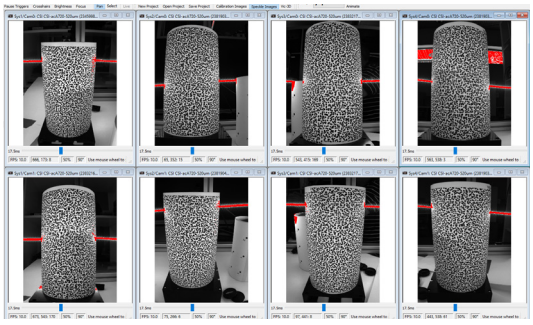
VIC-3D with *iris* Multi-System

The VIC-3D Multi-System software is an ideal measurement solution for applications that have large aspect ratios, involve full-field thickness/necking analysis, or require 360° coverage of a cylinder or sphere. VIC-3D Multi-System is capable of acquiring images with up to 16 cameras at the same time on a single PC and stitching the data together in post-processing. Multiple cameras pairs are essential when dense full-field data is required and one camera pair won't sufficiently cover the entire area-of-interest.



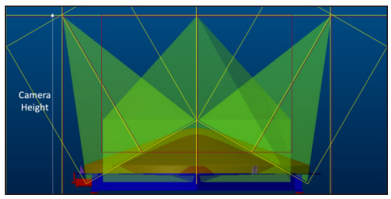
Calibration

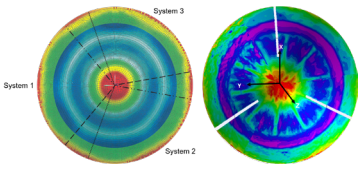
A single standard calibration target can calibrate a setup consisting of multiple camera pairs that are imaging samples that have either a large aspect ratio or require 360° data. Each camera pair is calibrated as normal, then all data from adjacent cameras pairs are transformed into a common coordinate system.

A facing calibration plate (FCP) can be used to automatically calibrate two camera pairs facing each other. This allows both camera pairs to easily be put into a common coordinate system and is most useful for applications that require a thickness or necking analysis. New in 2022, Correlated Solutions is offering dual-sided, laser-marked speckled targets for multi-system DIC. In addition to being more versatile and user-friendly, these new targets provide approximately 10x increase in the accuracy of the estimation of the location(s) of the other system(s) compared to the traditional marker technique. Furthermore, no scaling information from the speckled target is required because the angles and translations from the inputted (random) tilts are computed from each system. Speckled targets can also be used to combine data from multiple stereo systems even when there is no overlapping data.

VIC-3D Multi-System: Large Aspect Ratio Sample

Though many samples have aspect ratios of 5:1 or greater (wings, propellers, beams, etc.), most camera sensors have an aspect ratio between 1:1 and 2:1. If a single camera pair were used to measure samples with a large aspect ratio, many of the pixels would not be utilized, resulting in a data set with a relatively low number of data points. Ultra-high resolution cameras could be used, but may not be as cost effective as integrating multiple pairs of standard resolution cameras and using VIC-3D software. The VIC-3D Multi-System allows for greatly increased measurement sensitivity, a greatly decreased total project size, and results in an overall greater number of data points.





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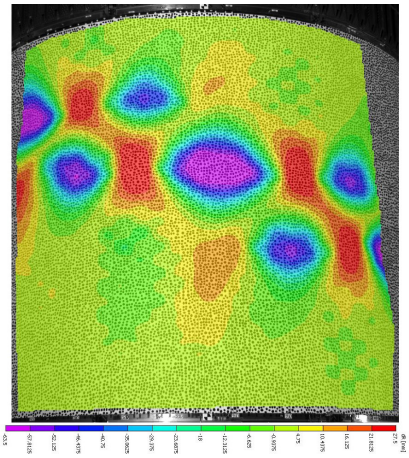
CASE STUDY
NASA Rocket Testing

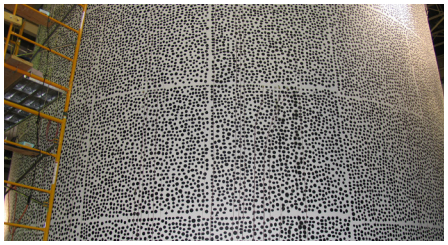
In 2011, NASA started a program that would update their design guidelines of cylindrical rocket shells under lifting loads. While computer simulations such as Finite Element (FE) analysis permit very detailed predictions of how results should look, it is critical that they be validated through the physical testing of actual samples. Though testing and measurement initially seemed like a “large” problem (note the size of the mobile lift at ground level) to the NASA team of engineers at the time, VIC-3D Multi-System provided an ideal measurement solution because it offered the quantity and quality of displacement data required to validate the new models.

To prepare the 20’ tall 27.5‘ diameter rocket shell for the test, a random black-and-white pattern was applied to its surface using a stencil technique. As the shell was pressurized to 1psi and gradually loaded to more than 800,000 pounds, a total of eleven camera pairs were used to continuously image the shell’s entire 360° surface.



An important milestone was reached in the program when NASA successfully tested a full-scale specimen to failure. During the test, the VIC-3D Multi-System software allowed NASA engineers to monitor detailed full-”eld three-dimensional data around the entire sample. As a result, the deformation and strain measurements could be safely controlled throughout the progression of the entire test. Although the outer wall was smooth, the effects of internal ribs and welds were plainly seen in the out-of-plane displacement data w, or Δz. Mark Hillburger, the Principal Investigator from Langley for this test, commented “We monitor the speckles during the test with high fidelity digital cameras [using digital image correlation] that can detect minute changes in the pattern. From that, we can calculate the deformations and strains in the test- and in real-time. So it’s a very powerful tool.”

VIC-3D Multi-System played a key role in the success of this NASA test program and will allow for improved designs to be implemented in the future, including lower weight, safer, and more cost-effective heavy-lift launch vehicles. If you’d like to find out more about the test above or how VIC-3D Multi-System can help measure your applications, contact us today.



All images courtesy of NASA.

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