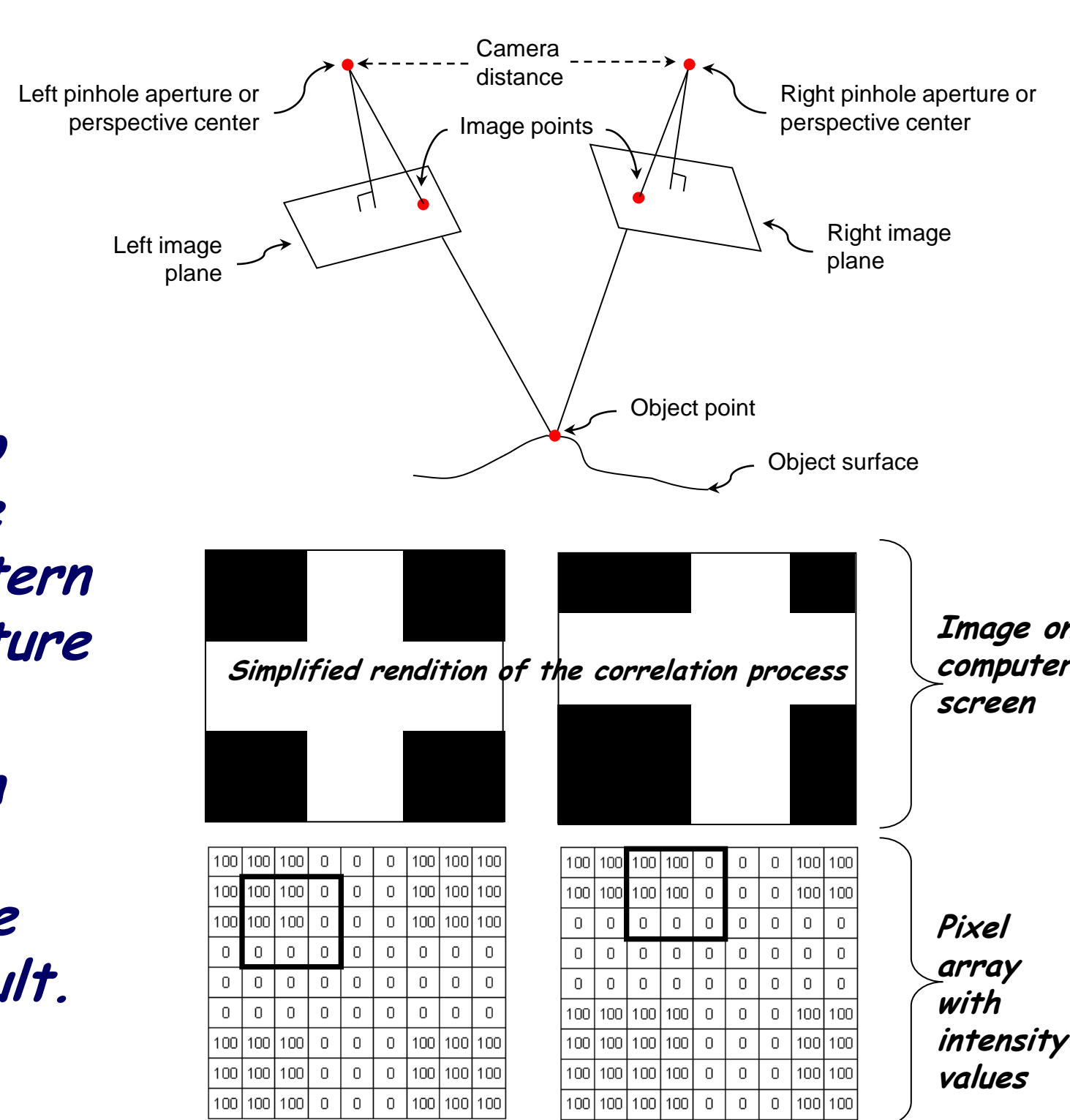


OPTICAL AND DIGITAL IMAGE CORRELATION TECHNIQUES APPLIED TO STRUCTURAL DYNAMIC AND STRUCTURAL HEALTH MONITORING APPLICATIONS

Mark Helfrick, Chris Warren, Pawan Pingle, Chris Niezrecki, Peter Avitabile

DIGITAL IMAGE CORRELATION - DIC

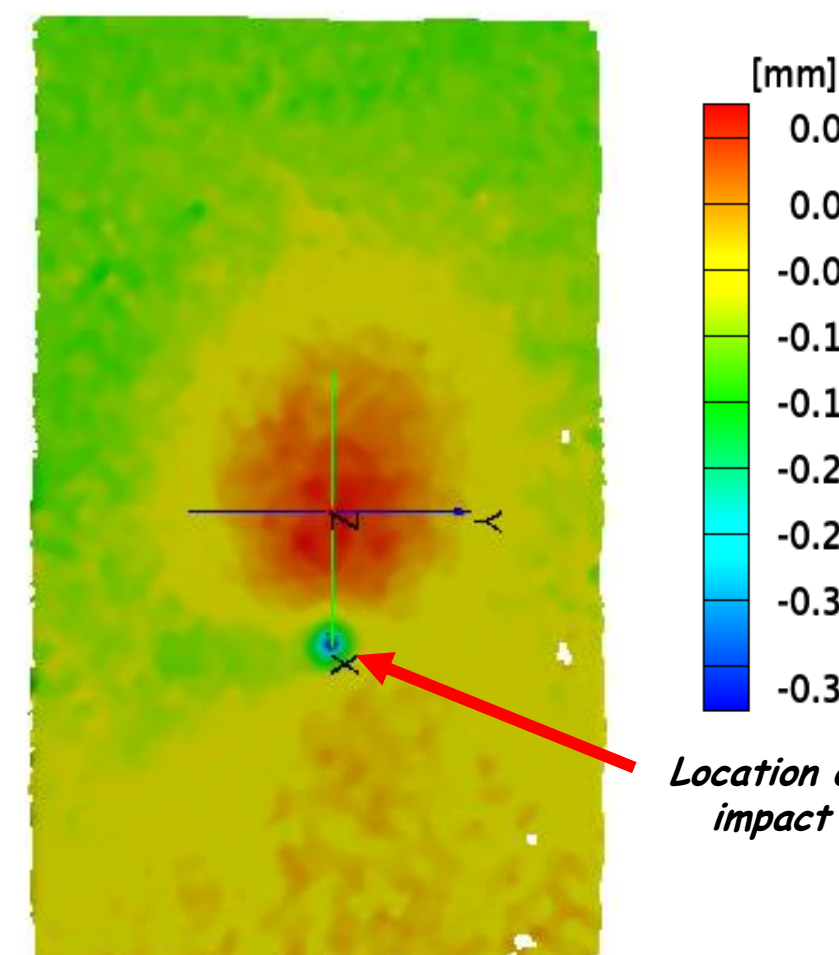
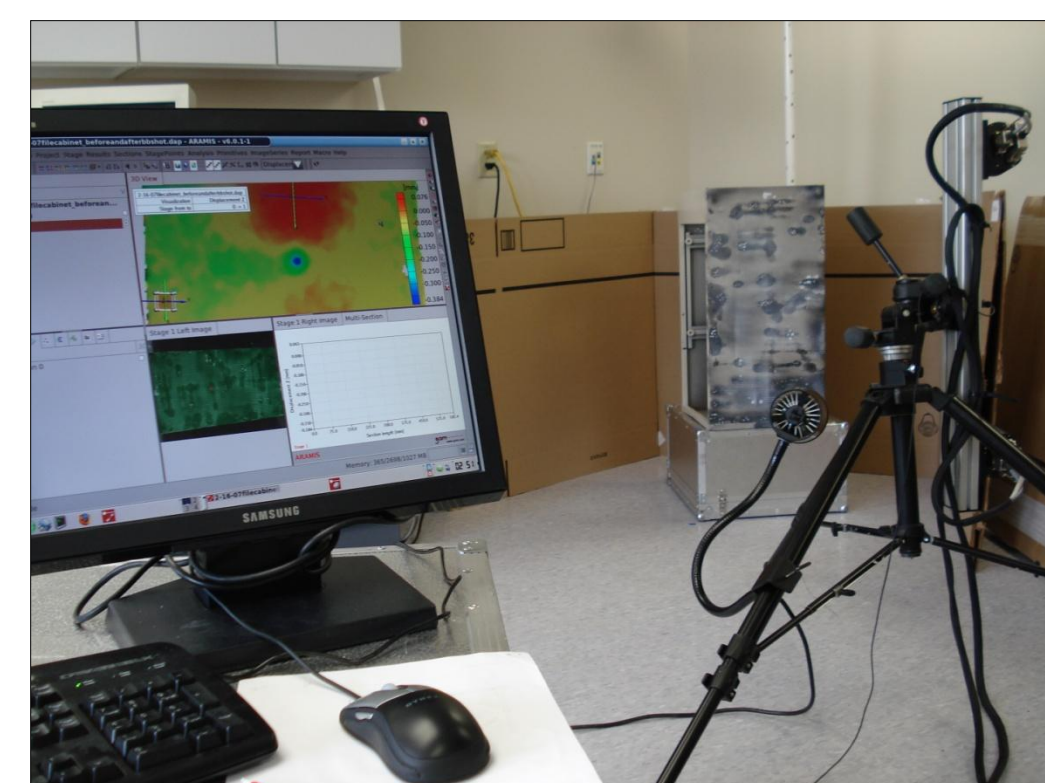
Using a pair of calibrated cameras (that are cognizant of each other's position), a speckled pattern on a structure can be monitored over time to observe changes in the correlation of the pattern as a function of structure deformation.



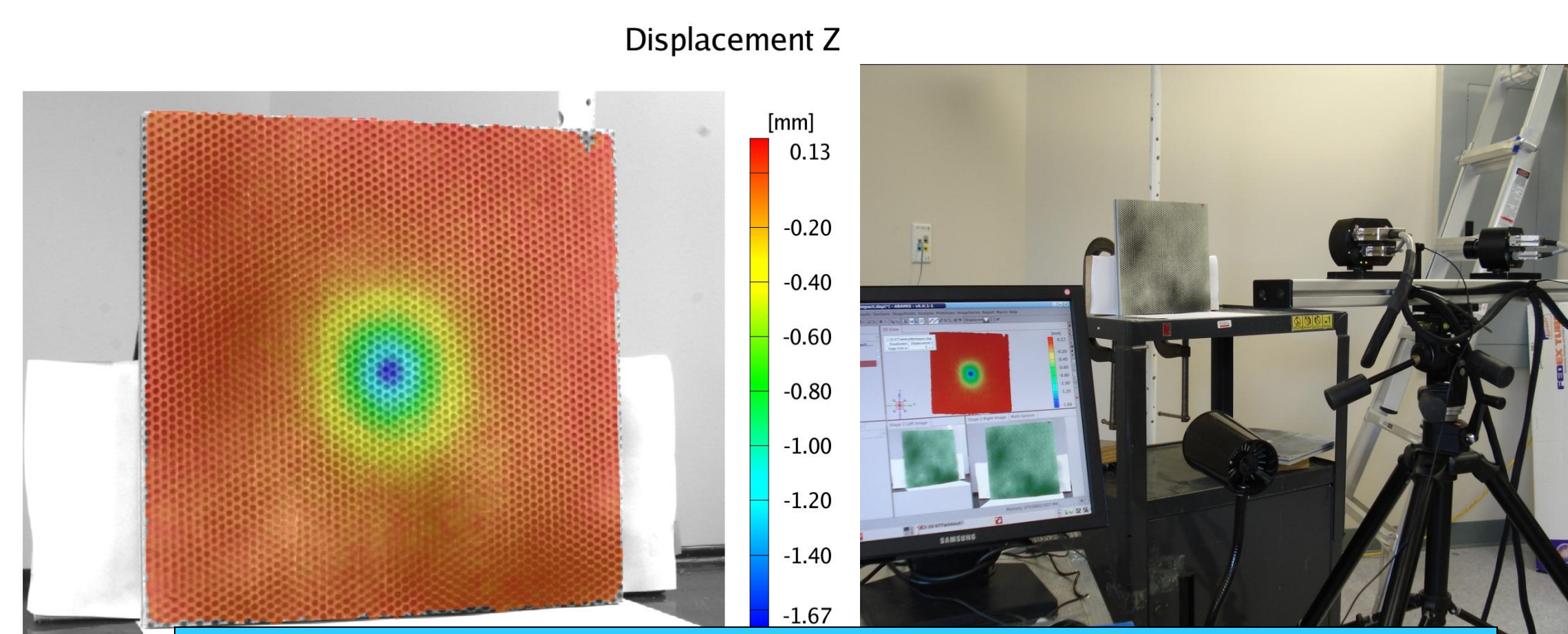
Changes in the pattern can be monitored and processed to determine deformations that result.

Trilion
Optical Test Systems

Projectile impact on sheet metal plate is easily detected with DIC

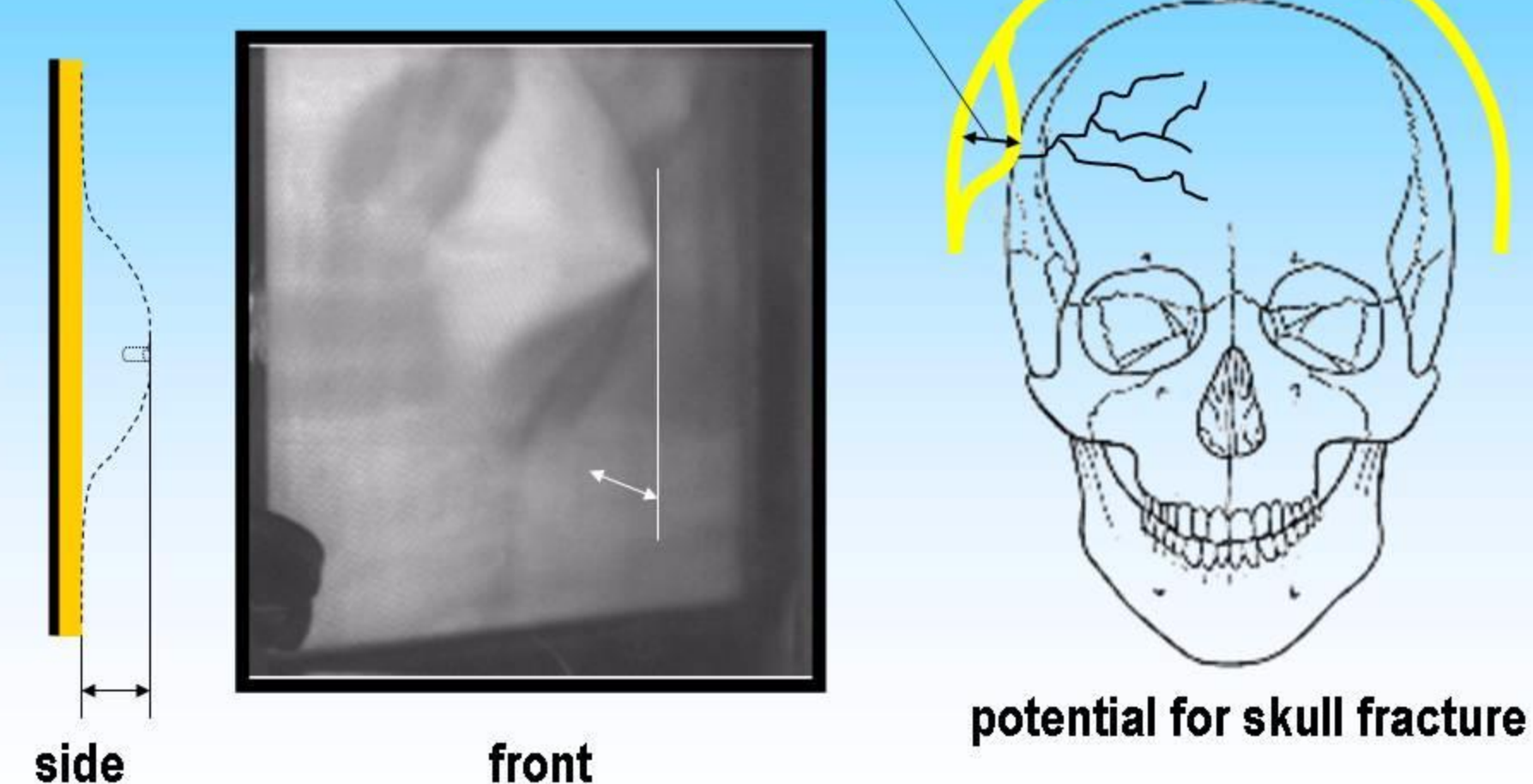


Composite plate damage is easily recognized even though the visual appearance is not obvious.

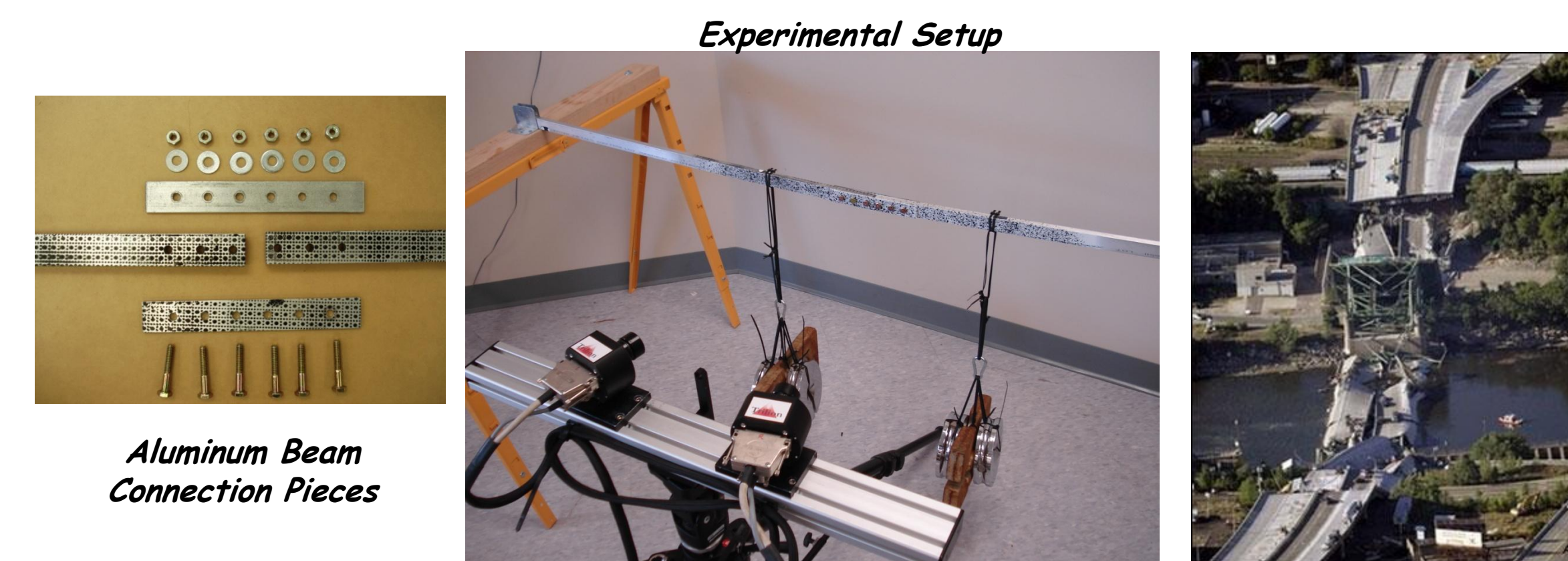


DYNAMIC DEFLECTION DURING A BALLISTIC EVENT

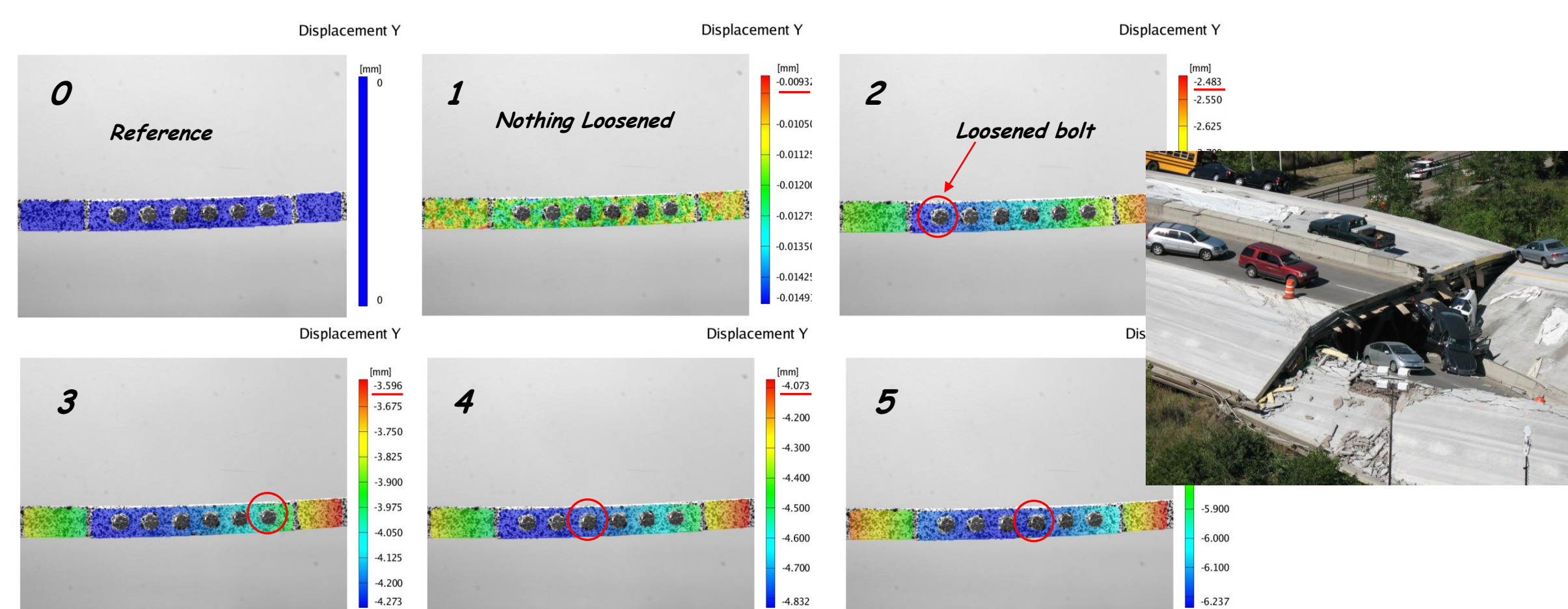
Projectile must be arrested before major impact force transmitted to skull



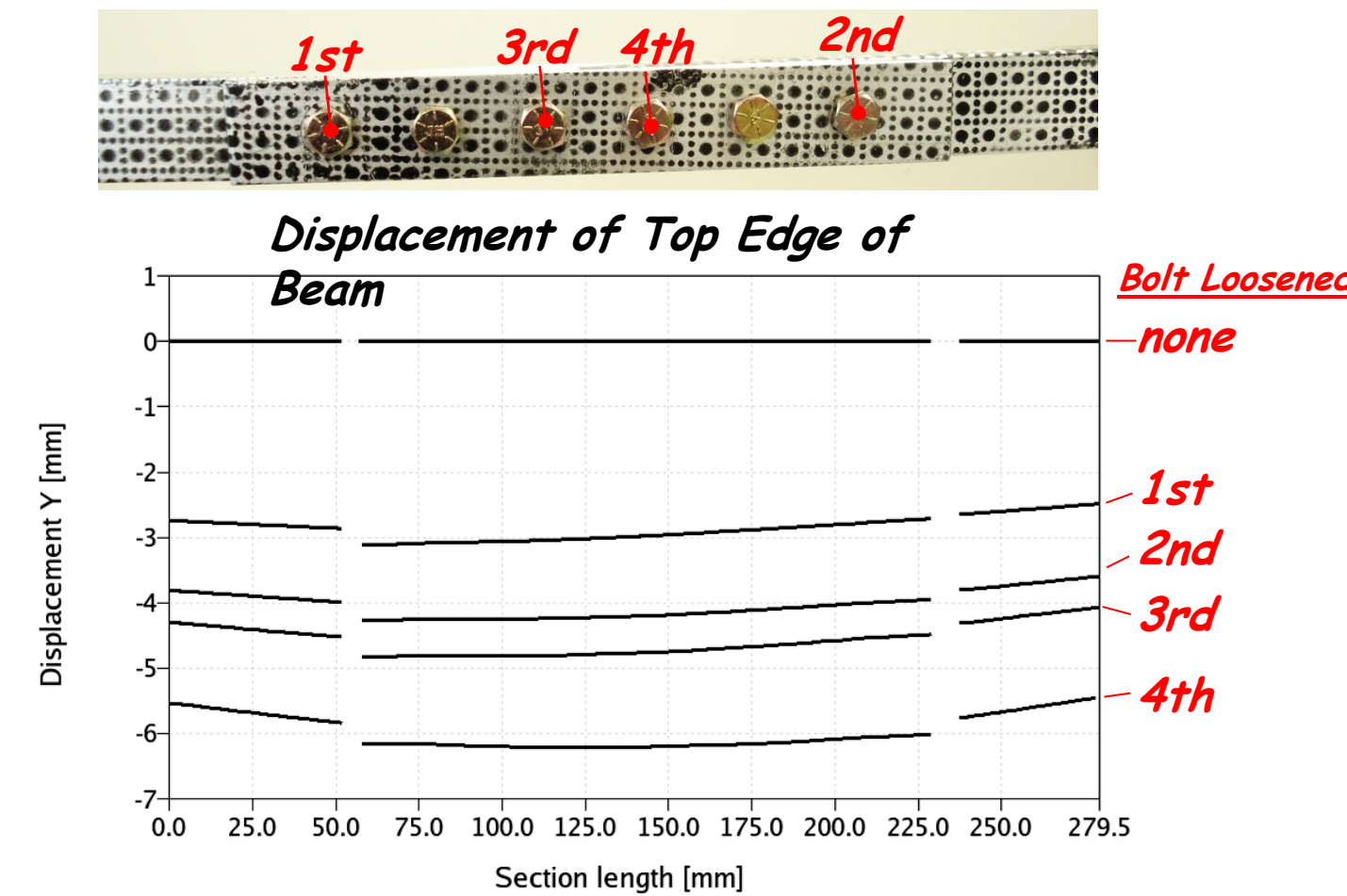
Bolt Loosening easily seen with DIC



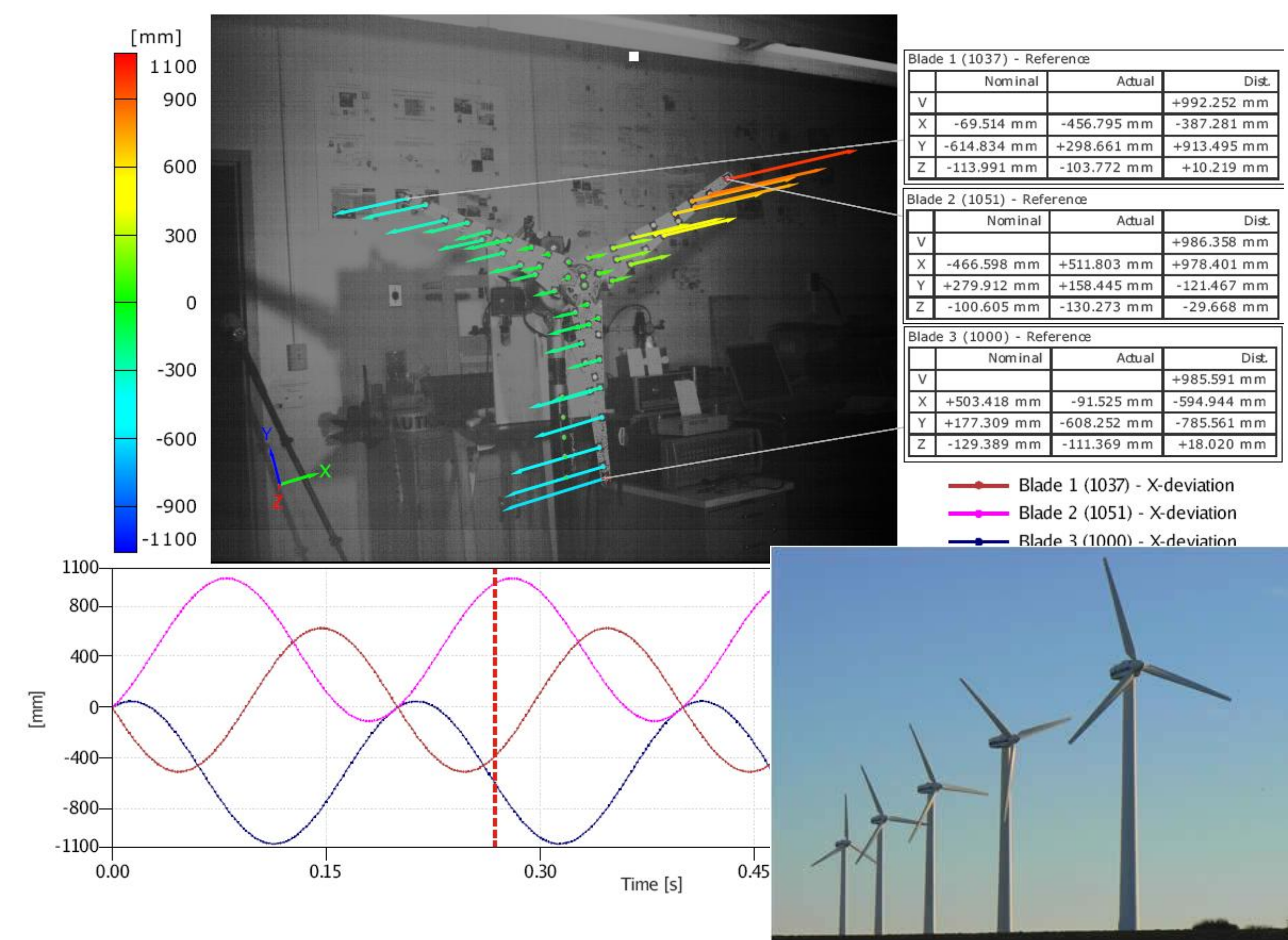
The progression of bolt loosening can be seen.



The relative displacement due to the loosening of individual bolts can be tracked and displacement monitored.



And rotating equipment can be monitored using these image correlation techniques to provide vivid representations of systems in operation with better understanding of response nature.

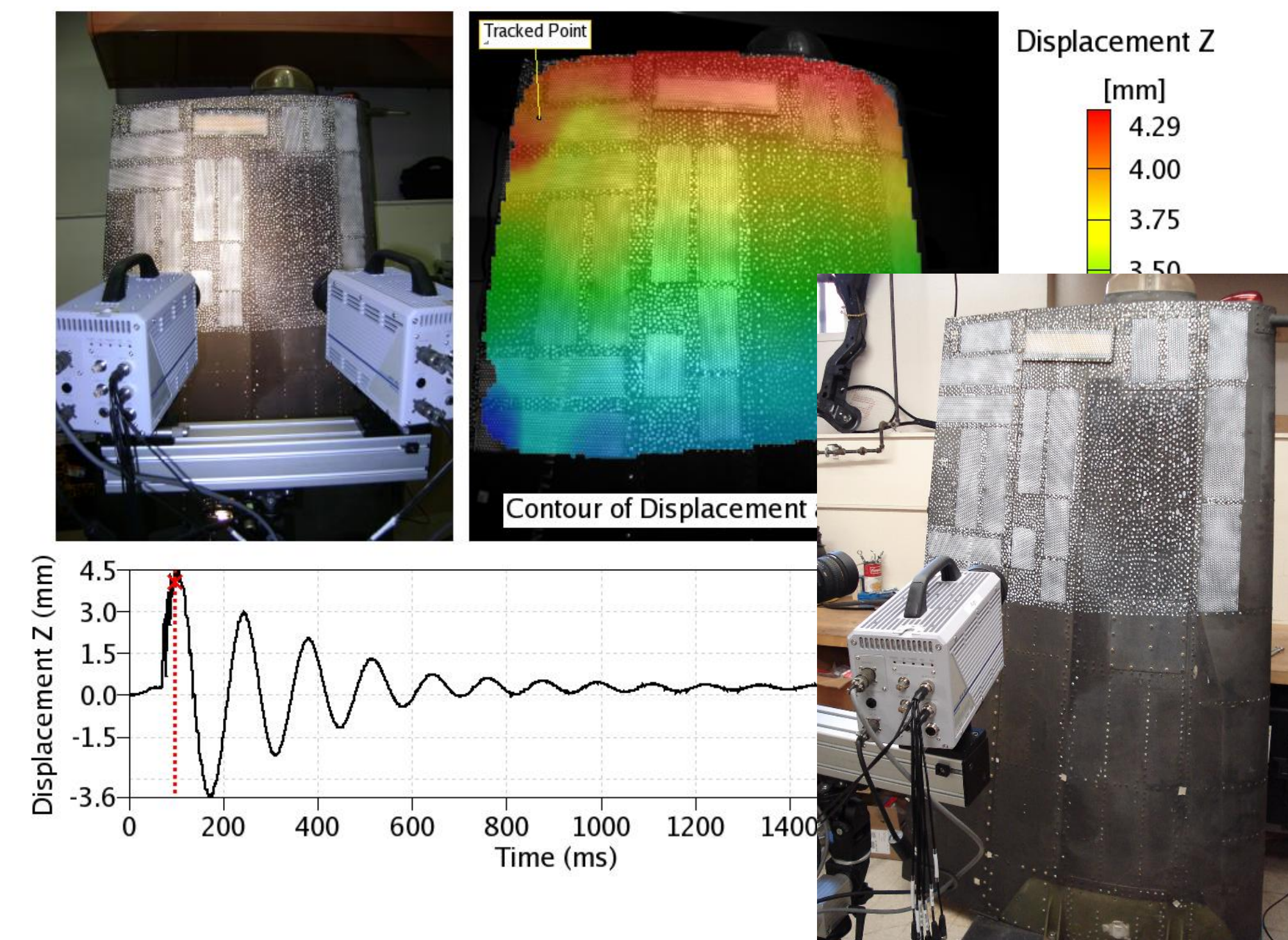


ARMY Missile Firing Applications

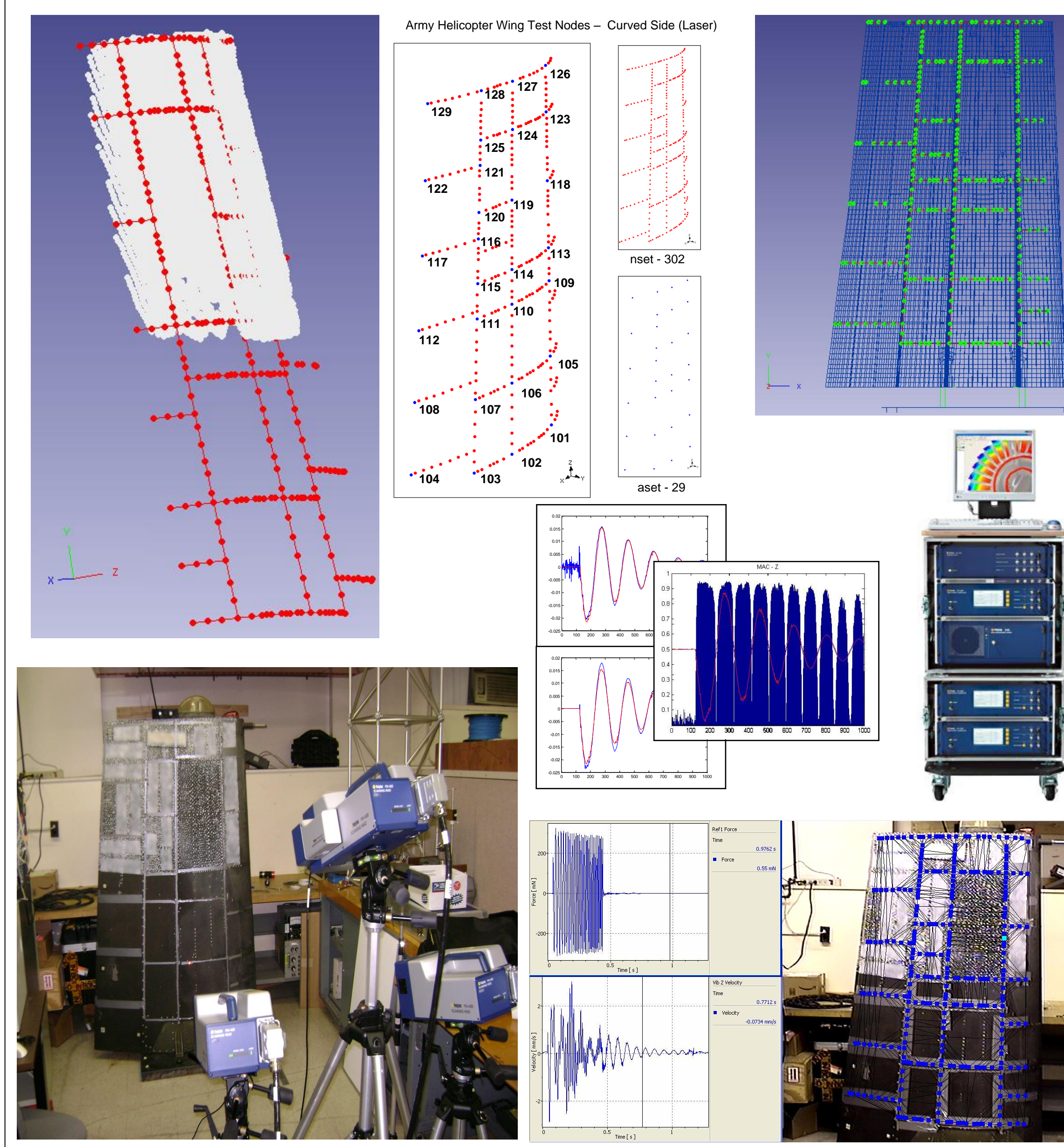
Optical, DIC, Laser methods used along with new approaches for real time operating data expansion techniques



Preliminary feasibility and proof-of-concept tests underway to prepare for actual firing of missile system

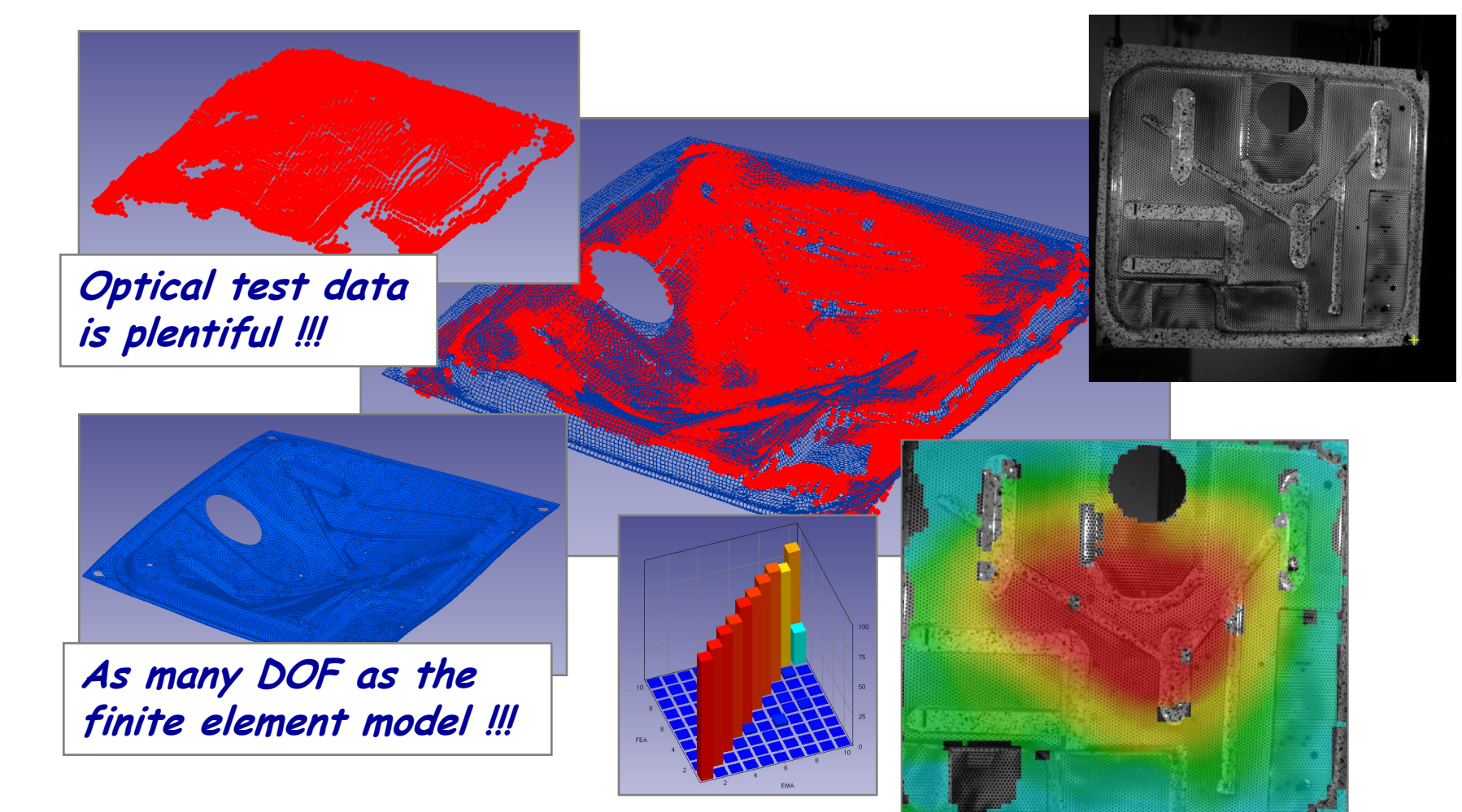


3D Laser Vibrometer measurements used for comparison with Digital Image Correlation and RTO Expansion Results



Correlation of Modal Data to FEM is Enhanced with Availability of Abundant Optical Data

DIC techniques allows significant number of test data points to be obtained. Correlation to the FEM is greatly enhanced.



Testing Operating Systems

DIC & DP provides abundance of information - systems in operating condition can easily be evaluated



Measured response while rotating can be measured with actual data and removal of rigid body motion

