

Extreme data acquisition

NASA's Zero Gravity Research Facility (Zero-G) is the largest microgravity testing environment in the USA. It allows NASA-funded researchers to simulate the effects of weightlessness on components and hardware designed for flight aboard NASA's Space Shuttle. On Earth, weightlessness can be modelled in a vacuum chamber by putting an object in a state of freefall.

The Zero-G facility includes a 140m long steel vacuum chamber that is 6.1m in diameter and is surrounded by an 8.1m diameter concrete-lined shaft extended 155m below ground level. An object placed inside a test capsule that is dropped in the vacuum chamber can obtain a state of near weightlessness for approximately 5.18 seconds as it drops a free-fall distance of 132m.

NASA selected KineticSystems' DAQ532 data recorder to collect critical data such as voltage, acceleration, and temperature of the free falling device under test within the capsule. DAQ532 data recorders were mounted into five different free-falling capsules that are required to each perform different sets of tests. The flexibility, robustness, and ease of configuration of the DAQ532 data recorder set it

apart from the competition. Any of the DAQ's 32 differential input analog channels can be activated and assigned a varied sample rate up to the aggregate maximum of 32k samples/second. The DAQ532 provided the most choices of gain/filter combinations via signal

conditioning and allowed NASA researchers to easily fine-tune test setups. Data was captured before, during and after the capsule's free-fall for a total of approximately 10 seconds. Once the capsule is retrieved by overhead crane, the data is transferred via Ethernet, or

via the unit's CompactFlash, to a PC using KineticSystems' included VersaDAQ™ software.

VersaDAQ's simple, yet powerful user interface, allowed NASA researchers to easily configure channels and sample rates, activate record mode, perform calibration, and control any of the DAQ532's functionality with a few mouse clicks and pull-down menus. The data conversion utility provided in VersaDAQ allowed collected data to be easily ported to other applications such as MATLAB or LabVIEW for further data analysis or to Excel for report generation or inclusion in other documentation.

The DAQ532 responded to all of NASA's requirements for a robust and easy-to-use data recorder. It was the only data recorder robust enough to withstand the extreme conditions, such as very high temperature and shock upon impact, of the vacuum chamber in the Zero-G test facility.

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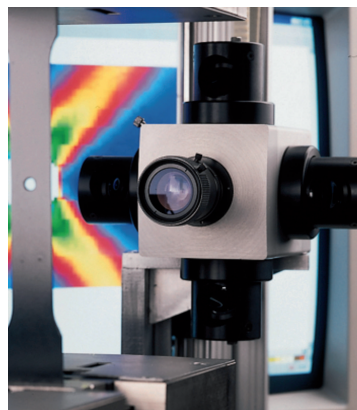
Detecting the hot spot

Within the aerospace industry, R&D departments are called upon more and more to provide innovative products at a challenging pace. That is why simulation and FEA have been widely accepted and product development is done with the help of CAD for a large portion of the time. At some time however, prototypes and real testing are required and this is an area where Dantec Ettemeyer measuring equipment can be a great help in reducing development time.

In order to optimize design in the automotive and aerospace industry, materials are developed for specific applications. Often these materials are anisotropic, so full-field and 3D measurement, in order to define material characteristics, is extremely helpful and much more appropriate than

average values between two points such as those delivered by strain gages. The 3-D ESPI system Q-300 delivers such full field information.

Further on during the prototype stages, component measurements have to be taken on a complex shape, so the ESPI system Q-100



includes a contour measurement and is also specifically designed to make full-field deformation measurement on complex components. This way it is possible to find very quickly 'hot spots' on components, therefore saving time and money by avoiding potential problems in the market, including recall actions.

For large deformations and for dynamic events Q-400, the Digital Image Correlation system provides an additional benefit for fast and effective measurements. Components are also affected by vibrations. Dantec Ettemeyer equipment Q-500 and Q-600 provide full-field information about vibration on components which can help to solve potential problem areas. This includes harmonic vibration transient events in NVH.

Composite materials, which have

now become extremely popular in the aircraft industry, require new and fast techniques for NDT in production and maintenance. Dantec Ettemeyer shearography Q-800 provides a full field opportunity to test composite materials for disbonding, impact damages, water and air inclusions and other damages. For development purposes, flexible manual systems can be used and it is possible to increase the degree of automatization to test serial production with an automatic system, where only the ID number of the part to be tested must be entered.

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