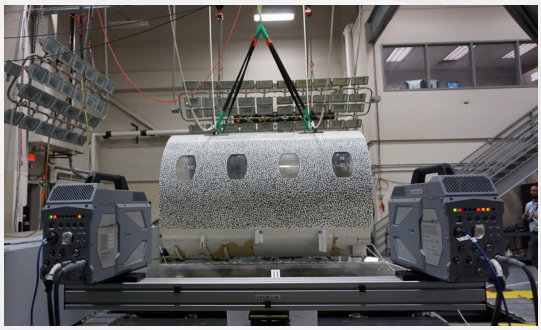
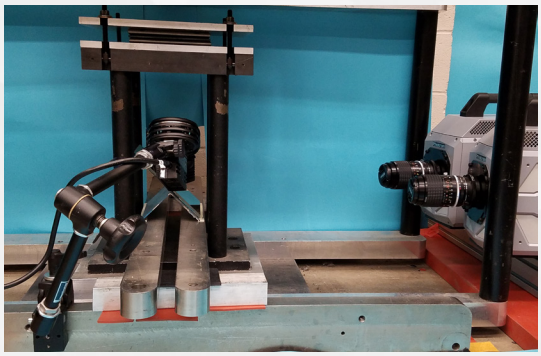
Photron

Case Study





Virtual Engineering Lab Using Photron High-Speed Cameras for Aviation Research

Wichita State University's National Institute for Aviation Research (NIAR) is using high-speed digital cameras, manufactured by Photron, in their Virtual Engineering Laboratory in a variety of testing modes such as high-impact dynamic events.

Laboratory Director Gerardo Olivares uses Photron's FASTCAM SA-Z models to capture high-resolution images of events that happen too fast for the eye to see. The SA-Z high-speed cameras capture up to 20,000 fps at full resolution of 1024 x 1024 pixels.

The Virtual Engineering Laboratory has four Photron SA-Z cameras, two of which are color plus two monochrome models. Olivares says the flexibility of the frame rate and excellent quality of image resolution make the FASTCAM SA-Z an ideal high-speed camera for their testing processes.

In one recent test, Photron cameras were used during a drop test of an airplane fuselage. The test was done as research for the Federal Aviation Administration (FAA), to examine the behavior of composite materials when used for main aircraft structures. In this case, the materials were a honeycomb structure covered by a carbon fiber laminate.

The ten foot section of composite fuselage was brought into the lab and filled with appropriate ballast to simulate the 1,500 pound weight of an operational fuselage. Extensive accelerometers and strain gages were attached with two SA-Z high-speed cameras placed on each side of the test area. Two monochrome cameras were set up to record the entire width of the fuselage and two color cameras were placed on the other side, focusing primarily on the emergency exit door area. The test represented a pure vertical crash at 30 feet per second.

A laser beam was used to trigger the cameras and instrumentation so that image collection began when the fuselage was about a foot away from impact. Set to record at 20,000fps and using the Photron camera's Pre-and Post-Triggering feature, 25% of the images were captured prior to impact and the remaining 75% of the images were recorded during and after impact. Using Digital Image Correlation (DIC), researchers were able to see levels of deformation and performance of the composite materials on the fuselage.

The FAA is studying results of the test to support future regulations on the use of composite materials versus metallic in 14 CFR PART 25 commercial aircraft. Composite materials are lighter and manufacturers design and build their products based on certification requirements set forth by the FAA showing safety levels equivalent or better to metallic materials.

Olivares also uses the SA-Z high-speed cameras for diverse tests such as airbag deployment, airline seat airbag studies for bulkhead seats and a variety of crash test applications in research for both industry and government. The digital camera's versatility to achieve high frame rates up to 20,000fps without losing resolution makes it ideal for their labs testing studies.

Bios

Gerardo Olivares Ph.D., Director

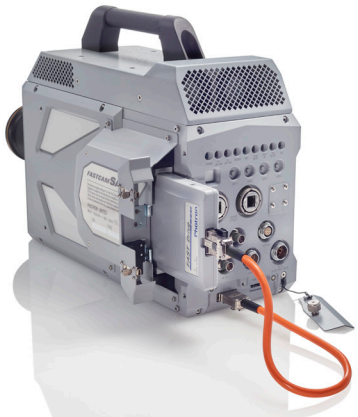
Virtual Engineering Laboratory and Crash Dynamics Laboratory, National Institute for Aviation Research (NIAR), Wichita State University.
Gerardo Olivares joined NIAR specializing in Computational Structural Analysis, Crashworthiness and Aerospace Safety Systems Development.

National Institute for Aviation Research (NIAR) at Wichita State University

NIAR was established to strengthen research and support to the aviation industry. Today NIAR provides research, design, testing and certification services to industry, government agencies and educational entities with over a dozen major laboratories. The institute is well-equipped to promote the safety, research, manufacturing and design of both aviation and commercial industries.

Photron

Photron manufactures a wide variety of high speed digital imaging systems. Photron high speed cameras are used by research customers worldwide, providing reliability and high performance in the most challenging imaging applications. Their imaging products include megapixel image resolution recording at up to 21,000 frames per second (fps), four megapixel (2K x 2K) cameras with the ability to produce high-definition 1080 HD resolution video and ruggedized systems with miniature camera heads for on-board automotive safety testing and defense applications. In addition to providing innovative high speed camera systems Photron also endeavors to offer the highest quality support to its customers through experienced and trained technical staff.



FASTCAM SA-Z

Camera Features

1-Megapixel CMOS Image Sensor:
1024 x 1024 pixels at 20,000fps
896 x 896 pixels at 25,000fps
768 x 512 pixels at 50,400fps
512 x 384 pixels at 87,500fps
512 x 256 pixels at 120,000fps

Class Leading Light Sensitivity:
ISO 12232 Ssat
• ISO 50,000 monochrome
• ISO 20,000 color

Global Electronic Shutter:
1ms to 159ns independent of frame rate

Dynamic Range (ADC):
12-bit monochrome, 36-bit color

Internal Recording Memory:
8GB, 16GB, 32GB, 64GB, or 128GB

Optional FASTDrive High Capacity Non-Volatile Data Storage:
1TB or 2TB high-speed solid state drive

Fast Gigabit Ethernet Interface:
Dual Gigabit Ethernet Interface provides high-speed image download to standard notebook/PC

Flexible Frame Synchronization:
Frame rate may be synchronized to external unstable frequencies

Fan Stop Function:
Remotely switch off cooling fans to eliminate vibration when recording at high magnifications

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