

Photron HIGH-SPEED CAMERAS



VIRTUAL ENGINEERING LAB USES PHOTRON HIGH-SPEED CAMERAS FOR AVIATION RESEARCH

BY: PHOTRON USA, INC. in collaboration with Mr. Gerardo Olivares Ph.D.

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.