SIMULTANEOUS MULTIAXIS VIBRATION TESTING WITH ELECTRODYNAMIC SHAKERS

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Equipment Reliability Institute

Wayne Tustin
Equipment Reliability Institute
Santa Barbara, California
www.equipment-reliability.com

Figure 7-23 Triaxial Accelerometer

courtesy Dytran

Figure 7-23A TRIAXIAL ACCELEROMETERS

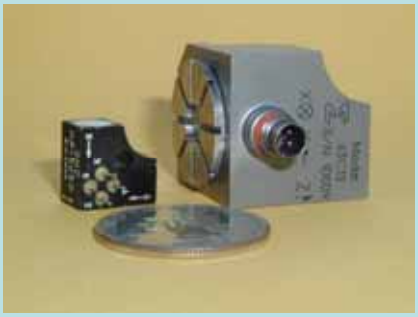


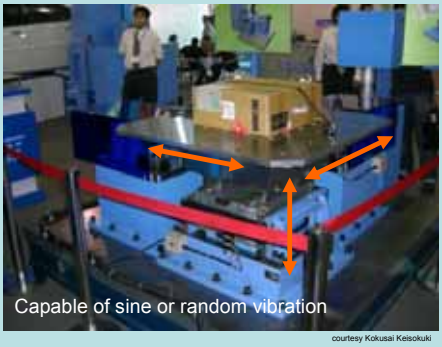
Figure 7-23B Three accelerometers → three signals

courtesy PCB

Figure 1 Vibrating Platform

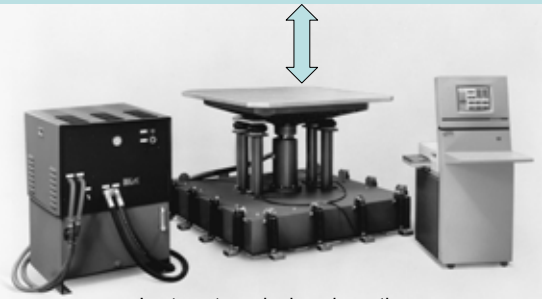
courtesy LAB

Figure 2 Three servomotor drives



courtesy Kokusai Keisokuki

Figure 3 Servohydraulic vibration platform



Last-century single-axis motion

courtesy Lansmont

Figure 4 Horizontal NEBS testing

courtesy Dayton T. Brown

Figure 5 Seismic Investigation of Residence

courtesy Mitsubishi Heavy Industries LTD.

Figure 6 Earthquake simulation

courtesy ANCO Engineers

Figure 7 Earthquake simulation

courtesy ASTRO NUCLEAR DYNAMICS, Inc. and ANCO Engineers

Figure 8 Platform Simulates Rail or other Transport

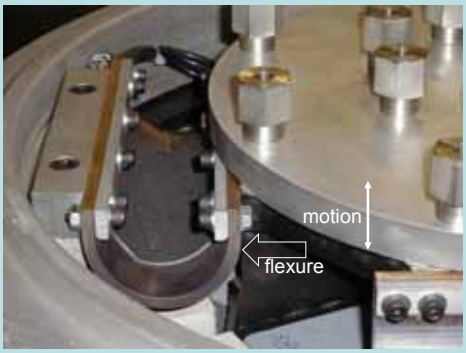
Figure 9 Road Simulation on Automobile

courtesy MTS

Figure 15-28 Shaker and Chamber Combined

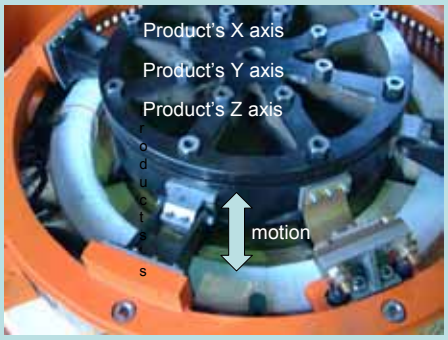
But note that shaker motion is single axis.

Figure 10 Last-century single-axis shaker



courtesy Ling Electronics

Figure 11 Last-century single-axis shaker



courtesy Dynamic Solutions

Figure 12 "Tilted" Fixture does not Multi-axis Test

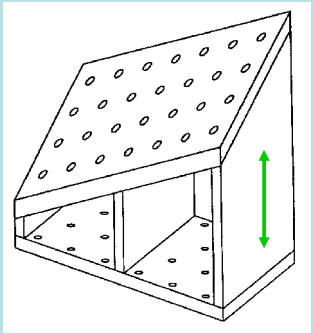


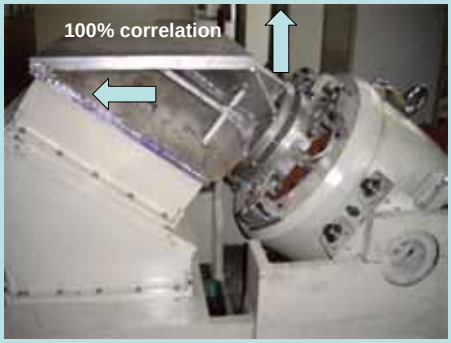
Figure 25-15A "Tilt" (not Multi-Axis) Fixture

courtesy Hong Liu

Figure 14 Tilted Shaker

Courtesy Quanta Labs

Figure 16-14B Tilted Shaker



Courtesy Quanta Labs

Please note that I'm not talking about RS or Repetitive Shock screening, sometimes called HALT & HASS, using pneumatic bangers.

Sure, RS is cheaper, but you have little control over the dynamic inputs your hardware receives. You can't repeat in the afternoon what you did in the morning.

Figure 25-45 Flexible Air Ducting

courtesy CHI

Figure 25-46 Screening Controls

courtesy CHI

Figure 25-37 Pneumatic RS Units Excite Platform

courtesy CHI

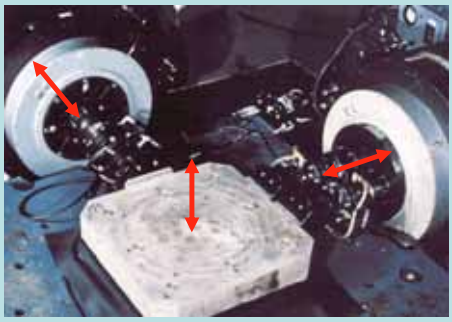
No. I'm talking about multiple (say three) electrodynamic (ED) shakers, driven by three power amplifiers.

Such as pioneered by the Army Research Lab at Adelphi, MD.

Figure 15 Pioneer Three-shaker 3DoF realization

courtesy US Army

Figure 16 Three-shaker 3DoF realization



courtesy Team Corporation and White Sands Proving Ground

Figure 17 Three-shaker 3DoF realization

courtesy Keyport

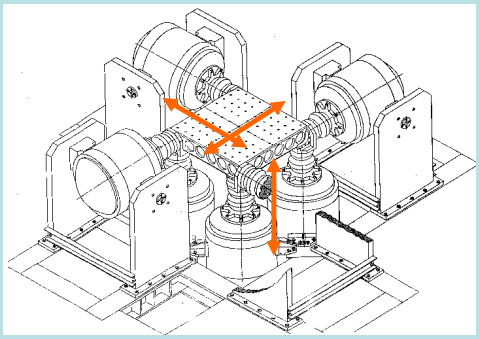
Figure 18 Three-shaker Navy 3DoF realization

Courtesy NUWC Keyport and Baughn Engineering

Figure 19 USAF Multi-Axis Test Equipment

Courtesy U.S.A.F.

Figure 20 USAF Multi-Axis Test Equipment



Courtesy U.S.A.F.

What do

- Adelphi
- White Sands
- Keyport and
- Hill AFB

have in common?

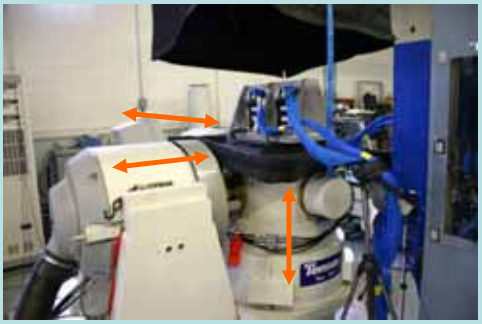
They all piled up three existing shakers, and with considerable difficulty made them work together..

Now, wouldn't it seem cheaper to buy a factory-assembled 3-shaker system?

Video Clip 4 Three-Axis ANCO ED Shaker

Click on the video above to see it play

Figure 21 Tri-axial automotive electronics shaking

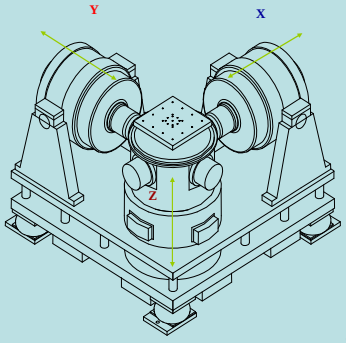


courtesy IMV, Visteon and Spectrum Technologies

Figure 22 Triaxial shaking of headlamps

courtesy Spectrum Technologies

Figure 23 Three Shakers drive Common Load



courtesy IMV

Figure 25 Three Chinese Shakers

Courtesy Dong Ling & Spectral Dynamics

Video Clip 7 Chinese Multiaxis Array

Play video link

courtesy DongLing and Dynamic Solutions

Click on the video above
to see it on You Tube

Question: When will the U.S. Army, Navy, Air Force procuring agencies *demand* the most effective vibration testing?

Question for each of you:

Whom do I know, who knows somebody who can influence hardware procurement, that I can tell about

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