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Dynamic Shock Simulation of Hard Disk Drive

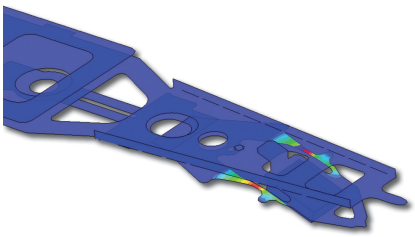
Case Study

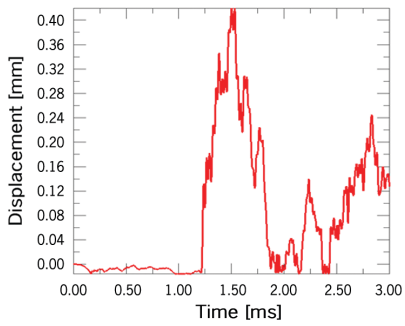
OVERVIEW

Hard disk drives (HDDs) must endure tremendous shock environments that occur during transportation, installation, and operation of the drives. The dynamic environments are very brief, 1 millisecond or less, and can have a peak acceleration of 800 g or more. This loading causes the deformation of the suspension arm for the read head and hard contact between internal components. ATA has a long history of supporting the design of sensitive electronics through the use of advanced dynamic analysis and test. To understand the interaction between the components of the HDD under shock loading, ATA simulated the highly nonlinear, short-duration dynamic events and recovered displacements and component stresses. Through this approach, ATA gained critical insight into the response of the system and design parameters that could be modified to improve the shock response.

TASKS PERFORMED & KEY OUTCOMES

- Modeled and simulated shock environments including a 10 g half-sine pulse.
- Carried out large-displacement, nonlinear explicit analysis to predict response for duration of shock event.
- Utilized multiple-processor capabilities to reduce analysis time.
- Recovered detailed stresses and accelerations in the suspension arm.
- Calculated slider separation distance as a function of time.
- Generated detailed animations of the response under the shock loading to allow deeper insight into the design parameters which control the response.





Slider separation distance and component stresses were recovered as functions of time