INDUSTRY:
Consumer Electronics

PROJECT NAME:
Dynamic Shock Simulation of Hard Disk Drive

CUSTOMER LOCATION:
San Diego, California

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 short in duration, 1 millisecond or less, and can have a peak acceleration of 800 Gs or more. This loading causes the deformation of the suspension arm for the read head as well as hard contacts between internal components.

ATA Engineering, Inc., (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 various components of the HDD under shock loading, ATA used Abaqus/Explicit, an explicit dynamics analysis code, to simulate the highly nonlinear, short-duration dynamic events and recovered both displacements and component stresses. Parallel processing was also used dramatically decreased the computational time required. Through this approach, ATA was able to gain critical insight into the response of the system and understand the design parameters which could be modified to improve the shock response.

ATA SUPPORT INCLUDED:

▷ 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
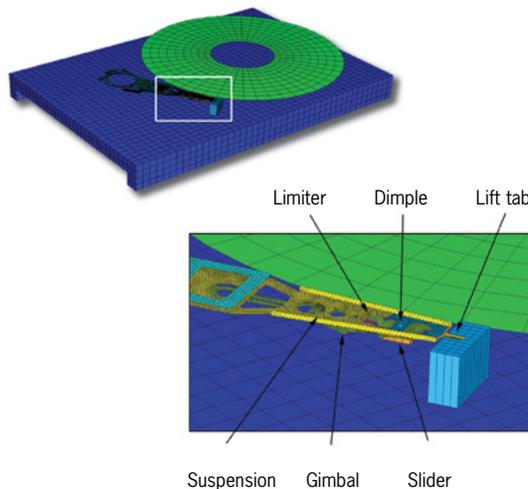
▲ The finite element model of the hard disk drive included detailed representation of the suspension arm and components