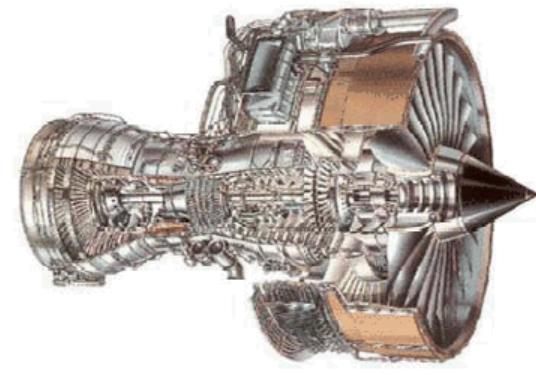
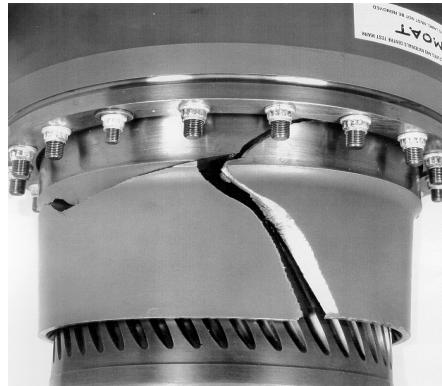
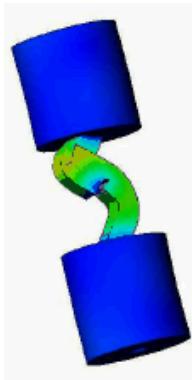


*Exceptional service in the national interest*



# Energy Dissipation Challenges in the Defense and Aerospace Industries

M.R.W. Brake, Sandia National Laboratories



Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND NO. 2011-XXXXP

- Central question: **how is energy dissipated in an assembled structure?**
- Joints are pervasive, but are becoming a liability in structures with severe constraints (defense, aerospace, auto...)
- Optimization of structures to the point where lack of joints knowledge is hurting:
  - 2% reduction in weight of a conservatively designed joint results in millions saved in operational cost for a single turbine over its life...
- Local effects of friction not well understood. Problem is fundamentally **multi-scale**.
- Different levels of **uncertainty quantification** needed
- Need for new design of joints with repeatable properties, or joints that are predictable to be within a certain regime...
- Potential for saving ~~billions~~ trillions of dollars though...

