

# Structural Reliability Partnership

## Moving from Cooperative Assessment to Collaborative Research

*Jim Redmond*

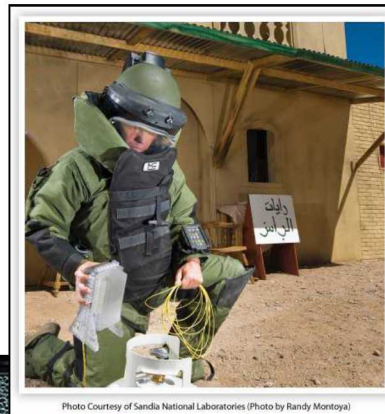
*Sandia National Laboratories*

**August 29-30, 2017**

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under Contract DE-NA0003525. SAND2017-7787C

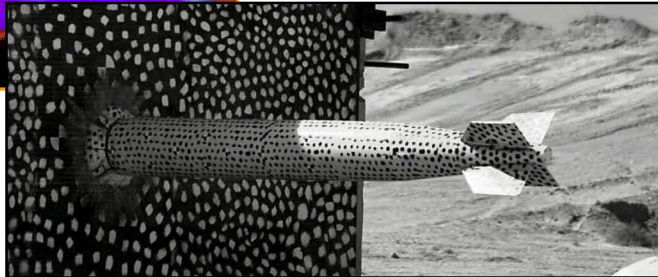
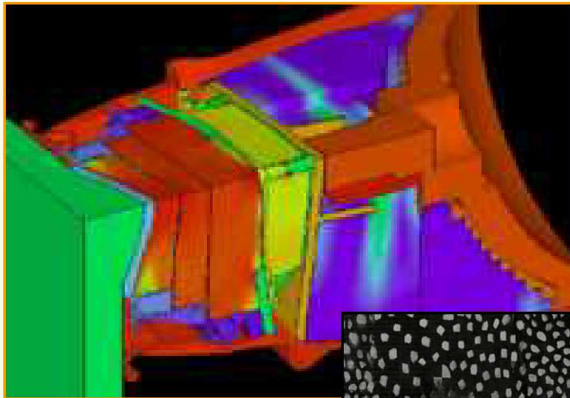
# Why model failure?

- Most design problems focus on preventing failure in normal service conditions
- A specialized subset must accommodate failure **as part of the** the performance envelop



# Sandia's stewardship mission drives predictive failure capabilities

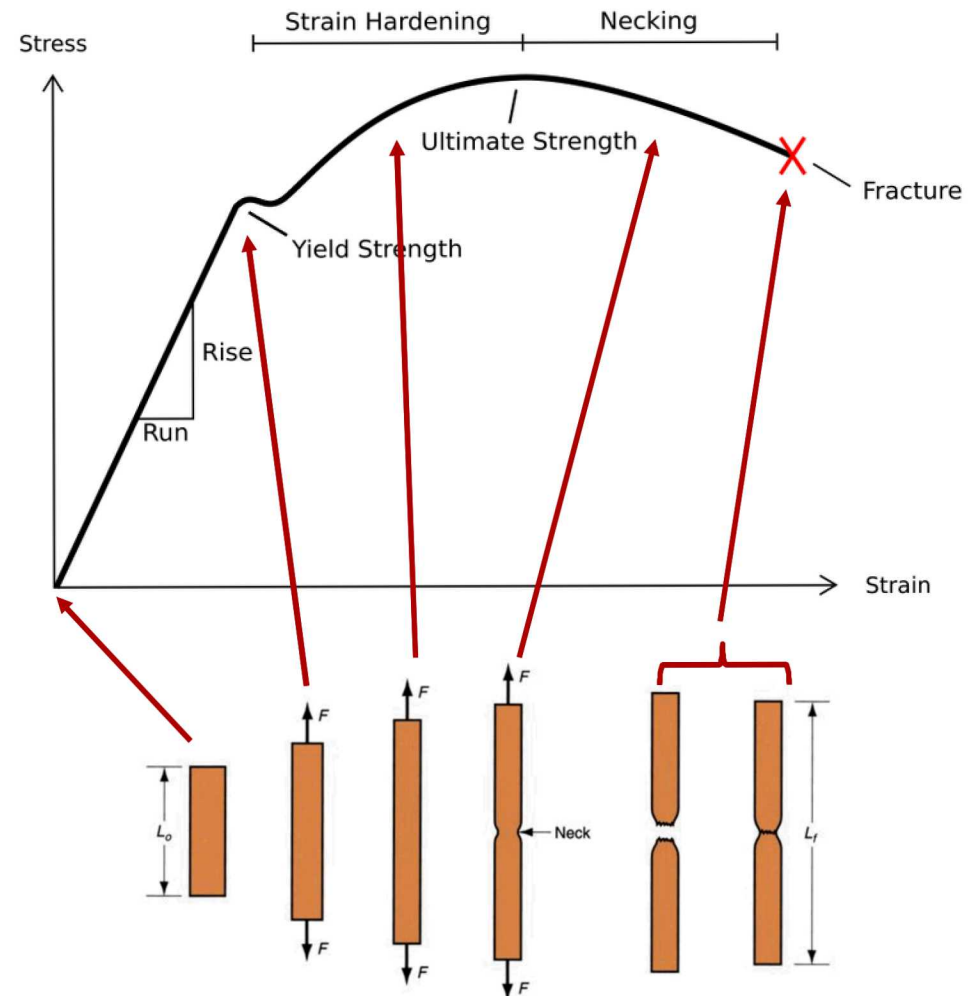
- Predicting performance in normal environments



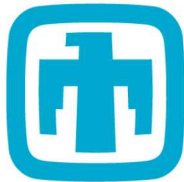
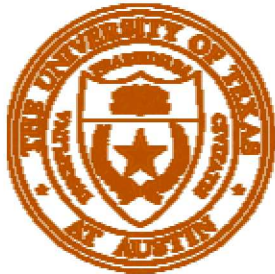
- Assessing safety in accident or adversarial scenarios

# Predicting ductile failure requires many elements

- Includes full load history
  - Elasticity
  - Yielding (isotropic or orthotropic)
  - Plasticity
  - Hardening
  - Localization / stress concentration
  - Crack initiation
  - Propagation
  - Strain rate & temperature effects
- Simulation requires
  - Verified simulation code
  - Calibrated material model
  - Appropriate failure criteria (uniaxial vs multiaxial loading)
  - Cracking - arbitrary crack initiation & propagation, crack branching, free surface, convergent result, ...



# Moving from collective assessment to collaborative capability advancement



Sandia  
National  
Laboratories



Charter Institutions

## A Coalition of the Willing!

A partnering model of tiered in-kind support to organize challenges and focus research efforts

