MER311: Advanced Strength of Materials

LECTURE OUTLINE

- Course Overview
- Stress-Strain Relations

Course Website

http://rbb.union.edu/courses/mer311

http://me.union.edu

http://www.union.edu

Advanced Mechanics Topics

- Elasticity
  - Isotropic
  - Anisotripic
- Plates & Shells
- Plasticity
- Composite Mtl's
- Finite Element
- Fracture
- Adv Dynamics
  - Lagrangian
- Mechatronics
- Design
- Optimization

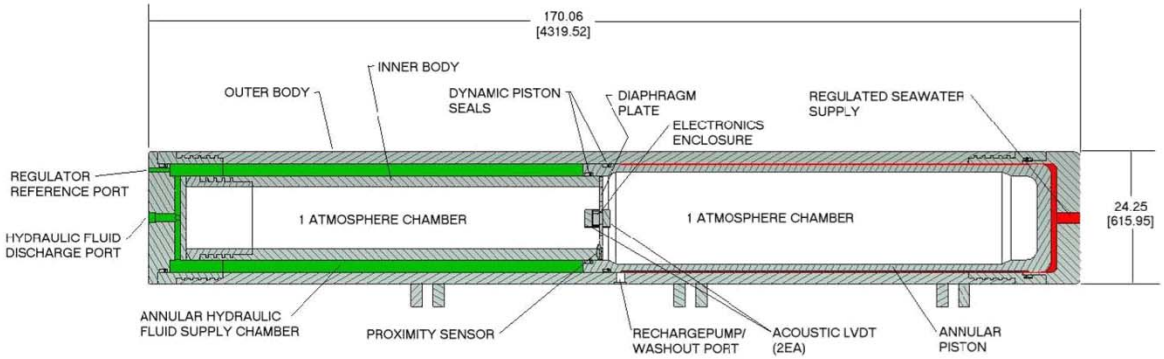
What are these and why did they capture the attention of our country and the world for almost three months in 2010?

A close up of what happened when they failed. Do you know what they are now?

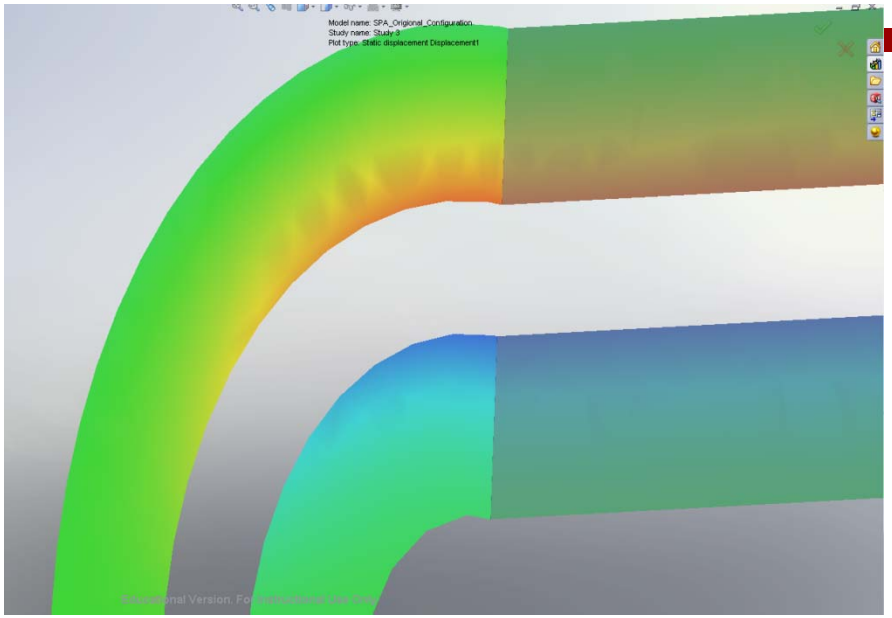
Five thousand feet above the failure, do you know what these are now?

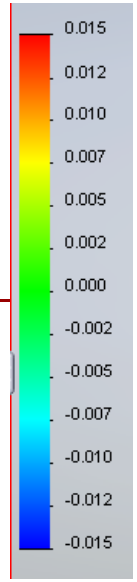
Who do you think is responsible?

The Redesign



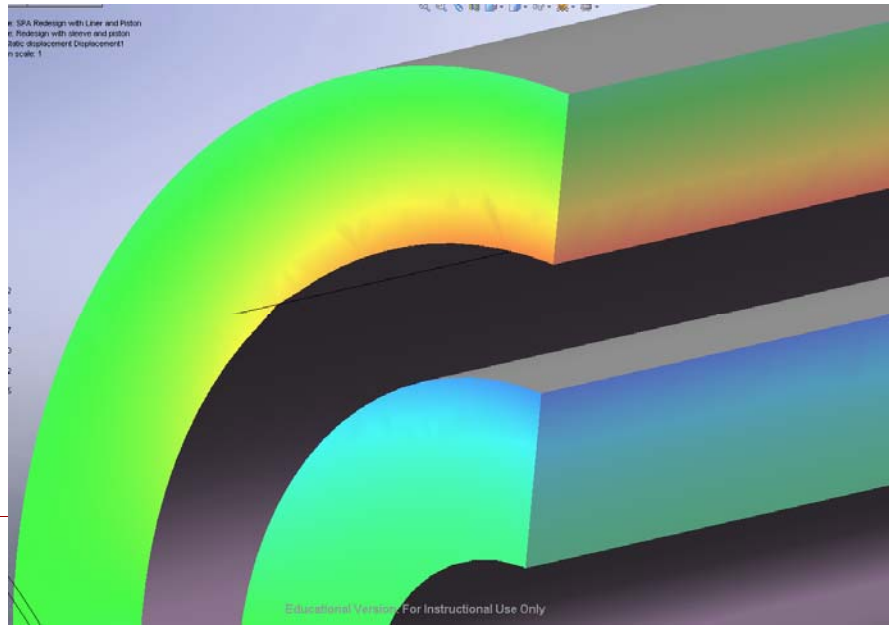
δy (Radial)
In The Inner and Outer Barrel





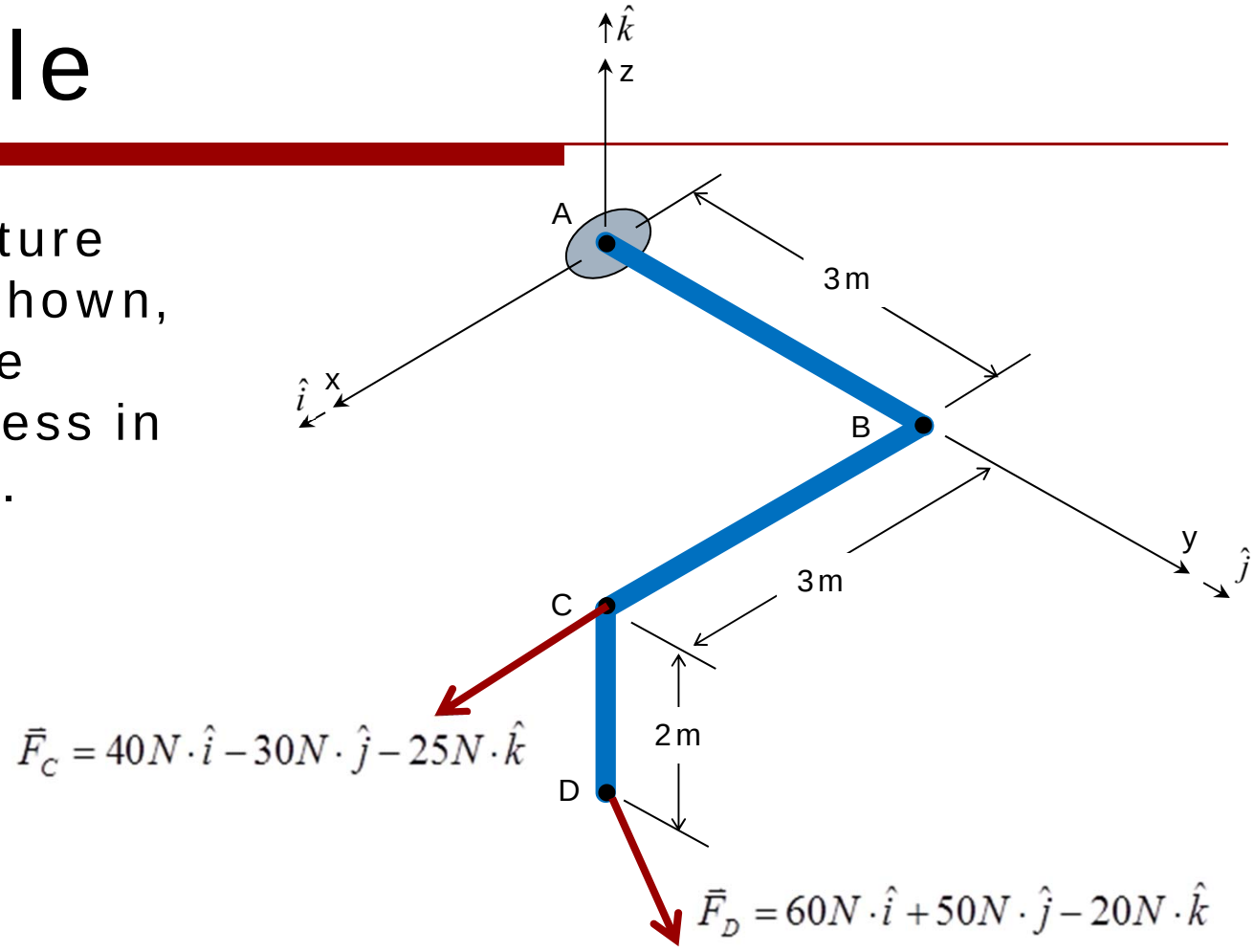
Without Sleeve

With Sleeve

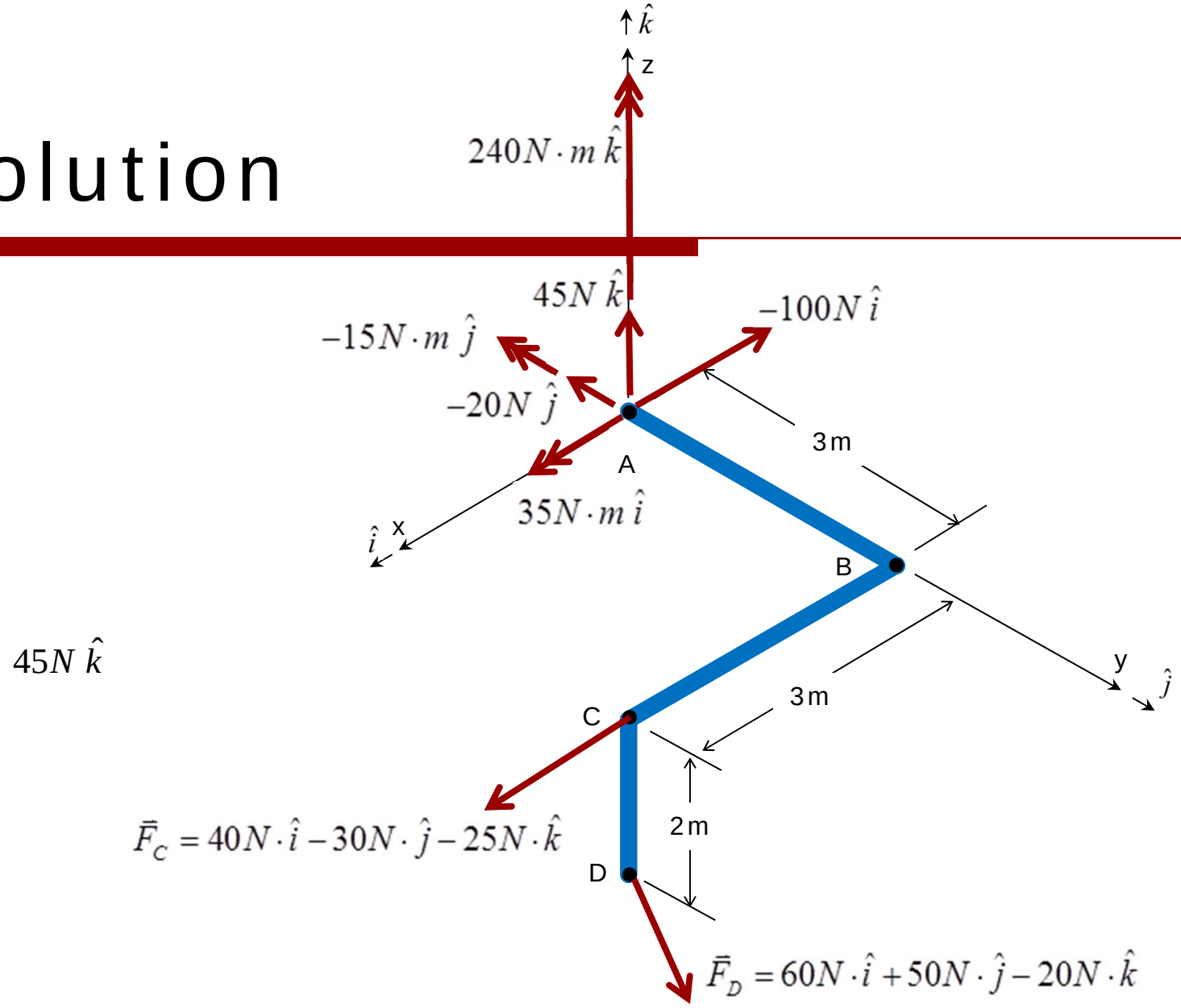


Example

For the structure and loading shown, determine the maximum stress in the structure.



Solution


$\hat{k}$
z
$240N \cdot m\,\hat{k}$
$45N\,\hat{k}$
$-15N \cdot m\,\hat{j}$
$-100N\,\hat{i}$
$-20N\,\hat{j}$
A
3m
$35N \cdot m\,\hat{i}$
$\hat{i}$ x
B
$45N\,\hat{k}$
y
$\hat{j}$
3m
C
2m
$\vec{F}_C = 40N \cdot \hat{i} - 30N \cdot \hat{j} - 25N \cdot \hat{k}$
D
$\vec{F}_D = 60N \cdot \hat{i} + 50N \cdot \hat{j} - 20N \cdot \hat{k}$