

University of Portland
School of Engineering
ME 421 – Failure Analysis
Fall 2011

1) Below is a photograph of a broken bar. The failure was due to an overload, not due to fatigue. Answer the following questions:

- a) Does the failure appear to be ductile fracture or brittle fracture?
- b) How was the part loaded when it failed? Does it appear to have been predominantly torsion, predominantly bending, or predominantly axial tension/compression?
- c) What failure theory(s) would have been appropriate for the design engineer to use: maximum shear stress, distortion energy or maximum normal stress?
- d) Observe the actual specimen available outside my office. Are there signs of where the crack initiated at?

Briefly justify (explain) each of your answers.



2) Use the following link to learn a little more about Flight 111 (and de Havilland Comet, if you wish):

<http://accidents-ll.faa.gov/> (links: accident themes then flawed assumptions – search for flight 111). Read the “accident overview” “lessons learned” and “common themes.” Note IFEN is an acronym for “in flight entertainment system.”

Discuss in approximately one half page the similarities and differences between the root cause of failure (or near failure) of the de Havilland Comet, Flight 111, and the Citicorp building (the first video we watched). Include in your discussion a conclusion about how such mistakes could be avoided on design in general.