LET'S DESIGN A LINK

WHAT THINGS AFFECT WHETHER OR NOT THE LINK FAILS?

- ULTIMATE TENSILE STRENGTH (UTS)
- THICKNESS
- LENGTH (MANUFACTURING TOLERANCES)
- HOW PINS ARE LOADED
  - PINS BEND 1ST?
  - PINS STRAIGHT?
- HOW LONG IN SERVICE? (CORROSION, DEGRADATION)
- LOADING?
  - TENSION / COMPRESSION?
  - CYCLIC / STEADY?
- CRACKS AROUND HOLES?
- EXTRA MATERIAL NEEDED TO REINFORCE

HOW **PREDICTABLE** WOULD YOU SAY MANY OF THESE THINGS ARE? **NOT VERY**

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00 FACTOR OF SAFETY (FOS)
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**Key Idea:** FOS makes things safer!

Let's assume our link will fail by fracture at an ultimate tensile strength of 90 ksi.

For a $FOS = \frac{3}{4}$, what stress should the link be designed for?

- a. 90 ksi
- b. 30 ksi
- c. 270 ksi
- d. Schifty-five

**What FOS to use? (Typical Values)**
- Structural stuff $\rightarrow 2.5$
- Aircraft $\rightarrow 1.25 - 2$

**Why not make $FOS = 10$?**
- Weight
- Cost

**Where do you get guidelines for FOS?**
- Design standards
- Industry experience
- High when you don't know much

**Diagram:**
- $\sigma$: Yield strength
- $\sigma_y$: U.S. LE
  - Fails by yielding
    - Use $\sigma_y$ in FOS
  - Fails by fracture
    - Use $\sigma_u$ in FOS