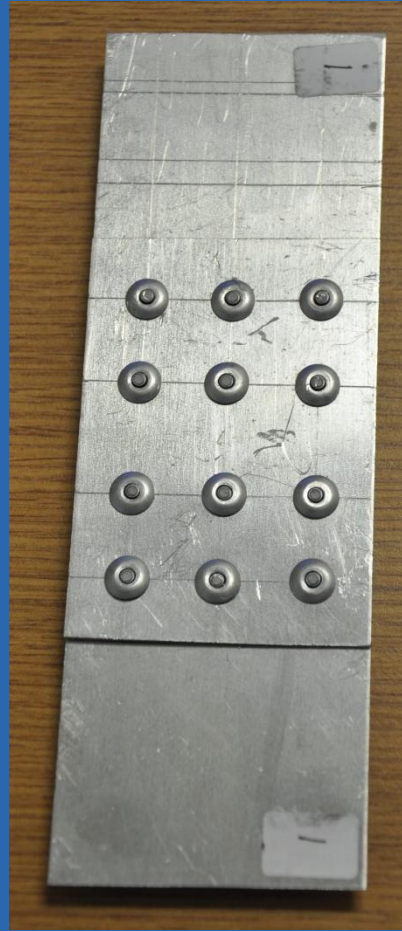# Reliability of Riveted Joints

Zachary Johnson

Objective

- Develop failure model for a riveted joint design

Design Configuration Represented by Test Specimen
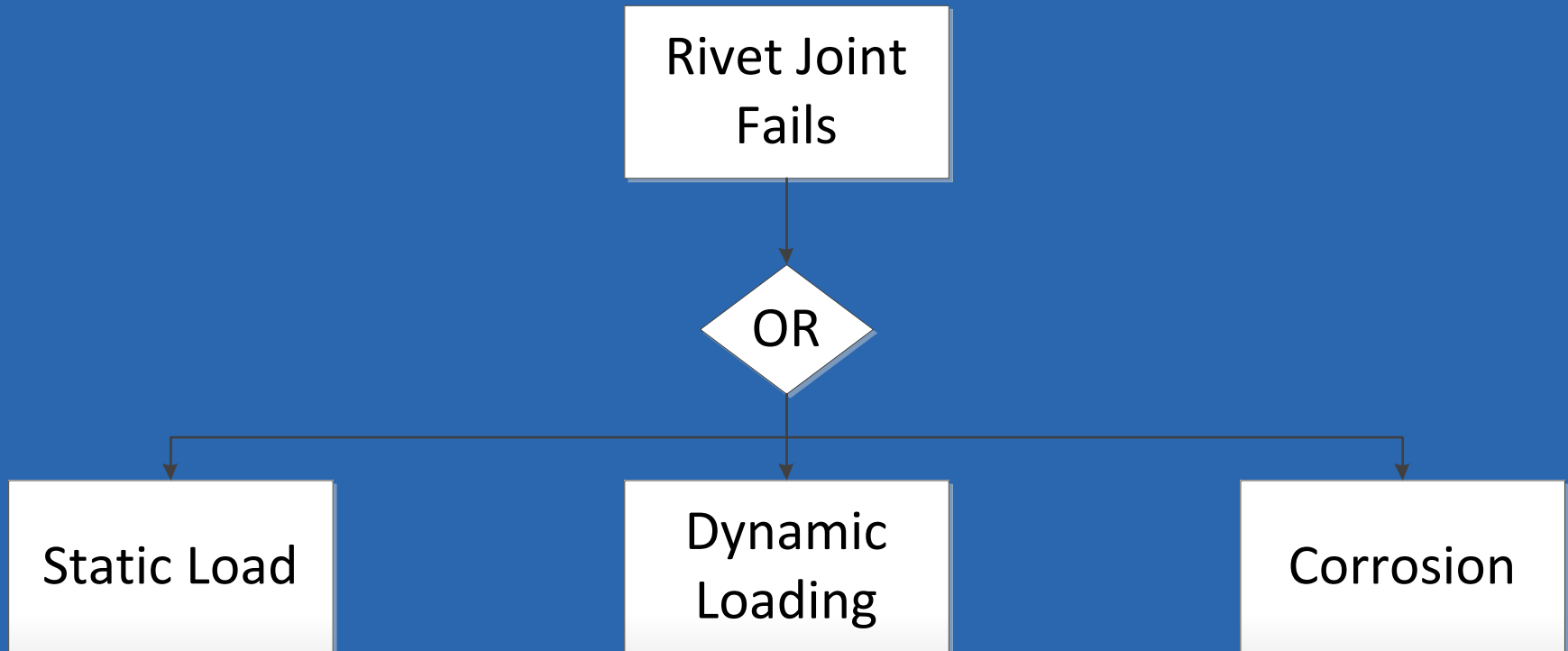
Coupon is:
- Managable
- Meaningful

Design Input:
- Design Analysis
- Bill of Materials
- Design Art
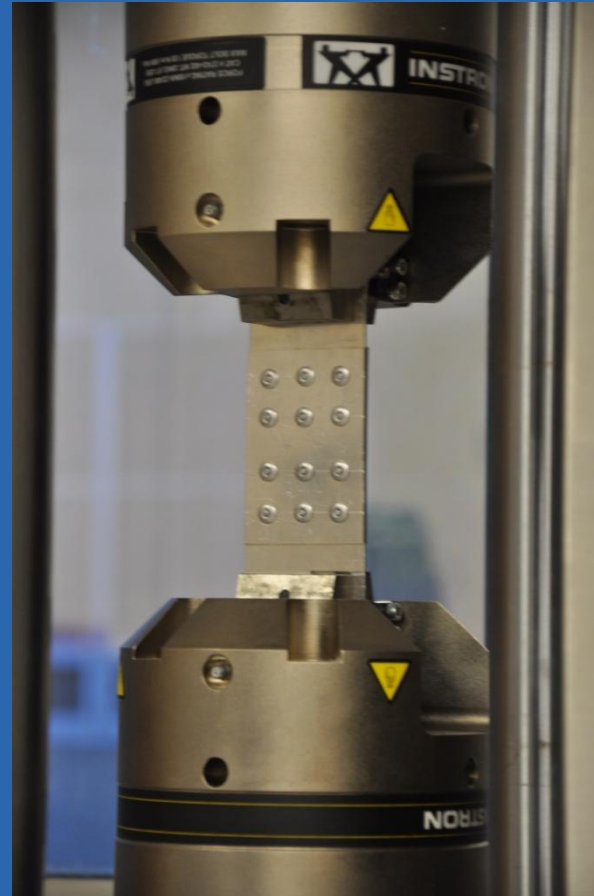
Failure Mechanism FTA

Testing

- 6 Qualified Coupons
- Instron 22kip Tensile Machine
- Failure Definition: Fails when load decreases 10%
- Displacement Rate: .001 in/min
- DAQ
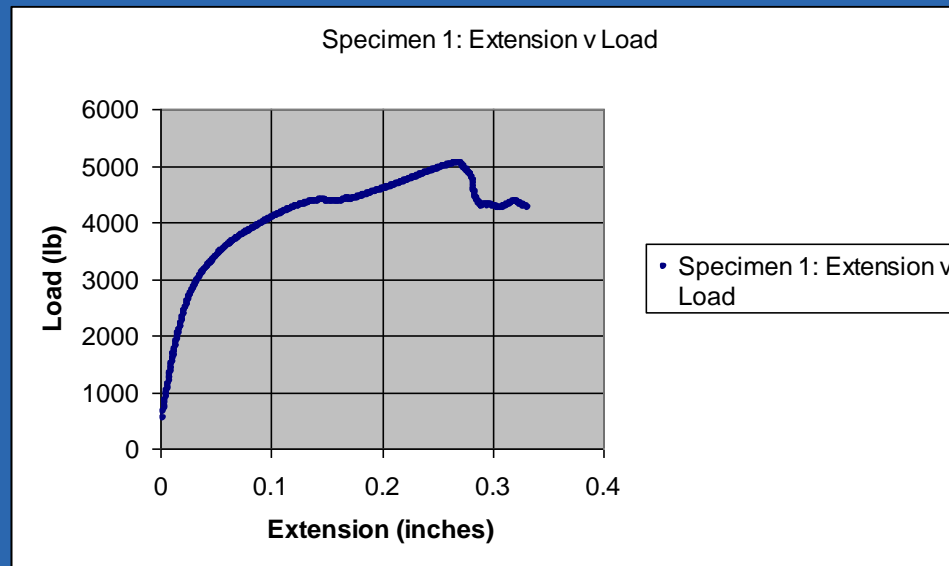 - Load
  - Displacement of actuator

Experiment

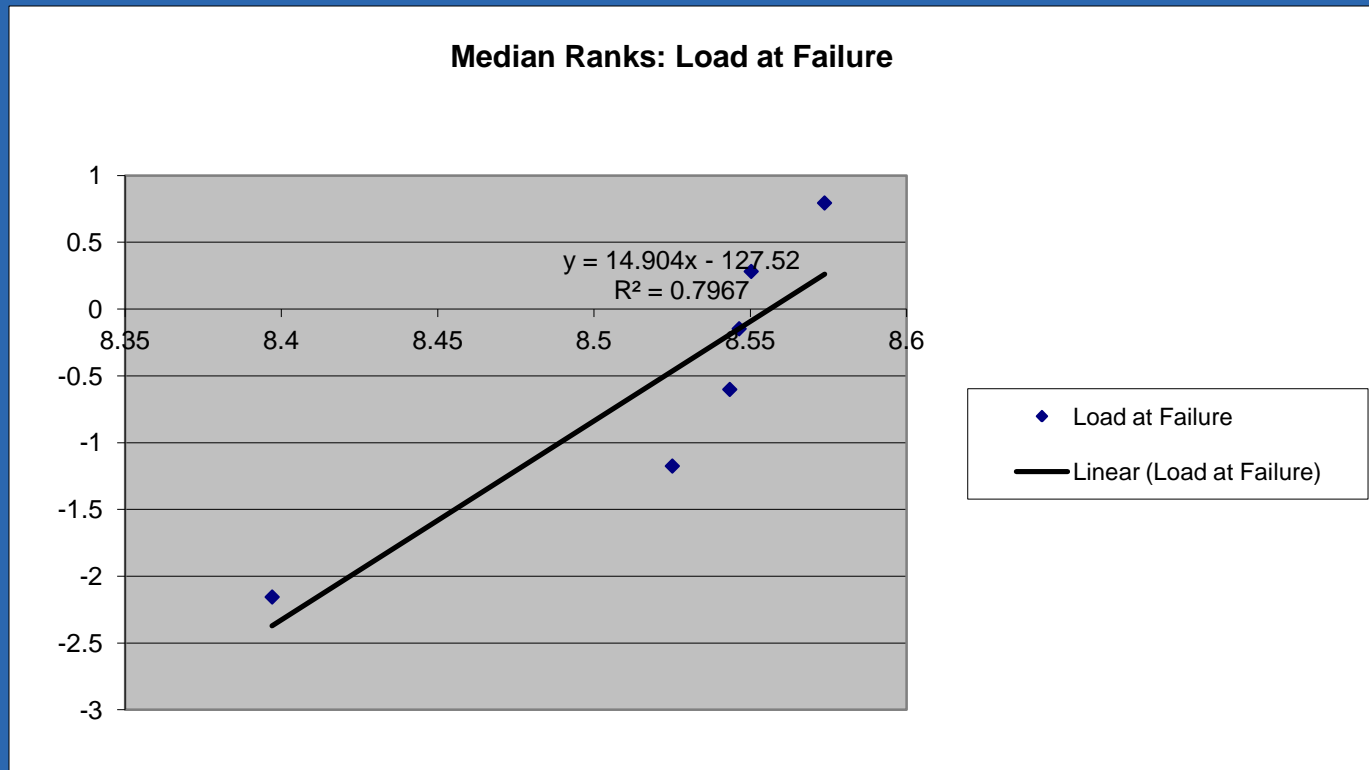Coupon being loaded in tension

Failed Specimen

Experiment

Specimen 1: Extension v Load

Load (lb) vs Extension (inches)

Legend: Specimen 1: Extension v Load

Test Results

		Max Load
Spec 1		5039.514
Spec 2		5168.269
Spec 3		5148.394
Spec 4		4434.032
Spec 5		5290.959
Spec 6		5132.971

Median Ranks Regression

Median Ranks: Load at Failure

$y = 14.904x - 127.52$
$R^2 = 0.7967$

LCL

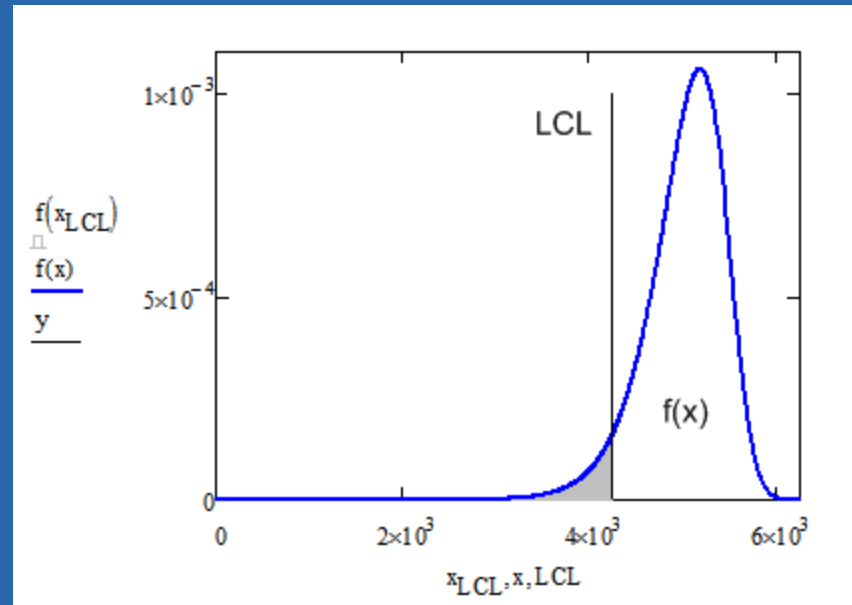|	
Eta=	5198
Beta=	14.9
LCL=	4253.333
f(x)=	0.049115

Scale Parameter

Shape Parameter

➡ Excel Goal Seek
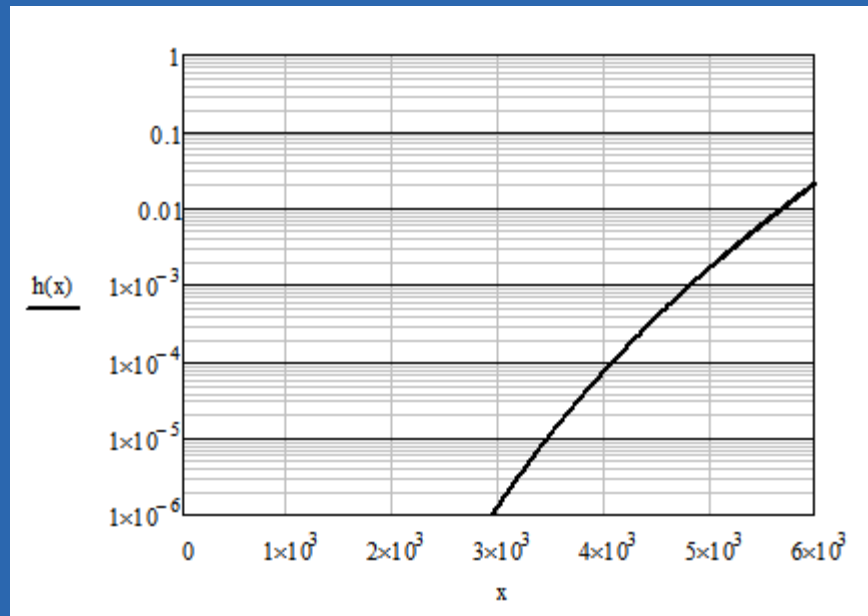
Weibul Fit

$\eta := 5198$

$\beta := 14.9$

$$f(x) := \left(\frac{\beta}{\eta}\right) \cdot \left(\frac{x}{\eta}\right)^{\beta-1} \cdot e^{-\left(\frac{x}{\eta}\right)^{\beta}}$$

$LCL := 4253$

Hazard/Risk

$$h(x) := \left(\frac{\beta}{\eta}\right) \cdot \left(\frac{x}{\eta}\right)^{\beta-1}$$

What's Next?

- Investigate fatigue failures
- How can we make the hazard function a usable tool to design engineers
- How can we measure and record loads on components

Questions

For Questions or comments please visit us at
http://rfal.uah.edu
and reply via the contact us page

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