

# Fatigue Technology Inc: Static and Fatigue Testing of Two Aluminum Specimens

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## What is FTI?



- Seattle-based company that tests and improves the fatigue life of materials used in aircrafts
- Conducts fatigue and static testing
- Measures crack growth under constant-amplitude or spectrum loading



#### **Material Properties**

#### 7075-T651. Aluminium Zinc Alloy

#### 2024- T351 Aluminum Copper Alloy



## **Static Testing**

- Material is stretched until it breaks
  - Pressure is added gradually
- Malleable materials perform
  well





#### **Static Test: Stress Strain Curves**



# **Fatigue Testing**

- Material is stretched and relaxed several times each second
- Up to 1,000 times less pressure applied than in static testing
- Stress concentrates in hole, simulating real scenario



#### Fatigue Test Data

	Fatigue Specimens				
Specimen	Width (inch)	Thickness (inch)	Hole Diameter (inch)	Test Stress (ksi)	Cycles to Failure
UW15-2024-Fatg	2.3509	0.2566	0.2498	25	86,486
UW15-7075-Fatg	2.3612	0.2484	0.2498	25	56,886

### Constant Amplitude v. Spectrum Testing





# Which metal would be the ideal material for a plane wing?

#### • 7075:

Withstands more force due to its high ultimate strength, but is more brittle than 2024

• 2024:

Endures more fatigue cycles because it has a higher yield strength and therefore greater ductility

#### Final Decision:



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### Improving Fatigue Life: Cold Working

- Creates compression stresses to counteract harmful tensile stress
- Uses the processes of plastic and elastic deformation





1. After verifying the starting hole size, slip the

pre-lubricated split sleeve onto the mandrel.

which is attached to the hydraulic puller unit

2. Insert mandrel /sleeve assembly through the

flush against the work-piece

starting hole, while ensuring the nosecap is held



 Activate the puller unit. The mandrel is drawn through the sleeve and starting hole





 Remove and discard sleeve. The cold expansion process is complete

 Ream hole to final size. Use pin-end of combination gage to confirm size

# **Questions?**

