



Progress report

Thermomechanical fatigue of Boeing 60-NiTi

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Scoping Experiment

- Generation of first validated fatigue results
- First estimation of life expectancy under thermomechanical cycles and under high cycling frequencies

Summary of scoping experiment

Run order from 1 through 4 achieved

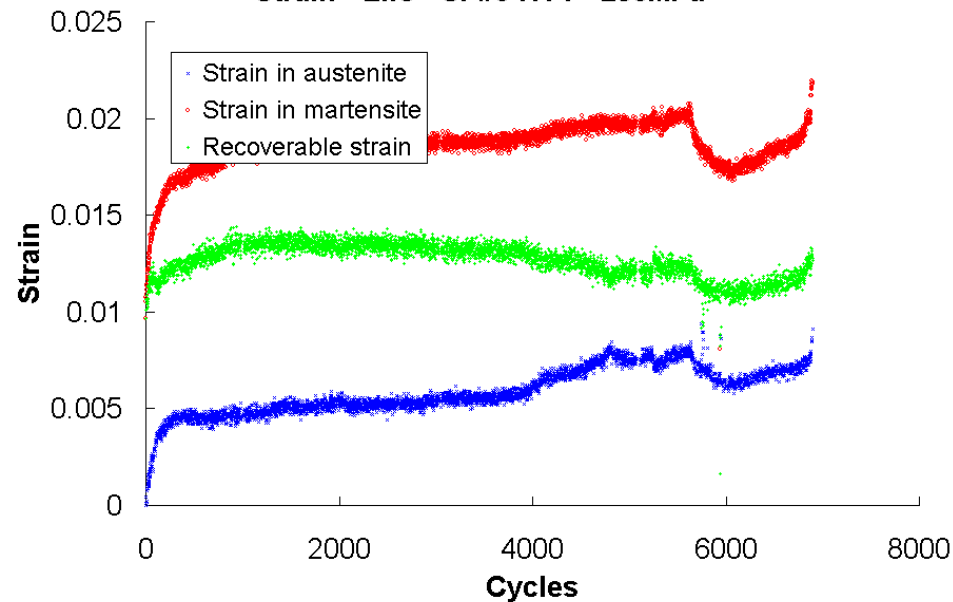
Run order	Heat treatment	Thickness (mils)	Applied stress (MPa)
1	A2	10	250
2	A2	5	150
3	A1	15	250
4	A1	5	250
5	A2	5	150
6	A1	15	150
7	A2	5	150
8	A1	5	150
Heat Treatments	A1	1 hr @ 850°C, 1 hr @ 450°C	
	A2	1 hr @ 850°C, 20 hrs @ 450°C	

Fatigue frame results for HT1

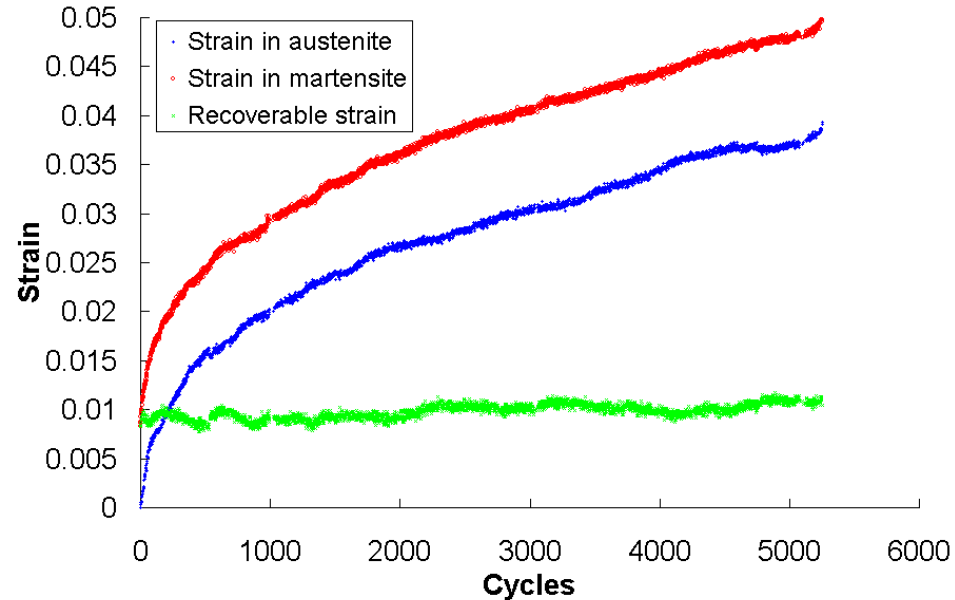
Thickness = 5 mils
Stress level = 250MPa
 $N_f \approx 7000$ cycles

Thickness = 15 mils
Stress level = 250MPa
 $N_f \approx 5400$ cycles

Strain - Life - SP#3 HT1 - 250MPa



Strain - Life SP#7 HT1 - 250MPa

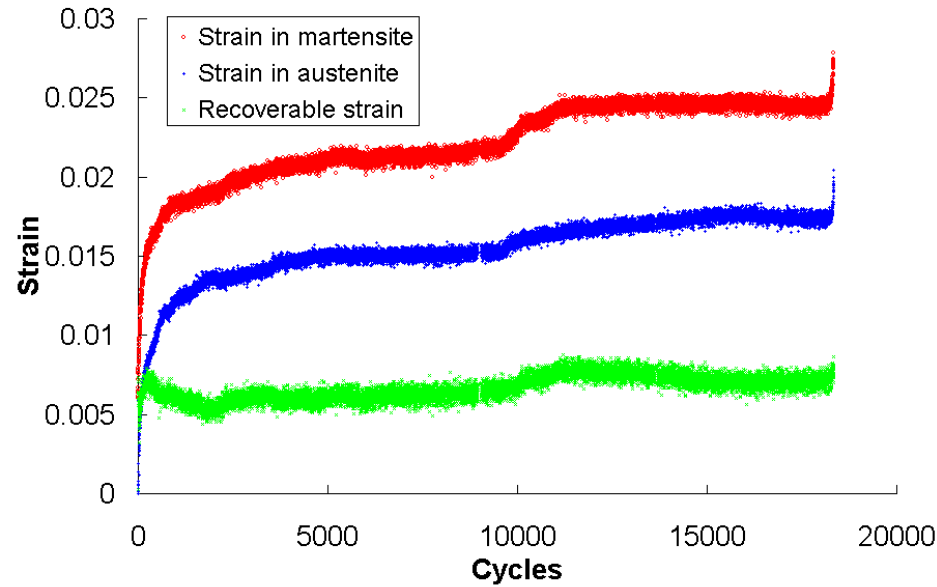


Fatigue frame results for HT2

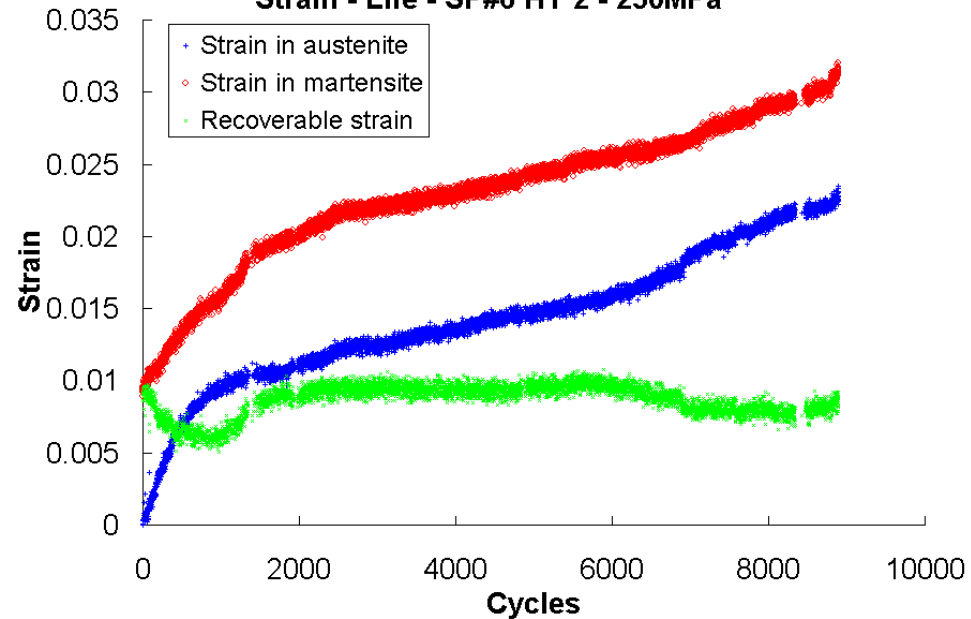
Thickness = 5 mils
Stress level = 150MPa
 $N_f \approx 18000$ cycles

Thickness = 10 mils
Stress level = 250MPa
 $N_f \approx 9000$ cycles

Strain - Life - SP#4 HT2 - 150MPa



Strain - Life - SP#6 HT 2 - 250MPa

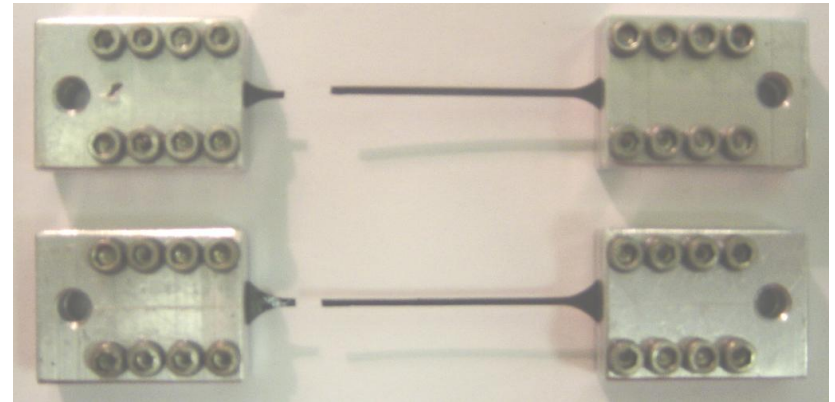


Failure of specimens

Specimen from heat treatment 1

Specimen #7 – thickness = 15 mils →

Specimen #3 – thickness = 5 mils →



Specimen from heat treatment 2

Specimen #4 – thickness = 15 mils →

Specimen #6 – thickness = 5 mils →



- Failure occurred systematically on the left hand side of the specimens (actual testing configuration and conditions).
- Validation of failure occurring at the test gauge section of the specimens insuring failure under appropriate stress level.

Future work

- **Finish scoping experiments**
- **Make first analysis on influence of heat treatments and thicknesses**
- **Discuss possible geometries and scale for upscaled fatigue frame specimens**