# Effect of Loading Frequency on the Very High Cycle Fatigue Behavior of TC17 Titanium Alloy (Postprint)

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## Abstract

TC17 titanium alloy is a typical engine blisk material, and its very-high-cycle fatigue performance is directly related to the long-life, high-reliability design of engines. The very-high-cycle fatigue performance of TC17 was investigated using four test methods: conventional tension-compression, conventional bending, accelerated tension-compression, and accelerated bending, with conventional test frequencies of (1,500 ± 500) Hz and accelerated test frequencies of (20 ± 1) kHz. Fatigue test data for TC17 were obtained in the life range of 5$×10^{5}$ to 2$×10^{9}$ cycles, with fatigue strengths primarily concentrated in the range of 400–570 MPa. Analysis of different test data types revealed that loading frequency has a minor effect on the very-high-cycle fatigue performance of TC17, and that bending fatigue strength exceeds tension-compression fatigue strength. Fracture analysis indicated that loading frequency has no significant influence on the fatigue crack initiation and propagation mechanisms of TC17.

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