

## TRIBOLOGICAL PROPERTIES AND PERFORMANCE OF A NOVEL AEROENGINE BEARING STEEL ARCTIC15

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### KEYWORDS

*Bearing, steel, ceramic, friction, smearing, rolling contact fatigue, aeroengine*

### ABSTRACT

The development of new generation very high bypass ratio aeroengines requires bearing solutions with increased speed and load capabilities. A temperature-resistant and corrosion-tolerant carburizing steel with high surface hardness has been developed to enable a minimum of 15% increase of contact pressure capability compared to conventional aeroengine bearing steels [1]. This novel aeroengine bearing steel called Arctic15 opens the door to smaller engines with reduced fuel consumption and emissions. The first industrial melt has been produced in 2018 to undergo an extensive range of verifications from material characterizations to full scale testing and engine assembly for ground tests.

Here, the tribological properties and performance of Arctic15 are compared to that of conventional M50 and M50NiL aeroengine bearing steels, notably in hybrid contacts, meaning against silicon nitride rolling elements. A focus is made on the tribological performances and material properties related to bearing reliability, mainly being resistance in rolling contact fatigue (Figure 1), spall propagation, oil starvation and smearing. The correlation between elemental, subscale, and full-scale tests (Figure 2) results will be discussed.

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### REFERENCES

[1] A. Kerrigan et al., "Temperature-Resistant, Corrosion-Tolerant Carburizing Bearing Steel for Aero-Engine Applications," in *Bearing Steel Technologies, 12th Volume: Progress in Bearing Steel Metallurgical Testing and Quality Assurance*, ed. J. M. Beswick (West Conshohocken, PA: ASTM International, 2020), 403–420, <https://doi.org/10.1520/STP162320190059>

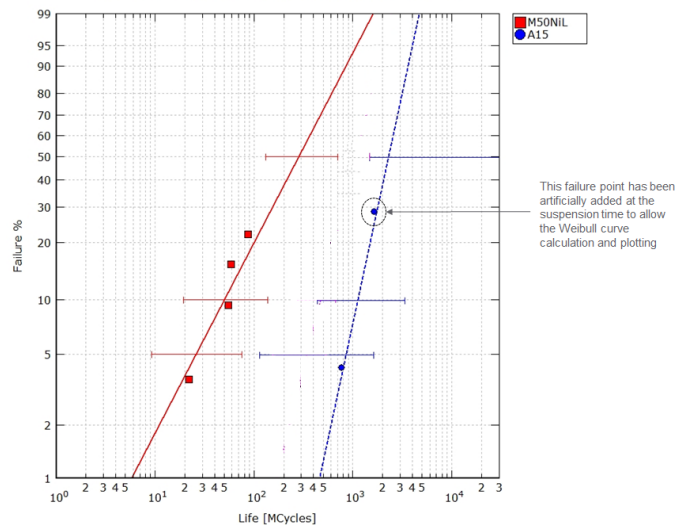


Figure 1: Rolling Contact Fatigue endurance on SKF Multi Contact Test Rig (MCTR) with double flat washers tested at 4.2 GPa.

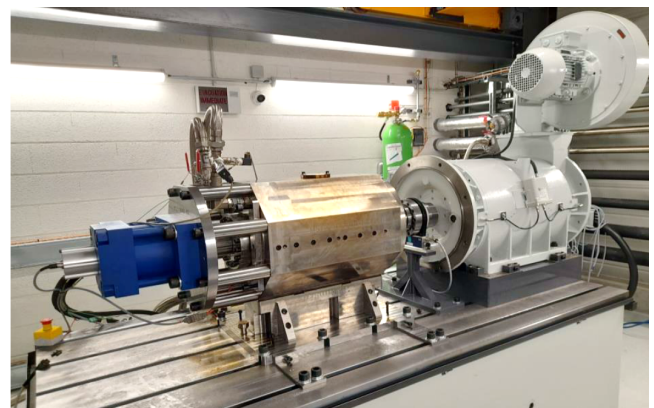


Figure 2: Full scale tests of Arctic15 main shaft bearings under representative duty cycle on state-of-the-art high speed test rigs.