



SURFACE VEHICLE INFORMATION REPORT

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Bearing and Bushing Alloys

RATIONALE

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1. **Scope**—The bearing performance of steel backed half bearings, bushings, and washers is dependent on the properties and thickness of the lining alloy, the strength and dimensional stability of the steel backing (usually SAE 1010) and the strength of the bond between the lining alloy and the backing. This SAE Information Report is primarily concerned with the properties of the lining alloys used in automotive applications, in particular, the crankshaft bearings of the internal combustion engine.
2. **References**—There are no referenced publications specified herein.
3. **Factors Affecting the Choice of Crankshaft Bearing Alloy**—The choice of alloy for the main and connecting rod bearings of an engine depends on the conditions in the hydrodynamic film separating the bearing surface from the crankshaft. If the dynamic load applied to the bearing through the oil film is high, fatigue strength of the bearing alloy will be the prime consideration. If the thickness of the oil film is low or at times incomplete, compatibility, or the ability to withstand occasional rubbing contact with the crankshaft, will become the most important property; the related property of dirt embeddability becomes particularly important if strict attention to cleanliness is not observed during engine assembly or maintenance. Cavitation of the oil film, which may arise from rapid movement of the journal across the bearing clearance or from other causes, requires that the bearing alloy be resistant to erosion by the collapsing vapor bubbles. Both fatigue strength and cavitation erosion resistance are broadly related to alloy hardness; generally, the harder the alloy the stronger and more cavitation erosion resistant it will be. Dirt embeddability and compatibility, on the other hand, are inversely related to alloy hardness; generally, the softer the alloy the better will these surface properties be.

The correct choice of alloy for a particular engine is that which offers the optimum compromise among these opposing requirements.

Corrosion and wear resistance are other important properties of engine bearing alloys. Corrosion resistance is necessary if engine temperatures are high and there is a danger of oil degradation and the appearance of an acidic component. Wear resistance is required if the crankshaft surface roughness is comparable to the oil film thickness. The choice of crankshaft finishing procedure has become particularly critical with the adoption of nodular iron crankshafts.

Characteristics and applications of typical bearing and bushing alloys are outlined in Table 1.