2.5L 60 Degree Mazda KL Engine Features

* **Split Crankcase** - Similar to 911 flat-6 split case which offers increased rigidity over traditional bearing-cap solutions for high-rpm capability (7800rpm 2.0V6) and low NVH (winning 1992 German engine award)
* **Bearings** - 4-bolt Mains, with a further pair of bolts at each bearing section. Key journals & bearings are oversized regarding width. Bearings are triple-layer heavy duty
* **Crankshaft** - Forged, nitrided, triple-lapped, mirror-finished
* **Piston Squirters** - Upper bearing journals contain piston oil-squirters to aid cooling
* **Exhaust-Valves** - Stainless steel & sodium cooled
* **Pistons** - Lightweight to reduce reciprocating mass
* **Head Gaskets** - Stainless steel is used, with torque-to-yield bolts
* **Stroke** - Very short stroke creates low crank angles & low rod/bearing loads

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Mean Piston Speed / Max Piston Acceleration

Engine Dynamic Stress Levels

- **Mean Piston Speed (MPS)**
  - 2.5V6 MPS = 0.167 * 2.92 * 7000 = 3170 ft/min at 7000rpm
  - 2.0I4 MPS = 0.167 * 3.62 * 6500 = 3929 ft/min at 6500rpm
  - F1 engine MPS = 4519 ft/min at 16,400rpm
  - As a benchmark, MPS
  - under 3,500 ft/min - Good reliability
  - 3,500-4,000 ft/min - Stressing
  - over 4,000 ft/min - Very short lived
  - Bore & Stroke
  - 2.0 Bore*Stroke of 83x92mm (3.62" long stroke)
  - 2.5 Bore*Stroke of 84.5x74.2mm (just 2.92" stroke)
  - For comparison F1 engines have 70x42mm (1.65" stroke)
  - Ring Loadings
  Top-rings must balance high-rpm capability and wear, a thin ring allows high-rpm capability, too thin and wear becomes an issue. With reduced crank angles from a short stroke ring wear is reduced. A 1.5mm ring is beneficial over a 1.0mm ring for high-rpm.

- **Maximum Piston Acceleration (MPA):**
  2.5 top-ring - 1.49mm/0.06"
  - MPA Permitted = 77,000ft/sec^2
  - MPA Experienced = 51,354ft/sec^2 at 7000rpm
  2.0 top-ring - 1.17mm/0.046"
  - MPA Permitted = 105,000ft/sec^2
  - MPA Experienced = 70,157ft/sec^2
  - The BMW M5 in comparison experiences MPA of 90,000ft/sec^2 on a 1.5mm ring.

  Lighter rings create reduced accelerative forces, reduced ring/piston interface overheating and reduced hammering of the piston-ring-groove. Too light and ring longevity is adversely affected.
  MPA = (rpm^2 * stroke"/2189)*(1/2A), A = ratio between rod-length-between-centres to stroke.
  2.0 rod-centre-dist = 135mm; stroke = 92.0mm; A = 1.47
  - MPS-2.0 = (6500^2*3.62/2189)*(1.2*1.47) = 51,354 ft/sec^2
  2.5 rod-centre-dist = 138mm; stroke = 74.2mm; A = 1.87
  - MPS-2.5 = (7500^2*2.92/2189)*(1.2*1.87) = 70,157 ft/sec^2
  Both the 2.5V6 & 2.0I4 engines are engineered for longevity. The 2.5 engine is likely to be the longer lived engine subject to identical maintenance to the 2.0 engine. Mazda V6 engines are assembled entirely by robots, not humans, at the Osaka engine plant in Japan alongside Rotary engines.
  Ford bench testing, with very minor changes, showed the V6 to be capable of continuous running at 8900rpm - well beyond redline 7500rpm.