

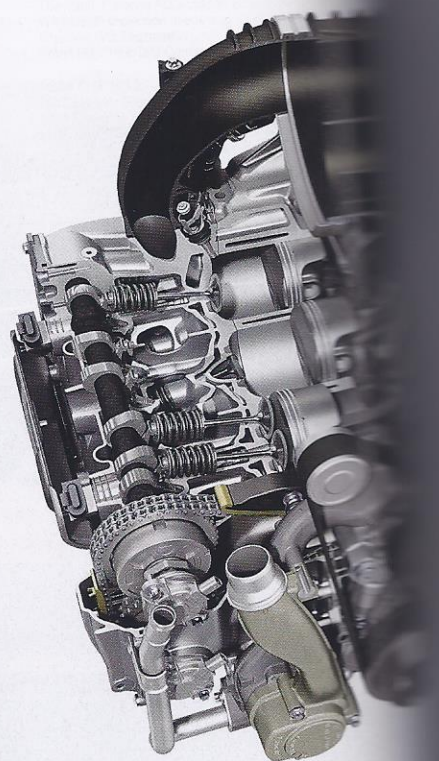
Clearly, Porsche responded decisively to the problem and moved quickly to stop any further damage or property loss. We suspect that Porsche found the problem in engines that had not yet failed which allowed engineering to positively identify the cause. The above news release has two important statements. First, "it has been confirmed that engine damage resulted from a loosened fastener on the connecting rod," and second, "Now, engines with optimized fasteners will be used in all 2014 Porsche 911 GT3s."

We feel that these two statements are somewhat in conflict, since loosened or optimized fasteners could suggest two potentially different problems. Were the fasteners installed incorrectly or was an incorrect fastener being used? We will come back to this, but first we would like to talk about the dynamics associated with connecting rod fasteners.

The connecting rod bolt is arguably the highest-stressed fastener in an internal combustion engine. During every crankshaft revolution, the stroke movement of each piston assembly (which includes the weight of the piston, its rings and wrist pin) come to a complete stop twice in the cylinder bore, once at top dead center (TDC) and again at bottom dead center (BDC). Because of this, the speed of the piston assembly is constantly changing; it is either accelerating from or decelerating to zero. Additionally, the movement of the connecting rod assembly is also constantly changing as the large end of the rod (which includes the rod cap) moves horizontally and vertically while at the same time following the stroke distance of the piston and the rotation of the crankshaft.

The other critical parameter that affects the connecting rod bolts is engine speed. This is because the stroke distance and maximum rate of acceleration imposed on the moving mass (piston and connecting rod assemblies) is what determines the reciprocating mass. This is but one of the design factors that the connecting rod fasteners must meet. The rod bolt must control the bending forces between the rod and the rod cap, plus fatigue resistance caused by repetitive high stresses. Also, careful consideration must be given to the shape and finish of the fastener to ensure no stress risers are present which can lead to fatigue failure.

Connecting rod fasteners are among the most critical fasteners in an engine.



Above: The GT3's 3.8-liter flat-six has a factory redline of 8,250 rpm and 325 ft-lb of torque at 6,250 rpm. The engine also produces 385 hp at 6,250 rpm and a top speed of 195 mph.