*From the 2-2-2005 Technical Bulletin issued by Yamaha. This represents the official factory explanation of engine mechanical noise characteristics typical to the XV1600/1700 Road Star models including Warrior. Source of text is unknown, I do not have a PDF of the actual Technical Bulleting but this comes from a reliable source.*

---

Please use the information in this bulletin to assist you in handling customer concerns about normal engine noise. Yamaha designed the Road Star to be a very special motorcycle, the heart of which is it's enormous v-twin engine. Our goals were to build a big-bore, high torque engine in the tradition of classic motorcycles that have long been part of the American landscape. We also wanted it to have the exceptionally clean, muscular lines that without a doubt would draw attention to the Road Star.

Several engineering decisions were made to accomplish our goals. For example, we chose traditional no-fuss air-cooling so as not to have a radiator detract from the bikes clean lines. We chose proven push-rod valve actuation to give the engine its particular style, as well as its particular height and weight distribution characteristics. We also gave it 98-102-cubic inch displacement-bigger than many car engines-with massive internal components like a crankshaft that alone weighs a hefty 45lbs.

If a customer should question the overall engine noise level, explain to them that certain mechanical operating noises from the engine are expected, and the Road Star is no exception. It has engine-operating sounds that are inherent precisely because of the type of engine that it is. The air-cooled engine design used for the Road Star, unlike liquid-cooled engines, does not have a sound deadening, liquid-filled jacket surrounding most of the sound-producing mechanical engine components. What is at issue is what are normal and abnormal noises.

Remind the customer that this is a very large air-cooled engine. Aluminum and other metal components expand when they get hot, and the engine is designed with operating tolerances to accommodate for this expected characteristic of the metal. The result is that the customer will likely hear more overall mechanical noises from the engine when it's hot and the oil is thinner.

Above all, make sure the customer is aware that the Road Star engine is proving itself to be extremely reliable and we are confident that Road Star will deliver trustworthy performance for years to come. Assure them that normal mechanical noises are not the sign of impending engine failure.

Engine Noise Analysis: **Tapping Noise from Camshaft Area**

Normal Noise
During initial engine start-up, the customer may occasionally hear a tapping noise from the camshaft area and, within a few minutes, the noise subsides. Explain that this is due to extra clearance at the push rod end before the hydraulic lifter is pumped up. When the engine is turned off and it stops in a position where one of the valves is open, that lifter will bleed down over time due to the constant pressure applied to the lifter by the valve spring. When the engine is restarted, a small amount of air may enter the lifter and it can take a few minutes for the air to bleed out of the lifter and self adjust to proper clearance.

Abnormal Noise
Constant tapping noise regardless of engine temperature - may be caused by what is called a flat lifter. If the piston inside the hydraulic lifter becomes scratched, the lifter will not be able to hold the compressed oil inside to take up the valve/push rod clearance. Explain that a failed lifter will need to be replaced.

Engine Noise Analysis: **Ticking Noise from Cylinder Head Area**

Normal Noise
Explain that a light ticking noise is normal due to the compact air-cooled design of the cylinder heads, which allows the sound of rocker arm loading/unloading and valve-to-valve eat contact to be heard. Clarify that the ticking noise may increase slightly as the engine gets hot where the engine parts expand and the oil thins down.

Abnormal Noise
A consistently loud ticking noise, regardless of engine temperature may be caused by an improper valve clearance adjustment. Explain that this engine is designed with 2 intake valves and 2 exhaust vales per cylinder. The single rocker opens and closes both valves at the same time. One side of the rocker is nonadjustable and the clearance is self adjusted by the hydraulic lifter. The other side is adjustable and must be adjusted so the valve contact point is the same as the other side.

Engine Noise Analysis: **Knocking Noise from Crankshaft Area**

Normal Noise
When an extremely hot engine is idling, the customer may hear what some describe as a light knocking noise coming from the crankshaft area, primarily from the right side. The noise is more pronounced if the idle

speed drops below 900rpm. This is a normal engine noise.
Explain that the Road Star engine is designed to produce very high torque at low engine operating rpm. Because of this low operating rpm, for the alternator to produce sufficient electrical output to support the system, the alternator is driven off of a jackshaft that is geared to the crankshaft and spins at approximately 2 times the engine rpm.

As the engine heats up and the aluminum crankcase expands, the gear lash (clearance) is increased between the alternator shaft drive and driven gear. Inform the customer that, normally, the oil viscosity dampens the gear contact surfaces and helps reduce mechanical noise. However, in this case, the oil is thin which reduces the damping effect.

Under these conditions, if the machine is put into 1st gear and the engine is loaded down below 500 rpm with the brakes applied, the described knocking noise will become even more pronounced. Explain that this is because of several factors. 1st, the ignition timing is set for 900 rpm idle speed. At below 500 rpm, the timing is too far advanced and causes early combustion that will try to force the piston down in the opposite direction. 2nd, at such low rpm, the oil pressure is also very low which affect the damping effect at crankshaft plain bearings. Combine these factors with the slow spinning alternator shaft which is juddering from the magnetic field of the alternator rotor, the engine will make some mechanical noises. Reassure the customer that this is common with any engine design and does not indicate excessive wear/clearance of components or impending failure.

<u>Abnormal Noise</u>
If the engine is consistently making what is described as a knocking noise regardless of engine temperature or load, convey that it may be due to a bearing or bearing surface failure at the upper or lower connecting rod or crankshaft plain bearings. If your customer is concerned that a normal operating noise is impending bearing failure, remind him or her that bearing failures get progressively worse in a short time. If the noise hasn't been getting worse or even seems to "fix itself" from time to time, it's not a bearing failure.

End.