

vibration was gone. Looking at the engine as installed in the motorcycle, the flywheel is very heavy. We chose to emulate that and do away with the light-weight flywheel supplied with the PSRU.

As a result of the vibrations, we also suffered a crack in the aluminum engine case. A little welding proved to be only a temporary cure, as the alloy has a silicon content, which we don't have the technology to deal with properly. I think we had these cracks after first 400 hours.

I'd like to say a bit about vibrations in other BMW1100s engines. We had numerous early BMW conversions in Poland but, due to vibrations, we had few unexpected engine failures. As a result of this the engine doesn't have a good reputation here. We are confident that the true source of many of the problems encountered to date was brought about by the flywheel; it was just too weak. One of my other Czech friends has a CH701 with BMW1100 and he had forced landing. As he told me, it was just a huge vibration without reason, and as a result, the engine threw a prop blade. When we examined the engine we found a destroyed PSRU damper bushing.

### **BACK TO OUR BMW**

One dumb problem was in the alternator. The original German design has a generator fan which works "opposite" to the airflow. Due this bad design, we have to change the alternator drive belt every 60 hours! The alternator belt was destroyed a few times by the elevated temperature of the alternator pulley. The pulley was just too hot and when the engine was not running, the belt's rubber was damaged. We fixed the fan, of course, at the same time we fixed the flywheel situation. During the following 300 hours we never suffered a single belt breakage. We're not certain, but potentially the vibrations were as harmful to the belt as the hot pulley.

We did not have any problems with the basic engine, just the PSRU. Cylinders, crank, bearings, valves, pistons and rings were all within specification after 1,000 hours. No problems with the fuel injection or electronic ignition. We had zero unexpected engine stops! The engine starts right up without any problems, hot or cold.

### **INDUCTION AND ATTENTION TO DETAIL**

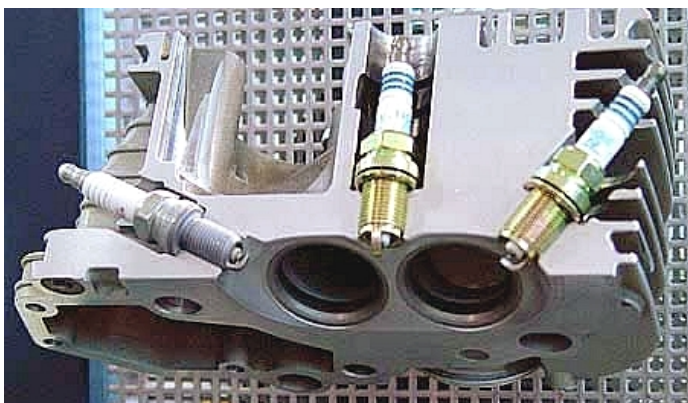
One of the many things I like about this engine is the electronic fuel injection. One reason for this is that the system (like most fuel injection systems) is not as susceptible to induction icing as a standard carburetor is. There's no reason to fear the complications of the computer either, as any BMW bike serviceman can help you with any of the engine settings. The most difficult part to get set up properly is with throttle synchronization. You need to be very careful when tuning the throttle bodies and injectors; using a good flow indicator as guessing just won't cut it here.

Next issue: Spark plugs. They must be within specification. This engine does not like "hotter" or "colder" plugs.

Another area to pay close attention to is that the Lambda sensor (O2 sensor) must be torqued in place exactly as specified. Strange, but the BMW engines didn't work smoothly when it was a little bit under torqued.

Careful attention must be paid to the electrical wiring. This engine will stop if there are any interruptions in the system. We had situation where a mechanic replaced the battery. By mistake, he didn't secure the connections tight and correctly. As a result, the engine didn't run smoothly due to cable vibrations on connector. In our next CH 601 we will have a small dedicated back-up battery for computer unit.

Still another tip: in this engine you must have about 5 liters of volume between injection unit and the air filter. The huge stock composite tubes, running from the air-filter to the throttle-body, will become useful here.



This cutaway of the 1100 head (displayed on the Take Off GmbH website) shows 3 plugs. The 10mm plug on the left is the "traditional" location for a secondary plug. The center plug is the factory location, and the one on the right is an optional 3rd plug location for triple redundancy.

### **A FEW WORDS ON SINGLE IGNITION**

Two ignition systems doesn't always mean better, especially if the heads are not designed for it. I know of another airplane, a very nice Czech EUROSTAR (a Czech version of Pottier P220) that has a BMW 1100. We have this one in our school to field test the new engine/airframe combination. The manufacturer, Evektor, <http://www.evektor.cz> used only a Rotax 912 in the past. In the test pilot's opinion, this plane is flying 20-40 km/h faster than similar configuration with the 100hp Rotax 912. "Evektor" built and installed a double ignition for the BMW with the following results:

1. We've had problems with starting a cold engine. There is second set of spark plugs which share the same coil with the original set. This, in my opinion, weakens the spark. With the starter engaged (while cranking the engine), the available voltage to the coil is reduced, making for an even weaker spark. To me (and again, this is just my opinion) it just doesn't make sense to say you have a dual ignition system when you only have dual plugs. At a minimum you should have a second set of coils to fire

the second set of plugs if you want closer to a "true" dual (redundant) system.

2. The sparkplugs are small 10mm, and the second was installed on the "side" of combustion chamber (see the "peanut plug", photo on the previous page). As a result, we had two "flame fronts" colliding as the fuel ignited. Usually they would meet each other in an incorrect place and the result would be a burnt or "holed" piston. We had a forced landing on the EUROSTAR due this fact.

Engine specifications	
Model	BMW R1100RS
Year	1993-2001
Engine type	Two cylinder boxer
Stroke	4
Displacement	1085.00 CC (66.21 cubic inches)
Power	90.00 HP (65.7 kW) @ 7250 RPM
Torque	95.00 Nm (9.7 kgf-m or 70.1 ft-lb) @ 5500 RPM
Bore x stroke	99.0 x 70.5 mm (3.9 x 2.8 inches)
Valves per cylinder	4
Intake / Outlet dia	34mm / 29mm
Cooling system	Air
Compression Ratio	10.7:1
Valve control	OHV, using chain drive, cup tappets, push rod and rocker arm
Induction system	Electronic injection, Bosch Motronic MA 2.2
Engine lubrication	Wet sump
Ignition	Electronic ignition; Bosch Motronic MA 2.2
Starter	Electric, 1.1 kw
Spark plugs	Bosch FR6 DTC

### ENGINE MAINTENANCE

After the first 10 hours: Change the oil and filter. Check the valve lash Every 100 hours: Change the oil and filter, sparkplugs and check valve lash. The valves are hydraulic, but check them anyhow. Every 400 hours: Change shock absorbers (neoprene bushings), damper and clutch. 500-800 hours: Basic examination.

That's end for now. If anyone is interested any added details more - I'm still present on Yahoo AirVW group or please ask me directly at [kuba\\_mysluk@yahoo.co.uk](mailto:kuba_mysluk@yahoo.co.uk)

**Kuba Mysluk**

### Do you think BMW only ever made fine sports cars and high-end motorcycles? Here's some history and background on BMW:

Bayerische Motoren Werke AG (BMW), German manufacturer of automobiles, motorcycles and aircraft engines. Based in Munich, Germany, the company is the leading auto exporter in Europe. The English translation of the company's name is Bavarian Motor Works.



**The inspiration for the BMW Roundel came from BMW's aircraft legacy.**

The company traces its origins to 1913, when a Bavarian named Karl Rapp began an aircraft-engine shop in Munich named Rapp Motoren Werke. In 1917 Rapp resigned and the company, led by Austrian engineer Franz-Josef Popp, changed its name to Bayerische Motoren Werke. That same year chief engineer Max Friz designed the company's first aircraft engine, the six-cylinder Type IIIa, which created strong demand for BMW engines. When the 1919 Treaty of Versailles prohibited German companies from producing aircraft and aircraft engines, BMW switched to making air brakes for railway cars. In 1923 Friz developed the company's first motorcycle, the R32, a model that held world speed records for motorcycles during most of the 1930s.

In 1928 the company entered the automobile business by acquiring Fahrzeugwerke Eisenach (Eisenach Vehicle Factory), a maker of small cars based in Eisenach, Germany. In the 1930s BMW began producing a line of larger touring cars and sports cars, introducing its highly successful model-the 328 sports car-in 1936.

After World War II ended in 1945, Allied forces dismantled the company's main factories. BMW made kitchen and garden equipment before introducing a new, inexpensive motorcycle to the German market in 1948. The company's return to auto production in the 1950s resulted in poor sales. In the 1960s the company turned its fortunes around by focusing on sports sedans and compact touring cars, and it began to compete with Mercedes-Benz in the luxury-car markets of Europe and the United States. BMW's U.S. sales peaked in 1986 but then dropped steeply, partly due to competition from two new luxury cars-Lexus, made by Toyota Motor Corporation, and Infiniti, made by Nissan Motor Co., Ltd. The 1989 collapse of the Berlin Wall led to a boom in car sales in Europe, and in 1992 BMW outsold Mercedes-Benz in Europe for the first time.

In 1990 BMW formed a joint venture with the British aerospace company Rolls-Royce PLC to produce aircraft engines for business jets. In 1992 BMW broke ground for a major automobile plant in Spartanburg, South Carolina, its first automobile plant in the United States. In 1994 BMW acquired 80 percent of the Rover Group-a British manufacturer of small cars, luxury cars, and Land Rover sport-utility vehicles-from British Aerospace PLC. The \$1.2 billion acquisition brought the company into new markets.