



the fifth wheel

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Next LVCC Meeting: Weds. Jan. 27, 2016

Time 7:30 PM. Place: Lehigh and Northampton Transportation Authority Headquarters (LANta), 2nd Floor Meeting Room, 1060 Lehigh Street, Allentown, PA 18103. Latitude : 40.587607 | Longitude : -75.474405. Bring a guest!

Don't get locked out! If you arrive late, the main door of the LANta office building may be locked. This is for security purposes. But the facility is open around the clock, so ask one of the garage employees to direct you to the second floor.



The Fifth Wheel is published monthly by the Lehigh Valley Corvair Club (LVCC), Inc. We accept articles of interest to Corvair owners for publication. Classified advertising of interest to Corvair owners is available free of charge to all persons. Commercial advertising is also available on a fee basis. For details, email our newsletter editor, Allan Lacki, at redbat01@verizon.net.

LVCC is one of the many regional chapters of the Corvair Society of America (CORSA), a non-profit organization that was incorporated to satisfy the common needs of individuals interested in the preservation, restoration, and operation of the Chevrolet Corvair. LVCC dues are \$10 a year for CORSA members or \$15 a year for non-CORSA members. Make your check payable to Richard C. Weidner, LVCC Treasurer, and send it to his address at 2304 Main Street Northampton, PA 18067.

The Last Two Air-Cooled Car Engines

The following article was inspired by End of an Era: The Last Air-Cooled Automobile Engines, by James Kraus. For a full list of references, please contact Al Lacki. See Page 6 for address.

By the end of the 1960s, automotive engineers realized that it was necessary to control cylinder head temperatures to moderate emissions of NOx. And the EPA was mandating ever-tighter rules and regulations for air pollution. The air-cooled engine had to go.

But there were a few manufacturers who had built their reputations on air-cooled engines, and they continued to believe in them. Among them were Honda of Japan and Citroen of France. Within months of each other, in 1969 and 1970, they introduced brand-new cars with air-cooled engines designed from a clean sheet of paper. The cars they powered were small by American standards, but mid-size in their native countries. We're talking about the Honda HT1300 and Citroen GS. Ironically, this was right around the time of the demise of the air-cooled Corvair.

Honda HT 1300.

Honda had been dabbling in microcars as a sideline to its fantastically-successful motorcycle business for a few years. But these were just a curiosity outside of Japan. Soichiro Honda, the founder and master of the Honda company, wanted to enter the big leagues. He wanted to manufacture a car that could be sold outside the home market in large numbers. Something that would compete with the Toyota Corona and Datsun Bluebird.

With the exception of a few water-cooled Formula 1 cars, Honda built nothing but air-cooled engines for its motorcycles and cars through the 1960s. Soichiro Honda loved air cooled engines. "Since water-cooled engines eventually use air to cool the water, we can implement air cooling

from the very beginning," professed Mr. Honda. And he wasn't taking no for an answer, for he personally oversaw the engineering of the new HT1300 automobile.

Offered as both a sedan and a sporty coupe, the new Honda HT1300 bristled with innovations. It was one of the very few front wheel drive cars in its class. It had disk brakes in front and four wheel independent suspension. This was remarkable stuff for a Japanese manufacturer. And of course, it featured an air-cooled engine, mounted transversely at the front of the car.

The fact that it was an inline air-cooled four cylinder engine was not remarkable. This had been done before. But the engine was nevertheless notable for two reasons. (1) the technology employed for cooling the engine was both strange and unique, and (2) it was ridiculously powerful for its size.

Soichiro Honda knew that a noisy engine would not be acceptable for a world class car. And air-cooled engines have a reputation for noise due to the resonances of their cooling fins and lack of water jackets which would otherwise dampen miscellaneous vibrations. So he drove his engineers crazy with all kinds of ideas to overcome these problems.

Instead of relying on long, thin cooling fins, his engineers specified short stubby ones shaped with curves and waves to suppress harmonics. The blower fan had short blades for the same reason. But what really made the HT1300 engine so unique is that the engine block had cast-in airflow jackets, rather than sheet metal shrouds, to direct the cooling air around the heads and cylinders. And the jackets were ribbed, internally, to further exchange heat with the cooling air. If you look at the exterior of the block, you will see cooling fins. But these are not on the

cylinder barrels or heads. They are on the exterior of the cooling jackets. The castings were in aluminum, of course, and were intricate to the extreme. It must have cost Honda Motor Company a small fortune to build each one.

The HT1300 was available in two series, the 77 Series with 100 horsepower; and the 99 Series offering 115 horsepower. That's 115 horsepower from an engine with a displacement of only 1,300 cubic centimeters (79 cubic inches).

How in the world did they do it? Well, this was basically a little racing engine, with an overhead camshaft, four Keihin carburetors, hemispherical combustion chambers, and dry sump lubrication system. Peak power was delivered at 7,300 RPM. It combined all the best of Honda's motorcycle and Formula 1 racing experience.

Soichiro Honda was entering his 60s during the design phase of the HT1300 and he evidently saw this project as his *pièce de résistance*. It was the last engineering project he would ever lead. He drove his engineering staff to near mutiny with design changes even after the production line started rolling. Working from 5 AM to midnight every day, some of the workers were suffering from sleep deprivation, even falling asleep in the men's room.

So, if the HT1300 was such a masterpiece, why don't we hear about the Honda HT1300 today?

There are several reasons. It was more expensive to buy than similar-size cars in Japan. It was more expensive to make than it was to buy. And for all its engineering innovation, the little air-cooled engine turned out to be heavier than expected. The car was hard to steer and hard on front tires.

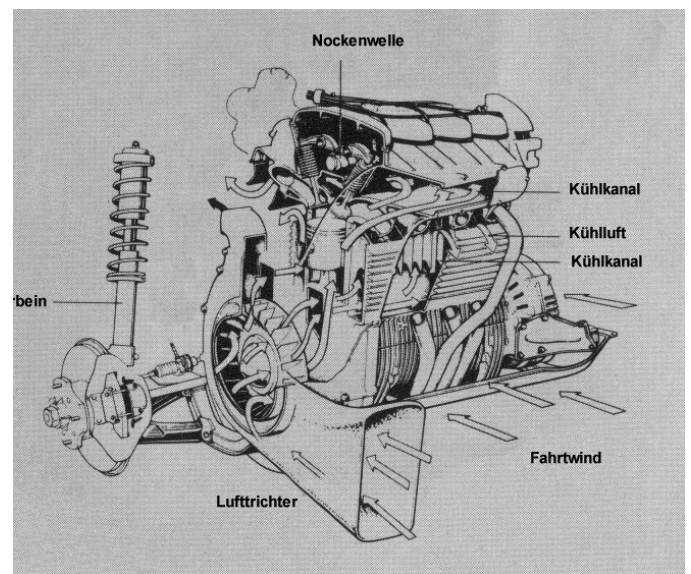
Air-Cooled Honda HT1300 Engine. Introduced in 1969.



4-carb "99" version of the Honda HT 1300 engine



The finned container on the left is the oil sump.



Cooling air is routed through cast-in jackets to reduce noise.



Soichiro Honda liked the split-grille theme from Pontiac!



Coupe version looks like mix of Subaru FE & Mazda RX-2.



Here is the sedan version of the Honda HT1300.

The HT1300 was sold in several countries around the Pacific Rim, (most notably Australia and, of course Japan). But it never made it to Europe and the Americas.

In 1973, Honda replaced the HT1300's air-cooled engine with a water-cooled fuel-injected variant which held things over until the introduction of the wildly-successful Honda Civic. And that was the end of Honda's foray into air-cooled engines for passenger cars.

Citroen GS.

Citroen occupied two segments of the market in Europe. At the top was the DS series, known for its advanced hydro-pneumatic suspension. The DS had sleek if somewhat strange styling which was considered quite sensational when it was introduced in 1955. Although they were front wheel drive, they were powered by conventional water-cooled engines.

But Citroen also had plenty of experience with air-cooled engines, too, for its entries at the bottom rung of the market had been around for a long, long time. Citroen introduced its 2CV series way back in 1948 as a "people's car" for France and the slightly larger Ami had been around since 1961. Both were powered by tiny air-cooled two-cylinder boxer engines.

So, while Citroen had cars for rich and poor, it had nothing to offer for Europe's middle class which was expanding fast in the mid-1960s. Other manufacturers, like Renault and Fiat were cashing in on this market segment. Citroen needed a contender and so the GS was born.

Citroen had a reputation for bucking convention in the 1960s, and the GS was no exception. Like its big brothers, the GS had hydro-pneumatic suspension for a soft cushy ride, front wheel drive, and aerodynamic styling. It also had four wheel disk brakes. But unlike the upscale DS, the GS had

an air-cooled boxer engine, a nod to its smaller siblings. And what an interesting little motor it was!

It was only the size of a Volkswagen Beetle engine in terms of displacement, and like the Volkswagen, it was a four-cylinder engine. Anybody familiar with a Beetle or Corvair engine would immediately recognize the basic layout, with a split crankcase, individual cylinder barrels and bolt-on heads.

But the GS engine was more sophisticated. It had an overhead camshaft for each cylinder bank driven by cogged belts. This allowed hemispherical combustion chambers with relatively large valves, not to mention elimination of those pesky push rod tubes.

The cooling fan was mounted directly on the crankshaft, so there was no fan belt. The crank shaft was a built-up affair, which enabled the use of one-piece connecting rods and journal bearings for lighter rotating mass; the one piece rods eliminated the need for connecting rod caps and bolts.

A two-barrel Solex carburetor was used, mounted on a central manifold with four separate tubular runners to the cylinders, much like one of those after-market center-mount four barrel manifolds that appear on Corvairs from time to time.

Initially, the carb base was heated with engine oil to prevent icing, but this did-

n't help much when the engine was cold, so Citroen replaced it with a setup that routed a bit of engine exhaust through the carb base.

These were small engines, and when introduced, displaced only 1015 cubic centimeters. Citroen made them small for taxation purposes in France. Later, in the mid 1970s, they were bumped up to 1129, 1222, and 1299 cc.

Power ranged from a mere 56 hp (DIN) to 66 hp, but the little engines revved happily at highway speeds and, according to anecdotal information, could easily be revved to 8,000 RPM with no damage.

You might be thinking that a car with such radical features would be a flop in the market, but Citroen built and sold 2,474,346 of its GS series cars between 1970 and 1986. But sadly, few remain on the road today. Although the engines were strong, the cars were not rust proofed very well and simply rotted away! Al Lacki

Nominations!

Nominations are still being accepted for the positions of President, Vice President, Secretary/Treasurer, and Activities Director. Contact Dick Weidner, our Secretary/ Treasurer. His address is on Page 6. Elections will take place at our January meeting. Please participate in this very important process.

'Tis the Season!

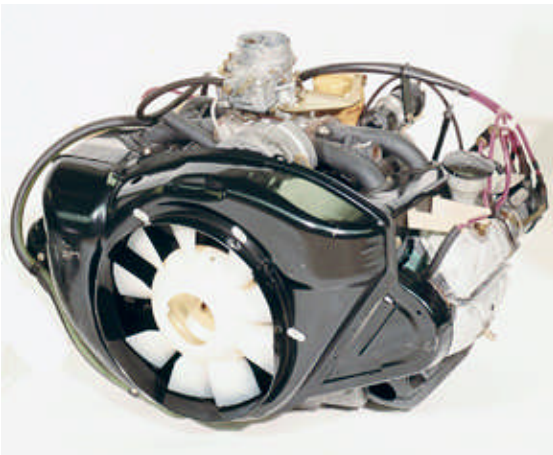
We hope you're having a wonderful holiday season! Happy Hanukkah and Merry Christmas to all our members! (I hope I didn't leave anyone out!)

Corvair news is slow around this time of year. That's why our feature article concerns Honda and Citroen engines. But at least we were able to stick with the air-cooled theme! We'll see you all in January at our next meeting.

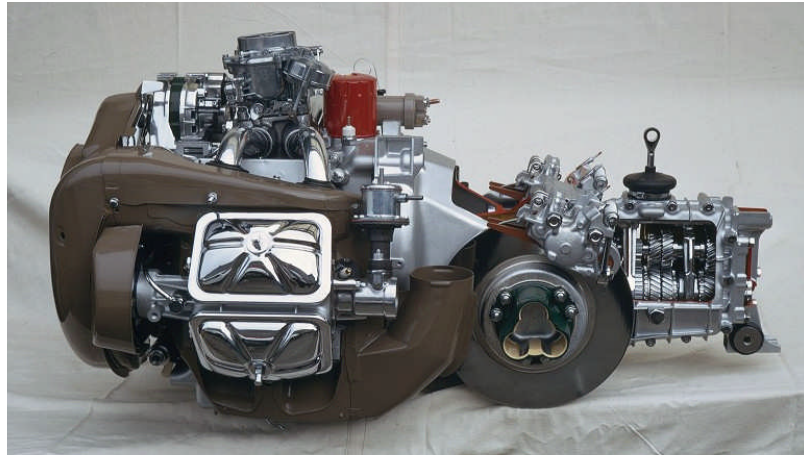


Citroen GS engines used 1-piece connecting rods to minimize rotating mass. Citroen used same design

Air-Cooled Citroen GS Engine. Introduced in 1970.



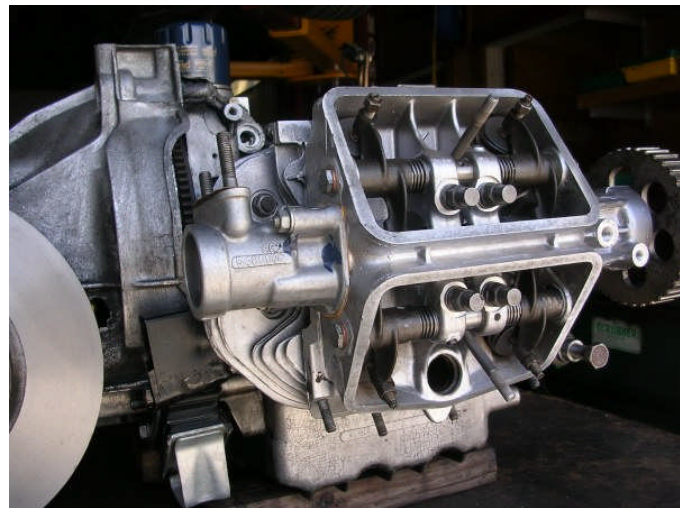
Engine cooling fan mounted on crankshaft.



Citroen power train. Complete with transaxle & inboard disk brakes.



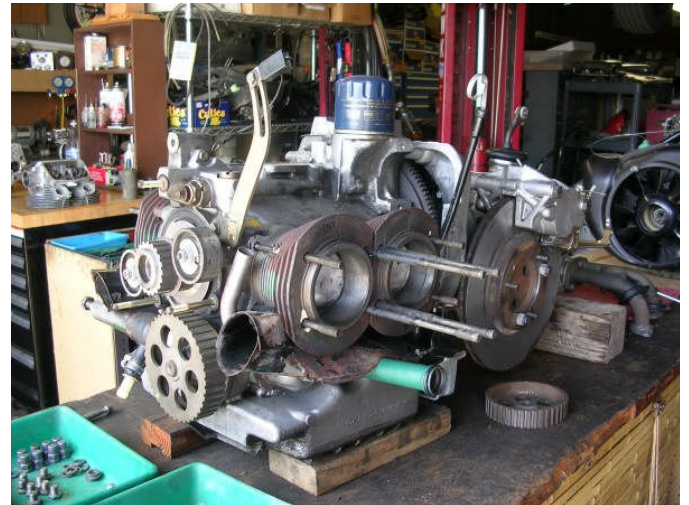
Cylinder head with hemispherical combustion chambers



Overhead camshaft with dual rocker arm shafts



Citroen GS four door sedan, circa 1980.



Partially disassembled. Large cooling fins!

Local Events In and Around Lehigh Valley

Car show season is over, and so we don't have any outdoor events to recommend to you. However, you may want to consider this indoor spectator event which sounds like fun!

Saturday, January 2, 2016 :::: Allentown Indoor Race at PPL Center

Location: PPL Center, 701 Hamilton Street, Allentown, PA 18101. Time: 6:30pm to 10:45pm. Admission: Adults from \$23. Children from \$8. The roar of engines will take over the new PPL Center in Allentown, Pennsylvania on Saturday, January 2, 2016 when the first annual Allentown Indoor Auto Race will be held. The event, presented by Len Sammons Motorsports Productions, will be part of a three-race indoor series that includes the popular annual events in Atlantic City, NJ on January 29 & 30 and in Trenton, NJ on February 27 & 28. TQ Midgets are the headline class with Slingshots competing on the undercard. Doors open at 6:30 PM with racing beginning at 7:00 PM. For more information: <http://aarn.com/category/allentown-indoor-race/>

Friday to Sunday, January 15 to 17, 2016 :::: Auto Mania Indoor Swap Meet & Car Corral

Location: Agricultural Hall at the Allentown PA Fairgrounds, 302 N 17th Street, Allentown, PA 18104. Time: Friday 12 PM- 9 PM; Saturday 9 AM- 6 PM; Sunday 9 AM - 3 PM. The 59,000 square foot facility that is Agricultural Hall at the Allentown PA Fairgrounds plays host to a wide array of vendors and attendees annually. This event is a great opportunity to interact with like minded enthusiasts in a family friendly atmosphere and is the perfect setting to buy, sell and trade all things automotive. Adult Admission: \$10 Daily. Phone: (717) - 243 - 7855 <http://www.carlisleevents.com/carlisle-events/automania/default.aspx>

Thursday to Sunday, January 28 to 31, 2016 :::: Pennsylvania Auto Show in Harrisburg

Location: PA Farm Show Complex & Expo Center, 2301 N. Cameron Street, Harrisburg, PA 17110 Hundreds of the new cars and trucks will fill the PA Farm Show Complex & Expo Center for the 2016 Pennsylvania Auto Show. Time: Thursday 1 PM to 9 PM. Friday & Saturday 10 AM to 9 PM. Sunday 10 AM to 5 PM. Price: Adults (13 and over) \$10, Senior Citizens (62 and over) \$6, Military (Active with I/D only) \$6, Students (w/ID Onsite Only) \$6, Children (12 and Under)* FREE *All children 12 & under admitted FREE when accompanied by a paying adult. Email: SFreeman@enthusiastnetwork.com Purchase tickets online here: <http://motortrend.tixonlinenow.com/paautoshow/>

FOR SALE: Nice black steering wheel with the correct horn ring & button for a 1963 SPYDER. Asking \$35.00. Carl Moore. Mohnton, PA. Phone # is 610 856 7630, call evenings. Email: moo568@dejazzd.com

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Clark's Corvair Parts provides door prizes every year to the Lehigh Valley Corvair Club's exhibit at Das Awkscht Fescht.