

Primary Gasket Leak (1996)

by Paul Rako



Even my newest Harley leaks oil. At about 12,000 miles a leak developed at the primary cover gasket. I had degreased and hosed the bike down the week before and driven it just a couple of miles before pulling over to look for the leak source. This is what it looked like after a weeks driving.



A3/4 inch wrench takes care of the drain plug at the bottom of the motor. You might want to stand the bike upright after it has mostly drained out to get the oil that is sloshed into the primary cover. Harley never bothered to make the drain plug at the lowest point when the bike is on the side stand. They assumed you would have a powered hoist like they have in the engineering garage. Even with the bike dead level the design of the primary gasket always traps some oil that will make a mess when you pull the cover. It's been this way since 1953 so don't expect any changes, just buy a lot of shop towels.



If you want professional results act like a professional. Bring the tools to the bike or vice versa. Why do you think they call it a "roll around" anyway? You should make every effort to "work out of the box" which means you replace tools right after using them. That way you'll know where to find it as opposed to sitting in a little pile of tools scattered all around you like 5 year old in a sandbox. Leaving a 60 dollar Snap-On wrench in the cowl area of a customer's car cured me of leaving tools laying around. I would watch the big dollar Porsche mechanics on the other side of the shop. They put every tool back immediately after they used it. I said "But your going to use it two seconds later". Tim said "Yep, and I know right where it will be."



First remove the gear shift lever pinch bolt with an English size allen wrench. When I was an engineer with General Motors they had a firm target date of 1976 to convert over to completely metric. They should have asked the machine shops what they thought. Like GM cars today, Harleys are a mixture of English and Metric fasteners. Most of the big stuff is still English. Remember that the front forks went Japanese in 1973, the Carb in 1976, the starter motor went Hitachi in the late 70s and Nippondenso in 1983. I hear the gears are from Korea and who knows what else is from what country. One of the automotive trade magazines was going to do a comparison on the domestic content of Harley vs Honda motorcycles but the story got spiked. I suspect it was because a Gold Wing has more American parts than a Harley.



This bike was wrecked once and the gear shift shaft got bashed up a little. The lever won't slide off anymore. I use this totally cool little puller made for battery terminals. Please do not try to pry the lever off with a tire iron.



Because I was too stupid to remove the footpeg first, I could not get a good grip on the lever. When it was half way out I switched to this position to get it the rest of the way. Maybe a cheap Taiwan puller would work better for you. Once again: Please do not try to pry the lever off with a tire iron.



You are using a tray or container of some sort big enough to hold all the parts, including the primary cover, aren't you? The tray keeps all the parts in one place, it allows you to carry the parts to the wash bench (aka the kitchen sink) and it can then be used for the clean parts. Carry it over to the polishing station (aka your meth addict girlfriend) and you will never loose a part. When all the individual parts are cleaned, polished, inspected for wear or damage and then repaired or replaced you have a tray full of parts ready to assemble. Throw the gaskets into the tray and reassemble the parts. This is how grownups do it. This is how you should do it.



The foot peg is held on with two large English allen bolts. I tend to agree with Vance, my racer pal who will not even use an impact tool to take his bikes apart, much less assemble them. I try to use the simplest tool for the job.



Now we can start on the primary cover bolts themselves. You might want to jump ahead to where I realized that late model sportsters need to have the clutch mechanism disassembled before you can remove the primary. For now just grin as I do the wrong thing.



Once you crack the bolts loose with the allen wrench the long way you can use the ball end (in the case of these ultra cool Bondhus drivers) to spin the bolts out. The 1/4-20 size is the smallest size that is called a bolt. When you go smaller, like a 12-24, they are called screws. Just thought you'd want to know.



See, I can show off too. I do have a set of 3/8 drive allen wrenches. It's a little handier but not a tremendous speed advantage over a plain wrench. I definitely use the wrench to assemble because it's shorter and bends a little to help judge the torque. It's no fun to strip these out. (Can you hear me meth freaks? I didn't think so.)



In 1976 Harley had a lot of AMF (American Machine and Foundry) money to spend. Most of it was wasted. Some geek figured we really needed to be able to adjust the primary chain with the cover on so they added a kludge-fest arraignment with pivoting tensioners and springs and an external bolt and locknut. I have never seen a primary chain stretch or wear out in 30 years. The nylon tension blocks do wear out and the older design breaks off and jams in between the chain and the case and stuff but the chain itself never seems to go bad. All this whizzy external adjustment has three primary (pun intended) implications: 1) more places for oil to leak. 2) greater misery in removing the primary cover. 3) no way to view the tensioned chain operate with the cover off. After the leveraged buyout from AMF Harley had even more money so they perfected the bad design so it's designed on CAD workstations and made with the latest technology and assembled with SPC precision by Union guys who are actually sober. It is still a bad design however. I'll keep my '62, thanks.



That goofy chain tensioner got me so worked up I took another picture of it. A good design principle: Covers suck. When absolutely needed for oil retention or safety or noise reduction they make sense. It never makes sense to put machinery in a cover. Then it is not a cover, it's some hybrid monster. The Panhead was great design-- the valve mechanism all bolted down solid with a tin cover to keep the oil in and the dirt out. Then the Sportsters and the Shovelhead with the rocker box being both a cover and a mechanism. The valve geometry goes all over the place with different gasket thickness and the gaskets wear out from the forces applied to them. It also makes things noisier. The Evo rocker kludge-fest is a joke. The 2-cam still has a whole heap a pieces, but at least the rockers don't run in them. (This was done for noise, not good design.) The Sportsters primary cover is really a combined chain tensioner and clutch release that is incidentally a cover too. At least it's not a starter bearing support like in the 70s and 80s. Pathetic. Where's my '62?



I know you're getting tired of this view but I couldn't resist a shot showing how the chain tensioner interferes with the kickstand bracket. Yup, it won't thread out any further. Hope you remember to put it on before you mount the primary. I guess the third assistant supplemental draftsman in the engine department reporting to Mr. So-and-So didn't have enough meetings or write enough memos to the 2nd assistant draftsman in the frame department reporting to Mr. Such-and-Such. See what too much money will do? They should stick to tee shirts and get out of machinery altogether. It would be a public service.



OK, you can start to giggle now because you know the cover is not going to come off yet. Unlike the 1970 to 1983 Iron Sportsters, the clutch mechanism has to come out of the evo sportster to get the primary off. This is progress? Note I just gave a couple taps with a soft mallet. I did not wedge a screwdriver in between the cover and the case which will cause an oil leak. Then the meth freaks will silicone the gasket. Then the silicone will sqwoudege out and fall into the primary. Then the little pieces will work their way into the transmission. Then they will get in the roller bearings. Then the whole tranny and rear wheel will seize at 80 miles and hour on a mountain road. Ahh, darwinism.



It's time for the manual. In a design that goes back to 1953 you would think there would be some coherence to the way things went together. You would think wrongly. I was supposed to pick up my friend Lorrie and go to a funeral service for a bro at 6:30. No problem, I started at 2:30 right? Read on. If Harley calls and threatens me with their lawyers for publishing a grainy picture of their lousy manual I will ride to Milwaukee and club a lawyer to death. Then they can give his salary to the Primary Cover Design Department and I won't need to publish the picture of the manual because they will make a piece of machinery and not a puzzle.



OK, much to my amazement the manual says the clutch mechanism must come out so off comes the derby cover. (A cover mounted on a cover-- you know something's wrong.) I thought this at least was a simple cover but just wait, it's really a clutch adjustment lock mechanism retainer that is just posing as a cover for those trendy LA wannabes that put 200 mile a year on their bikes. Read on.



Oh yeah, I almost forgot, you do have a set of Torx wrenches don't you? Why would any decent company use these satan-spawned tools of abomination on a mass produced vehicle with a reputation for do it yourself ownership? Well, a decent company wouldn't. It's not like they need the greater torque delivery on a screw that goes into aluminum. The crank freaks are already stripping out the Allen's and even the Phillips head screws for crying out loud. The only reasons? 1) To encourage you to take the bike to your friendly, efficient, 80 dollar an hour factory dealership. 2) So some lazy incompetent middle manager at Harley can get a hunting trip and a Vietnamese prostitute from the Torx people in exchange for fucking over every single Harley owner past, present and future.



I think this is called a quad ring by the factory. It's kind of like an O-ring only it's square in cross section, not round. I assume this will prevent us from using standard O-rings instead of official factory authorized original genuine big-dollar quad rings. Either that or they're too stupid to read the Parker Hannifin O-ring design guide and make an O-ring work. It might also have to do with the fact that after almost 100 years Harley Davidson Motor company is incapable of designing a motor with a decent oiling or breathing system. Whatever the reason, it's a quad ring. Accept it and throw it in the tray with the rest of the parts.



Here's the funky lock nut/spring assembly. The derby "cover" pushes on the spring and holds the nut in place. This is proof positive that given enough money and time even a moron can design something that sort of works (kind of). Pull it out and throw it in the tray.



Screw the center bolt in clockwise to back out the incredibly beautiful release mechanism. Powdered metal I think. Must be great to have all that T-shirt money to over-design parts with. Forgive me, I still have a soft spot for the old stamped steel jobs used from 1970 to 1983. Now that was great design. Virtually frictionless and cheap as all get-out to produce. They probably early-retired that guy.



We're really jamming now as Frank Zappa would say. Remember that the problem is a leaky primary cover gasket? So here we are disassembling the clutch mechanism. Turn the center bolt enough and this little fancy hex-threaded gizmo pops out of the assembly. Thread it all the way off and toss it in the parts tray.



Out plops the breathtakingly gorgeous clutch release mechanism ball ramp subassembly. Stunning.



Pivot it back like this to get it off the cable. If you haven't dropped any of the small parts in the oil pan below the bike you mind as well toss the little hook thingy in there now and get it over with.



Here is the little hook thingy that wants to drop into the oil pan so bad. If you were not intending to pull the primary it would fall off inside the primary and make you pull the cover just to spite you. Toss it in the parts bucket.



Only the finest binding glue is used in the official genuine authorized Harley Davidson Manual. Some engineers feel you should be able to work on machinery without bathing in lubricating oil. None of those engineers work at Harley. Oh yeah, Harley, Harley Davidson, Davidson, Sportsters, mother and God are all trademarks of the Harley Davidson portable jewelry company of Milwaukee Wisconsin and are not to be used, repeated, printed or spoken without a 50 page signed waiver from the Harley Davidson Portable Jewelry and T-shirt Company. I sure hope I make it to Wam's funeral on time.....



See how the gasket traps a bunch of oil so that when you pull the cover it drips all over? It's been like that for almost 50 years. Some things never change. That's tradition, that's legacy.



Here is the leak. It looks like the cover was over tightened. The loctite on the bolts indicated that the cover had never been removed so this may be on the factory. On the other hand I bought the bike wrecked with 4700 miles on it and we know how those crank freaks like to tighten 1/4-20 Allen's with a half inch drive breaker bar with a cheater on it to boot.



I have no idea what this part is or why I'm holding it. It's kind of like the rubber ring around the gear shift shaft so if you don't see me take it off later then this is it and take it off now. At least I had a parts tray with nothing left over in it.



This is where all the oil trapped in the primary leaked out. Splotches all over my driveway. Thanks Harley, my Honda riding pals can come over and make fun of all the oil stains. Why do I suffer so? At least it didn't get on the carpet scrap I sit on when I'm working on the bike.



Everything having to do with Harleys involves groveling. get on your belly to loosen the chain tensioner. get on your belly to pick up all the little pieces. get on your knees wiping up all the oil. I finally get wise and plop the cover back on momentarily so I can remove the clutch cable and take the whole damn cover into the shop to work on.



Another fine place for a leak. Make sure the little O-ring (what? No quad ring?) is in good shape and clean all this meticulously. Wam's funeral is only a couple hours away. Hope I make it on time.



Behold the Sportster primary drive. Between the electric start setup and the demon-inspired alternator-behind-the-engine-sprocket, I'd say the chain runs a good 2 or 3 inches outboard of my '62. Progress huh? Notice how the starter bolts in above the clutch-- yup, you have to remove the primary cover to change the starter. Good thing Harley doesn't make cars. You'd have to unbolt the steering wheel when you change tires.



Clean the gasket surface perfectly. Do not scrape or nick or pry on it ever. If it is an old old bike that has been abused you can knock down any high spots with a fine file and build up any gouges with a polyamide epoxy like JB Weld. Clean the gouge with carb or brake cleaner before using the epoxy. Under no circumstances should you use silicone or Permatex on the gasket. You should not have to glue your bike together. The silicone will get into the tranny and blow it (and you) up. Death is no fun.



Don't miss these little hollow dowel pins at the front and back.. They should pop out without force. Older bikes make have a press fit. If so, leave them in.



Yes, there's one in the back too. Into the part's tray they both go.



Back to that professionalism thang again. Wipe off the tools and put them away. I was not working out of the box since I was on my belly but if you do have any tools left out this is the time to wipe them down and put them away. If any are missing you have a better chance of finding them now.



I've got a little Taiwan solvent tank I fill with degreaser (I think it's kerosene and soap basically). You see me suffering with the chain tensioner still in until I get wise and



Go get the tool to remove the tensioner. A 7/8 wrench if I remember right.



When you back off the big jam nut it goes over the grungy threads that were exposed to the elements and puts enough force on the center bolt to tighten it too tight to come off by hand. Go get the Allen wrench and break it free.



Notice how the chain runs diagonally to the tensioner. When I was working in Detroit as an automotive engineer we had a phrase: Design Intent. I wonder if the design intent was to have the chain go at an angle to the tensioner? Be absolutely sure you put it in the same way it came out. As you can see from the picture above, the open side with the little hollow in the middle is facing out. The other side of the tensioner does not have this hollow. You will never be able to see if the chain is in the groves right because-- surprise-- the tensioner is part of the cover, not the engine case. Does Honda let this much nylon get ground up and mixed with the transmission lubricant? Just wondering. No biggie. It's been this way for 50 years. Tradition and legacy again I guess. Hopefully the noise regulations will force them back to the 76 and earlier style tensioner that at least does not use the cover.



Wash the primary off with a lot of clean water. Blow it off with clean dry oil free air. Towels are bad because they leave lint but at least lint will be ground up in the bearings unlike silicone which will destroy any roller bearing. (Can you tell I like silicone?)



It's just as important to wash out the tray as the parts it carries. Everything must be meticulously clean. Your bike is on the operating table and this is the tray that will carry in it's new heart (or liver maybe). You'd want it clean if it was your internal organs. Your Harley wants it clean too.



This is a tough call so I leave it up to you. I don't know if the factory used the Loctite or the previous owner. It's reprehensible either way. You need to get the crud off the treads but it looks like the fasteners are zinc plated for corrosion. I just touched the wire wheel as lightly as I could to remove the crud. As I use anti-sieze on the threads as opposed to glue I don't think corrosion will be a problem. Please please wear eye protection and hearing protection. The wires break off regularly and can punch a nice hole in your eye.



Here is our tray all washed out and cleaned and with all the parts stripped of oil, washed clean, blown dry and inspected for damage and wear. Looks professional huh? It is.



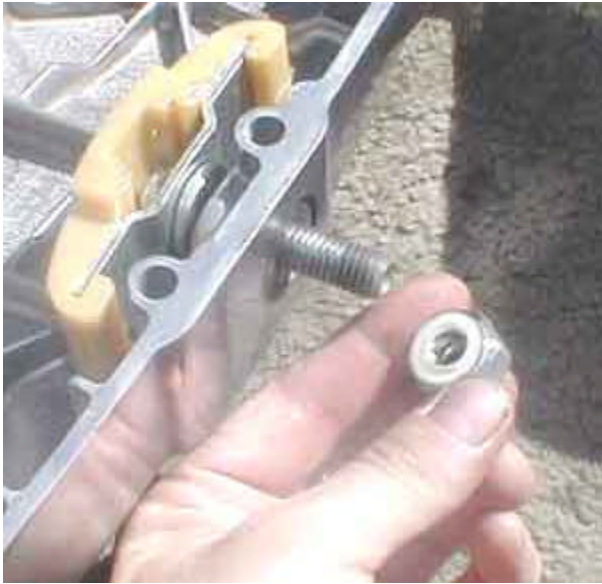
While I've got the stuff completely off the bike I take a few minutes to hit the buffing wheel. A machinist in the shop next door bought one of those cheap little Taiwan bandsaws. He over-tightened all the adjustments (without even using meth-amphetamines) and it soon was junk. He blamed Taiwan. In a rage he threw the whole bandsaw into the dumpster. No electrical engineer worth his salt would fail to notice the perfectly good 3/4 HP motor still attached to the bandsaw. You can still just see the pulley sheaves in the back. I just ran some self tapping screws through the buffing wheel and into the pulley flange. Instant buffer. It's worked great for 10 years.



Mind as well do the primary cover too. Wam's funeral is only an hour away at this point but he would understand me wanting to have my bike look good as well as not leaking oil all over the church parking lot. I use the "Stainless" compound which is made for -- surprise-- stainless steel. It cuts fast and leaves a decent polish. Not as shiny as rouge or finer compounds but still pretty good.



OK, assembly is essentially the reverse of disassembly. Ha ha. Just kidding. We try to be a little more helpful then the factory manual, which is not saying much. Back in goes the tensioner. Note the hollow part is out like when we took it apart. If yours is in the other way put it back together the other way, As long as it's the same. It's nice working on clean dry stuff. No oil to trap dirt and get your hands messy. That's why you clean all the parts. That professional thang again.



Here's the goofy tensioner lock nut. Remember how it has to go on now because it interferes with the kickstand. Make sure the nylon surface is clean and free of all grit. Same goes for the area on the case where it mates.



Of course the nylon makes the nut act like those evil prevailing torque nuts I hate so much. It won't free run in the bolt because the nylon needs to thread on the bolt for a (supposedly) leak free seal. Two tools. What joy.



Clean the gearshift shaft. A lot of dirt can collect in the splines and it might be pushed into the primary when you slide the cover on. Cleanliness is the sign of a competent mechanic. I try to be so clean I don't even swear when I put em together (although it's hard not to swear sometimes).



Back in go the hollow dowel pins, front and back.



The gasket won't stay on the dowel pins because Harley never intended you to work with the bike on it's kickstand. Hell, (I mean Heck), they never intended for you to work on it at all. They expect you to take to you genuine authorized original factory service center and pay 80 bucks an hour to get it fixed. That way you get a chance to but T-shirts twice-- once when you drop off the bike and once when you pick it up. T-shirts are where the real money is and no liability issues either. Too bad they have to sell bikes at all. Anyway, brush on some assembly grease like I did and the gasket will stay in place even though it is pointed a little down.



Put a little assembly lube on the gearshift shaft.



Put a little assembly lube in the primary cover where the shift shaft goes too. The factory says to replace the shaft seal. They also say to use genuine Harley transmission oil. I know the latter is pure bullshit so I suspect the former is a little suspect too. If I had a seal handy I would have put it in. The splines are a little bunged up and could easily cut the seal up during removal. Oh well, maybe another day. Let's hope a dental tool can get the seal out so I don't have to pull this cover again.



Here's the little trick when putting the cover back on-- you have to reach up and push the chain out of the way so it can go over the tensioner instead of slam into the side. Do not force anything-- you will be doomed. I want everyone to notice how shiny and pretty the cover is now that I polished it. I hope Wam understands. I'll never make it to San Jose to get Lorrie and then get back to Sunnyvale in time for the funeral service.



Note there are big bolts for the footpeg, long and short bolts for the cover, really short bolts for the derby cover and an oddball medium bolt for the shifter clamp. Don't be a wino and force the long bolts into the short holes. I know your tired of hearing about my '62, but all the bolts in it's primary cover are the same length, the way god and allah intended..



Anti-seize, not Loctite. If the bolts back out then put lockwashers under them. Do not glue your bike together.



With all the old grungy Loctite removed and the nice slippery anti-sieze on, the bolts spin right in. Better yet, they'll spin right out when you work on them the next time. Now they free-run. You could use your fingers if you wanted and just snug up the last quarter turn. Same way coming apart-- crack em loose and the free-run the rest of the way. Free run: Good. Loctite, glue, Permatex and silicone: Bad.



Get all the screw started and, unlike me, who will be suffering a few pictures later, start the big footpeg screws right now talso. I didn't and the gasket partially blocked the holes. I was so late and I was so rushed I did not loosen the cover-- I just leaned on the wrench and forced the screws to cut into the paper gasket-- shame.



Use the wrench the long way to tighten the screws. Tighten a little at a time working from side to side and top to bottom until they are all snug.



Major danger here. This cable is so easy to cross-thread it isn't funny, especially when you are running late. It's too stiff to turn by hand so you have to wrench it in. Careful. Note how everything has been cleaned up and the O-ring is in good shape.



Be oh-so-careful using the wrench to start the cable. Get down on your belly and make absolutely sure the cable is going in straight before you begin turning. I got lucky this time and did not cross-thread and strip it out despite my being in a panic trying to get to my bro's funeral on time.



Of course when you handle the cable it pulls apart. If I wasn't in a blind panic I would have put some oil on it. As it was I stuffed it back in under the rubber which made the cable part poke out in the primary cover....



Where I can put the little hook thingy on the now exposed cable. Do not drop it into the tranny or you will become a suicide risk.



Slip on the magnificent ball ramp assembly. Notice the ridge where the hook mates so it only goes on one way. This has always been important according to the manual but I fail to see why the hook can't go on either way in a design sense. Only Harley knows for sure.



Swing the ball ramp assembly into the pocket....



Where I can use a small screwdriver to spin the center bolt while the threaded hex nut assembly screws into the hex pocket on the ball ramp assembly. This is where you do the clutch adjustment. The factory says to tighten the center screw (by turning it counter-clockwise like you are unscrewing it) until you feel resistance. Then back off a 1/4 of a turn. Problem is the resistance is progressive for about a half turn so you never know whether to stop just as you fell any resistance whatsoever or to go the half turn more where the resistance really gets stiff. I put it on the loose side so that when I backed off 1/4 there was almost no resistance at all. One nice thing is that once you are close you can reach up and try the clutch to see how it feels.



Pop on the goofy spring with lock disk assembly. If it keeps falling out just slather on a pound of grease and stick the dang thing there.



The little goofy spring thingy keeps falling on the ground and the stupid quad ring won't stay put either. I am about to have a nervous breakdown I am so late to pick up my friend and get back for my bro Wam's funeral. Sometimes the quad ring stretches and pops off one section, other times it compresses and pops of another. Harley is using the as-cast surface for the ring for cost reduction so don't expect the grove to be cut with a dovetail cutter like the million dollar semiconductor manufacturing machines over at Applied Materials I have worked on. The dovetail allows the o-ring to pop in and stay even if you turn the whole mess upside down.



Assembly lube to the rescue. Glom it all over the place and everything should stay put just long enough to...



Pop on the derby cover and screw in the hated torx screws with a screwdriver. They won't strip this way. Leave the breaker bar in the house. (Notice how shiny the cover is. I hope Wam appreciates me dolling up my ride for his funeral.)



This is where panic turned to rage, The gasket did not line up for the footpegs even though all the cover bolts were in OK. I just leaned on the wrench to get the bolt to cut through the paper gasket. Horrible, this wipes off all the anti-sieze. I'm sure I will be punished for this one day.



Pop off the chain inspection plate with an English size allen wrench.



Feel the slack in the chain while tightening the adjuster bolt on the bottom of the primary cover. You should hit the starter momentarily to check at various places. My sprockets weren't out out round and the slack was the same. I wasn't brave enough to leave my finger in the hole while I cranked the bike. Don't blame me if your friends call you "Stumpy" when you loose a finger.



Start laughing out loud as I pour in the big dollar synthetic oil. (15W-50.) Why? Because you haven't seen the picture of me putting in the drain plug yet. Of course the Harley manual calls out some special Harley only genuine, original factory authorized lubricant. Like I'm going to drop 7 dollars (probably 15 knowing Harley) and make a special trip to allow more executives at Harley to have limousines. They may even ride bikes once in a blue moon for photo ops but I guarantee you none of them ever turns a wrench ever. That's low class work for us blue collar types.



In the background we see 7 dollars worth of virgin oil draining into the pan with the old oil. Since there is no fill level plug on the late model primary cover I have to let the whole quart drain through. I have cleaned off the magnetic plug and blown off all the metal particles with air. Choke up on that 3/4 inch wrench when you install it-- it's easy to strip. Make sure the seating area is clean and free of grit and grime. This is what happens when you hurry-- you screw up. I wouldn't have been so frantic if I was just making myself late but I was also holding up Lorrie who was counting on me to get her to the funeral service while her car was getting the timing belt replaced. I did put another quart in after the drain plug was installed.



Button up the inspection cover.



Slip on the rubber grommet over the shifter shaft.



Tighten the shift lever clam bolt with a english size allen wrench. Done. Now you get to ride again. Enjoy.

If your still laughing about me wasting the quart of oil you should have seen me back the bike up and forget to take the oil pan out from underneath it. The front tire flipped it on edge and both quarts ended up on the pavement (and my tire). Never rush-- your life is at stake and you brothers (and sisters) will understand. Lorrie and I got to Wam's funeral service a little late but we saw most of it including when his older brother read a letter Wam sent from Vietnam during the war. I'll miss Wam. He was a good man.