

FOURWHEELING ACADEMY

Moving In: The Air Robber

By Harry Lewellyn

In many future issues I'll talk about "moving in." That's the process I go through to make a new vehicle "Coyote" trail ready. And more than likely, that will have to do with practical, everyday things like airing up rather than tackling the black diamonds.

Jenna's father recently gave her his Toyota pickup, and Nissan just furnished me a new Frontier. Both will be the focus of movin' in. This article will show how I installed and used the versatile COYOTE AIR ROBBER (see page 17 for product details) on the recent San Felipe Sand Blast.

IT'S TIRE TIME!

One way or another, tires use up a lot of my field time. This may be due to flats and failures, or just simply airing down and up. It makes good sense for these tasks to be as fast and easy as possible. A Coyote Air Robber fills the bill on both accounts and more.

On last May's Sand Blast, I got a chance to test what follows. I was using my Air Robber to air up from sand pressure (10 PSI) and halfway through, the compressor quit. Nevertheless, I finished ahead of most everyone else. What happened was that the air remaining in my air tank (the spare tire) was sufficient to bring up my last two tires to street pressure without the compressor. The compressor failure, in reality, turned out to be a cigarette lighter wiring problem in Jenna's Toyota.

ROBBER EXPLAINED

Figure 1 is the real thing and Figure 2 (page 6) is a schematic of what I installed. Use them to understand how to connect a Coyote Air Robber. The numbers help correlate schematic and the real thing.

The system uses your standard spare tire, at the tire manufacturer's recommended maximum load pressure, as a compressor tank. This combination provides a sudden, massive burst of air to "pop" (re-



Figure 1 A COYOTE AIR ROBBER with TruckAir compressor and spare tire "tank" connected. The tire would normally be up, out of sight. Photo by Harry Lewellyn

mount) a dismantled tire back on the rim. In other words, the compressor gets a real big boost from the air in the spare. However, the Robber is primarily designed to speed airing up, even if the compressor fails, as it did.

BONUS

Don't have a compressor? Consider that the Air Robber can be attached to any inflated tire as a source of air, with or without a compressor! It doesn't have to be a permanent installation as described in the balance of this article. The Air Robber is designed to deliver (rob/share) air from tire to tire. With a broken compressor and flat spare, you still have three other air sources — your other tires. Got a traveling companion along? All five of her tires are potential sources, too!

In addition, the Robber's long deliv-

ery hose can serve as an extension from the compressor. That may be just what you need when the power plug wire is too short to reach the farthest tire or for your tent-bound air mattress a few too many yards away.

COMPRESSED AIR DANGERS

The Air Robber is part of a high-pressure air system and must be used with caution and care. Misdirected air can damage your body, particularly your eyes and ears. Air discharge can also harmfully propel other material like sand and dirt into your eyes and other parts of your body. Always pay attention to and safely control air discharge!

The spare tire serves as a compressed air holding tank just like the ones that come with garage compressors. It's not

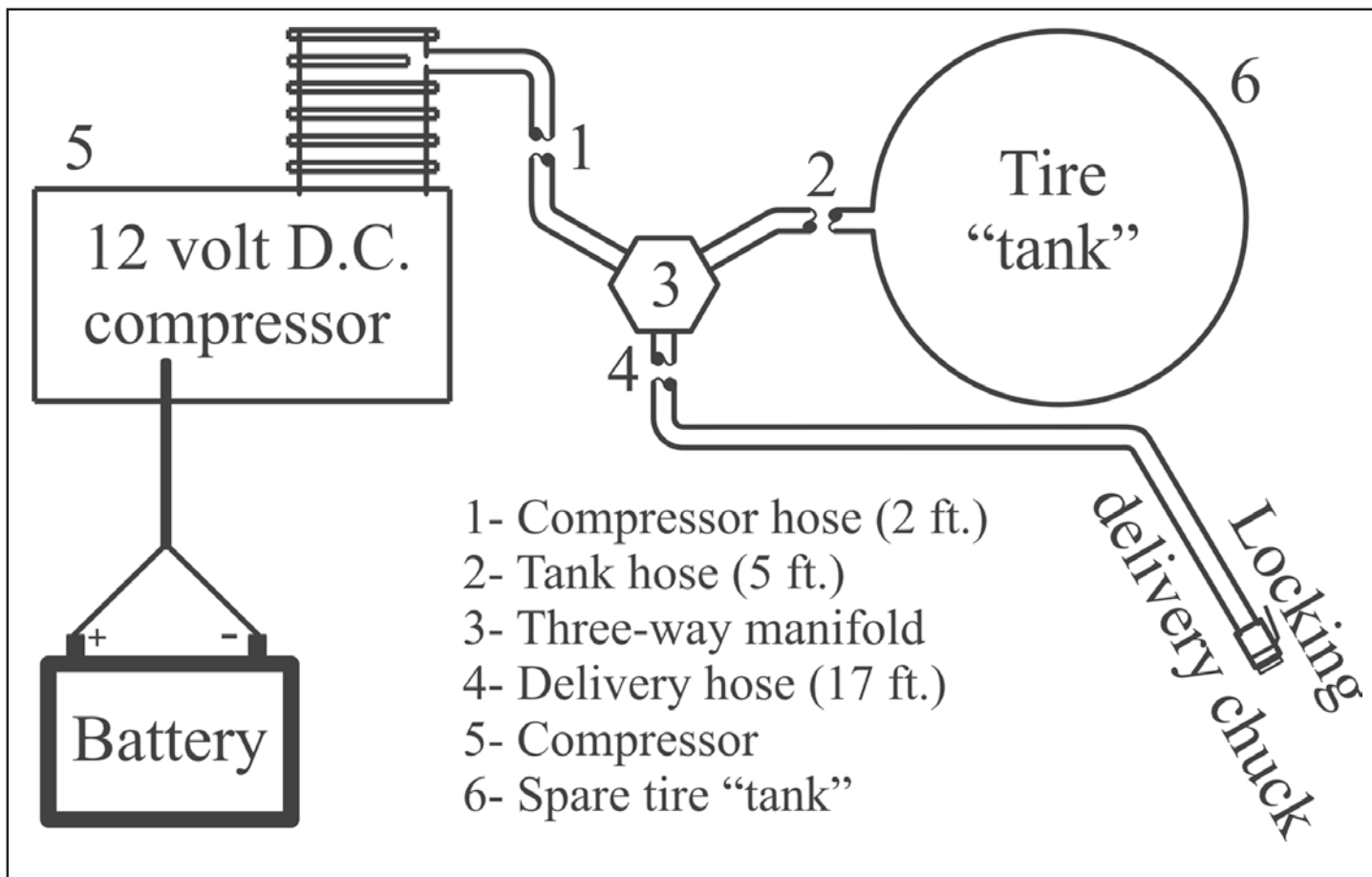


Figure 2 The COYOTE AIR ROBBER schematic.

By Harry Lewellyn

as big, and certainly of different shape and material, but nevertheless, it is a potentially explosive holding tank. Tank (tire) failure may occur due to over inflation or from a faulty tire. Here's how to safely test for the pressure you want to carry in your holding "tank."

ROBBER CAUTIONS

Let there be no doubt, inflating, and particularly overinflating, any tire can be **LETHAL!** Make no assumptions (age, wear, damage, maximum pressure) regarding any tire. I recommend you only use a new, undamaged tire for your "air tank" and not exceed 90% of the "MAX.LOAD" rating that is cast in the sidewall of the tire. That is typically right below the "LOAD RANGE" statement (see Figure 3) on the tire.

Don't assume your spare is identical to similar tires on the ground! Under all circumstances, remove and *thoroughly* inspect the tire you will use as the tank for cuts, bulges, damage and abnormal wear before testing it (see below). It's also wise to continually inspect the tire for new damage even after it passes the test. Pay particularly attention to the age, wear and



Figure 3 Typical tire MAX.LOAD statement. Do not exceed this pressure!

Photo by Harry Lewellyn

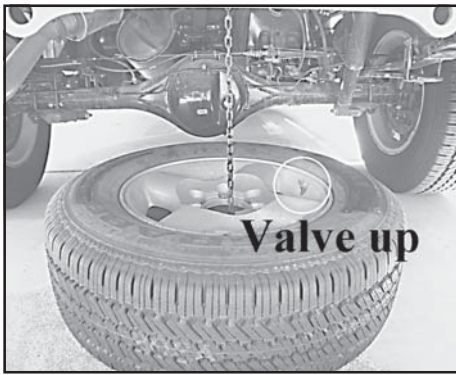


Figure 4 Tire down and valve up.

Photo by Harry Lewellyn w



Figure 5 Stuff bag ready to pack away.

Photo by Harry Lewellyn

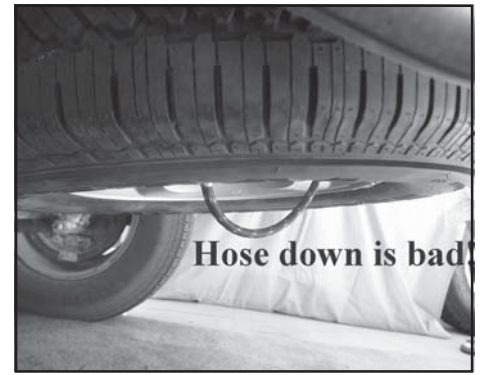


Figure 6 A hanging hose is vulnerable!

Photo by Harry Lewellyn

“MAX.LOAD” rating of the tire *you* choose as the air tank. Do not use a damaged, or greater than 80% worn tire for an air tank! Also consider that carried inside a vehicle, or readily visible outside (at face level), the high pressure spare exposes you and others to more personal explosion danger than those carried under the 4X and out of sight. Here’s a way to safely test your candidate tank.

TEST THE “TANK”

Understand clearly this test may destroy your tire and cause surrounding personal and property damage! After removing the spare and placing it out of sight, over several days, in steps, gradually inflate it up to *your* desired pressure. At each step (I used 10 PSI steps), let it stand for 24 hours to “temperature season” a bit. And remember again, do not exceed the “MAX.LOAD” rating pressure for that tire.

For safety, use the Air Robber (or any other long air hose) as an extension and test the candidate tire from afar. Your objective is to see if it will withstand *your* desired pressure. Connect the screw-on air chuck to the candidate tire and run the compressor valve stem hose around the corner of something substantial like a building. This allows you to be completely away from and out of sight of the test tire. Professionals first fill the tire with water. This eliminates the explosion hazard because fluids don’t compress. Also, see the sidebar (next page) for how temperature and altitude affect real and apparent tire pressure. Only after you have fully inspected and tested your candidate tire should you leave it permanently at *your* desired pressure. Again, let there be no doubt, inflating any tire to any pressure can be **LETHAL!**

MORE CAUTION

Do not let your compressor explode your “tank tire” or any other tire! A 31X10.50 tire inflated to 100 PSI, loaded into a “vehicle cannon” and fired, will lift a 4,000-pound car four feet in the air!

Figures 1 and 2 show a portable compressor connected to the tire tank. The only difference between a garage compressor/tank and your mobile setup is that the latter does not have an automatic pressure shutoff control relay. Left running, any measly little 12-volt DC compressor could explode the tire! Remember to power-down and remove the compressor from all tires if you leave the worksite for more than five minutes or when you’re done airing up. This will prevent **LETHAL** overinflation.

CHECK FOR LEAKS

Once you’ve passed the safety test, leave the tire at the final holding pressure and check for leaks everywhere. Mix one teaspoon of dish soap with one half cup of water and paint everything in question. That’s all fittings, connections and the end of the delivery chuck. Allow it to stand for several hours. If you find a bubble nest anyplace, you have a leak. Fittings may require Teflon tape. A delivery chuck leak can typically be rectified by simply releasing a little air and allowing the internal valve to reset.

INSPECT INSTALL AREA

Installation is a painless process, but if you venture underneath your 4X, make sure the emergency brake is set and the vehicle is safely in PARK (auto trans) or in gear (stick shift). Now, spend a moment or two and survey the spare’s surroundings in both the raised and lowered (see

Figure 4) positions. Is the tire valve pointed up or down? Can the tire be flipped to valve up? Is there room above (in the wheel) to store a stuff-bagged Air Robber, but still keep it readily accessible without lowering the tire (see Figure 5)? I found the Frontier most accommodating.

For me, for under 4X spares, the valve must be pointed up. This precludes the possibility of snagging a hanging hose while driving. With the valve down, as in Figure 6, the attach hose may catch on who knows what! And if you must use the valve down position, don’t stress (bend) the tire valve stem, and attach the hose to eliminate exposure.

ROBBER INSTALLATION

With that plan in mind, it was just a matter of dropping the spare and attaching the shortest Air Robber hose to the spare tire valve stem with the screw-on chuck. A quick crank up showed it would not be damaged and still left plenty of room for permanent storage (see Figure 6). Lastly, many bumpy field tests miles later, on both the Toyota and Nissan, the stuff bag stayed in place. Had that not been the case, plastic tie-wraps would have cured the problem.

USING THE AIR ROBBER

Using the Air Robber is quick and easy. You first ready the compressor near the “tank.” In my case, the compressor power point extension cord was run from the dash, out the door, under the Frontier and back to the spare at the rear.

Next, remove the bagged Air Robber (without lowering the tire), unscrew the valve stem protective cover and connect the compressor. Your compressor gauge

now reads the pressure in the spare. Only turn on the compressor when you are immediately ready to use air. Remember, leaving the compressor on for a long time without using air may overinflate and explode the tire tank as already discussed! Finally, use the service station-type air-chuck (on the longest hose) to inflate any tire. It's as easy as that!

SHORT HOSE?

The delivery hose should be long enough to reach all of your tires (see Figure 7). If you can't reach a particular tire, try one of the following suggestions. Move the compressor to the other side of the 4X. Pass the hose, hand to hand, around one front tire to access the other one. Run the hose completely under the vehicle only after you ensure the vehicle won't roll. Also remember not to drag the fittings in the dirt and to remove the hose from under the vehicle before moving on. Do not drive over the hose, fittings or compressor. The most important part is to remember to immediately power-down and remove the compressor from everything to prevent overinflating a tire when you're done.

STORAGE

Leave the screw-on air chuck connected to the spare tire. This makes it available for immediate use next time. Next,



Figure 7 Air Robber in use.

Photo by Harry Lewellyn

coil the hose, in a 6-inch or greater diameter circle, as you would a rope. You can loosely tie wrap the coil if desired. Now, stuff it in a bag and put it on top of the spare tire. For an inside spare, consider a larger coil, under the cover, without a bag.

Finally, remember at some time you will need to bring the tank tire back up to *your* pressure so it is available for the next usage.

LESSON OBSERVED

Wouldn't it be a pain if you had a flat and couldn't crank the spare all the way down?

While running the spare up and down for this article, it occasionally seemed to bind up. It wouldn't go down all the way. What I observed was that a chain link near the lift mechanism would turn sideways (Figure 8, left photo). This kept the remaining chain from feeding through the lifter to further lower the tire. If this happens, I also found simply reversing the crank for about half a turn cured the problem (Figure 8, right photo).

MAINTENANCE

The COYOTE AIR ROBBER requires no maintenance, short of an occasional cleaning. A leaking air chuck or valve stem may indicate a need for special scrutiny, disassembly, cleaning or seat replacement.

Write me with your COYOTE AIR ROBBER comments, suggestions, ideas and cautions.

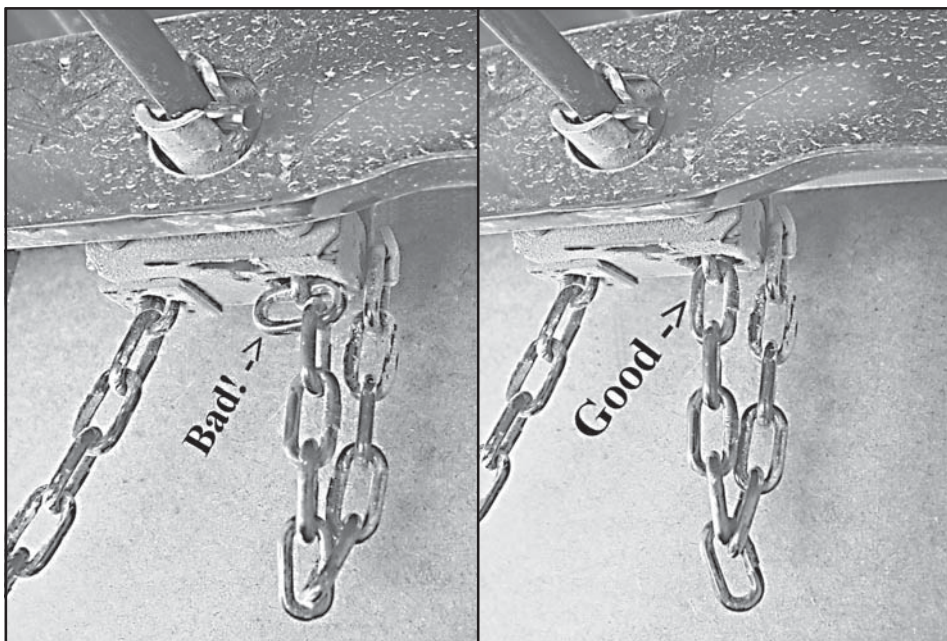


Figure 8 A crossed link will not allow the tire to come all the way down.

Photo by Harry Lewellyn



FOURWHEELING ACADEMY

SPARE TIRE/TANK CAUTION!

This alert must be read by all who use or are considering using their spare tire as an onboard compressor tank.

By Harry Lewellyn

In the December 1995 FOURWHEELING ACADEMY (Get it Up), I discussed tire inflation schemes. Following is a partial quote.

I disclaim all responsibility and liability for sharing the insane reserve-tank approach I have used for years. Plumbed via a valve stem connector to my ARB air locker compressor and automatic shutoff switch (not recommended by them), I carry my spare tire at 105 PSI. With quick-connect hose and chucks, I simply zip around the car as if I were at home or at the local station. This technique approaches household/service station speed and convenience. Then, in the leisure of the paved (good road) cruise back to wherever, I refill the "spare/tank." I run the ARB compressor, at short intervals to minimize overheating, and bring the spare/tank back up to maximum pressure. I can also fill the spare/tank directly from any larger compressor (service station or home, 110 VAC unit).

I'll offer only a few words to validate this continuing scary experiment. My BFG T/As are load rated at 50 PSI, cold. I reason they must be designed with at least a two-to-one safety factor taking into account road heat, road hazard and some sort of wear consideration. Very thin-sided 10-speed bicycle tires are typically inflated to 100+ PSI for example, and they too must have a pressure design safety factor.

The tire manufacturers won't share design-limit information, but a few confide you would probably split

or break the wheel before a new tire would blow. Five-plus years of personal experience show no failures on several test vehicles. For example, in a combined gas mileage/tire pressure test, I inflated all four tires to 80 PSI (cold) and ran them about 1,000 highway miles with no problems. Ride was terrible and gas mileage up 4%.

Without belaboring the spare/tank thing, consider one spare of equal size to the other four, inflated to 105 PSI. Assuming the other four tires to be totally flat, divide 105 PSI by five and you've got five tires at 21 PSI each. This is plenty of air to get me home or to another pump. In reality, all four tires would not be flat, therefore the average pressure would be even higher yet.

The explosive force of compressed gasses (air) is incomprehensible to most of us. Do not use the above approach on exposed spares. This goes for spares within the 4X or carried outside on swing-away racks! Spares underneath the car offer some degree of shielding.

I recently learned of a "spare/tank" within a 4X that exploded. The internally-stored, overinflated spare not only broke out all of the windows, but bent out the top of all four doors and deformed the roof of the Grand Cherokee! A shoe-size piece of rubber came forward and broke the windshield. Fortunately, no one was hurt. The explosion only rang the driver's bell and there were no other occupants. The tire had seen unpaved duty and I suspect, therein lies the problem.

Barring random manufacturing defects, I have great faith new tires are safe at

twice the load-rated pressure. I have less confidence once a tire sees duty. We can inspect the outside for flaws and that is good, but visible defects are not the only potential source of failure. Invisible, internal damage can weaken a tire too. Be extremely cautious with overinflated used tires. Further, do not inspect an overinflated tire. Deflate the tire to normal pressure before getting your face close to this potential bomb!

The tire companies conduct burst-pressure tests with water. They've learned air tests rip, shred and scatter the tire. Fluids do not compress and store energy, therefore they safely release the pressure at the first flaw. The small, initial flaw can be studied in more detail rather than trying to collect, reassemble and analyze all the scattered pieces.

Help me help others by spreading this caution. "DO NOT CARELESSLY OVERINFLATE SPARES WITHOUT SAFELY TESTING FIRST." If you must use the spare/tank approach, use only a new tire and crawl before you walk! With the tire out of sight of everyone and everything that could be damaged, progressively raise the tire pressure and let it "age" a week or two between steps. My first tests were at 120% of load rating, then 130%, and so on.

I'm eager to hear of your experience. Drop me a note if you've had an overinflated tire blow.



FOURWHEELING ACADEMY

SPARE TIRE/TANK, ALERT II !

By Harry Lewellyn

Whew! I'm really glad Ken Obenski read the December issue of this newsletter (SPARE TIRE/TANK CAUTION!) and took the time to share his expertise. He's a registered engineer, works in failure analysis, and blew open my eyes regarding tire overinflation hazards. My original fear dates back to a 6-year-old Coyote blowing out a 24-inch bicycle tire. The December newsletter understatement, "The explosive force of compressed gasses (air) is incomprehensible to most of us," is only emphasized by what follows. I expect, if you're like me, by the time you finish his letter (salient points reprinted below), you'll even be afraid to inflate your tires to street pressure!

1. An 8x15 inch trailer tire, load range E, 85 psi rating, blew out a sidewall during inflation. Tire tech was on top of the tire because the safety equipment was not working right. It launched him first, and went through the shop roof. Compressor was set for 165 psi with no regulator between the tank and the tire but 150 feet of 1/2 inch pipe.

2. A 15-inch car tire, 32 psi rating, gas station had a locking air chuck (OSHA required). User did not realize that letting go of the chuck would not stop air flow. The hose blew out, knocked him down and lifted the tire over a retaining wall. Severe head injury.

3. Wheelbarrow tire, 4x8, 32 psi rating, aired up with unregulated hose connected to 100 psi. The rim split in half and decapitated owner.

4. Nearly new bicycle tire, mine, 90 psi rating, blew off rim at 70 psi. Stress in bead wires is 300,000 psi! Tire manufacturer says, "Tires blow off the rim all the time," like it was no big deal. Tell that to my knee.

5. Bike tires are thin-walled but also very small cross section. Thin-wall pressure-vessel design

is just a ratio of diameter to wall. Bicycle tires are bias ply, so the cords don't separate as the tire swells, like a radial. (*Bill Fragale, Phoenix area, also nailed me on this one.*)

6. My tire engineer warns against exceeding sidewall rating by more than 10 percent. Orris says the first thing to fail should be the sidewall. Steel rims are formed from one piece of sheet and will not fail, but some aluminum rims might fail by the flange breaking off. The rim fragment will be a bullet.

7. Air at about 125 psi behaves like pure oxygen! Organic materials can spontaneously combust in it. When this happens the gasses expand even more and what you have is a one-cylinder engine with no crankshaft and no exhaust valve.

8. Navy has one serious accident a day from high-pressure air. See 7.

9. Desert temperatures and high altitude can raise tire pressure another 20 percent (pvnr = pvnr). See 7.

10. Tires have a warning on the sidewall not to exceed a certain pressure to seat beads. Usually it is less than 125 percent.

11. Most of the tire-explosion problems we have seen are from putting tires on the wrong size rims. There are 15.5- and 16.5-inch tires and rims, that almost interchange with 15, or 16, but will release without warning, at or near rated pressure.

12. Just because you get away with something does not mean it's safe. Safety factor is not there for us to use, it's a safety margin to deal with the unpredictable, like: Suppose your gauge is off, or the tire has latent defects, or they overstressed it in mounting, or in your case, you high center on a rock.

13. The energy stored in your 32-inch diameter tire at 100 psi is

13,000 foot pounds, enough to lift the entire truck 4 feet, or launch tire and wheel at 146 feet per second. That's 12 times the muzzle energy of a .44 magnum! How securely is that tire attached to your truck?

In doing the research for the FOURWHEELING ACADEMY on deflating tires, I learned the typical snap-in tubeless valve stem is only rated to 65 PSI maximum. There are others that are rated to 100 PSI maximum. You'd have to dismount the tire to tell the difference. Referencing Figure 1, on page 31: The large-diameter, bottom contour will have straight sides (lighter line) versus the curved sides of the 65 PSI version. The Tire and Rim Association, Inc. (TRA) engineer told me there's more than just a rubber contour difference, too. The metal core also has a flange to make it virtually blow-through fail-safe. There is no pressure rating specified by TRA for the bolt-in type.

With all that, let me radically revise my recommendations about using the spare as a compressor tank. 1) Only use the spare as a tank if it is stored outside and beneath the car. 2) Use a new tire only. 3) Use only an LT (load rating C or better) tire. 4) Per 6 above, don't exceed the sidewall rating by more than 10 percent. 5) Make sure you use high-pressure valve stems. 6) Only use steel rims. 7) Slowly and progressively increase (test) the pressure on your particular tire and rim. First test at rated pressure, then increase in 2 percent increments. Make sure the test-tire is out of sight of everyone and everything that could be damaged. 8) Don't inspect an overinflated tire. 9) Deflate the tire below the sidewall rating before using, removing or working on or around the spare. 10) Have a gauge permanently plumbed into the storage system and make sure it is in plain view. You want to detect a compressor automatic shutoff switch malfunction. 11) Put a blow-off valve in the system.

OK, what have I left out now?

