



The Safety Corner

From the Marine Corps Center for Lessons Learned

October 26, 2007



Tire Safety

This issue of the Safety Corner highlights multi-piece tire and wheel assembly safety.

- In this Issue:**
- [Welcome from the Director](#)
 - [USMC/USN Mishaps](#)
 - [A Real Story About a Wheel Job](#)
 - [Safety Tips](#)
 - [What You Should Know](#)
 - [Fatality Summary](#)

From the Director: The Marine Corps Center for Lessons Learned (MCCLL) strives to collect observations from units currently engaged in operations throughout the world. This issue of the MCCLL Safety Corner was sparked by an accident involving personal injury and death while servicing multi-piece tire and wheel assemblies.

Inflating a tire may seem like a simple task until you realize that an average-size truck tire, inflated to 100 psi can contain up to 40,000 lbs of explosive force. A properly maintained tire can handle this amount of pressure, but one that has been used up while flat or under-inflated can present significant dangers. Particularly serious are events caused by the explosion or separation of parts of multi-component wheel assemblies. The sudden separation or springing of tire lock rings, rims or flanges from tires being assembled, are the number one hazard. This usually occurs when tires are being inflated. Generally, the cause is over-inflation or improper procedures, but may also include mismatched, defected or damaged tire/wheel component parts. Tire and rim servicing can be dangerous and must be done only by trained Marines using the proper tools and procedures. Failure to do so may result in serious injury or death to the Marine performing the operation or to Marines and Sailors in the vicinity.

You are welcome to pass on and post this newsletter for widest dissemination. Log on the www.mccll.usmc.mil to download previous editions of the Marine Corps Center for Lessons Learned Safety Corner as well as our Monthly Newsletters. I look forward to receiving your comments and feedback so we can raise awareness, reduce risk and maintain a high level of readiness. Keep up the good work and remember to pass on the TTPs concerning safety knowledge in order to keep future Marines safe.

Semper Fidelis,
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USMC/USN Mishaps

- 03 Oct 07 (JFCOM/J-7) LTCOL was killed in a private aircraft crash.
- 04 Oct 07 (SOIW/AITBN) LCPL was speeding on his motorcycle when he lost control, hitting a guardrail. Injury was fatal.
- 06 Oct 07 (MVSD/CLB-15) PFC was changing the split rim tire on 130 Grader when it exploded. Injury was fatal.
- 07 Oct 07 (SUBLANT/TENNESSEE) SKSN died in an automobile accident.
- 11 Oct 07 (SPECWARCOM/SDVT-2) SKSN drowned in a training accident when his RHIB collided with a tug boat.
- 13 Oct 07 (IMEF/TEG/ATG) HM2 ran his motorcycle into the back of an SUV and was ejected into the back seat. Injury was fatal.
- 13 Oct 07 (IIIMEF/H&S CAB) GYSGT was killed in a diving accident.
- 16 Oct 07 (MCRD/4th RTBN) PVT died in an automobile accident.
- 17 Oct 07 (IIIMEF/G-4) LCPL was speeding on his motorcycle when he lost control and hit a pole. Injury was fatal.
- 17 Oct 07 (CFFC/NMCB ONE DET SAN NICOLAS) Two E-5 sailors lost at sea while in single man kayaks.
- 20 Oct 07 (VMFAT-101) ADAA's vehicle was struck head on by a civilian drunk driver. Injury was fatal.
- 20 Oct 07 (CNSL/JOHN L HALL) FC2 driving at high speed was killed in a single vehicle mishap.
- 21 Oct 07 (CNO/NAVCRUITDIST ATLANTA) AO2 lost control of motorcycle and hit utility pole. Injury was fatal.
- 22 Oct 07 (TBS QUANTICO) 2NDLT was killed on MCB QUANTICO in a single vehicle mishap.

Split rim wheel assemblies can blow apart during tire inflation or deflation due to:

- Damaged or mismatched rim parts
- Corroded or dirty rim parts
- Not deflating tires before removal
- Incorrect tire size
- Over inflating tires
- Removing the nut which holds the wheel rim together (on some types of split rims)
- Fitting tubed tires on a rim designed for tubeless tires



The observations and recommendations contained in The Marine Corps Center for Lessons Learned (MCCLL) Safety Corner represent the considered judgment of Marines who have identified safety issues in their units. The purpose of this newsletter is to apprise other Marines of these safety recommendations and to encourage them to enter their own lessons into the Marine Corps Lessons Management System (LMS).



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A Real Story About a Wheel Job by Capt. Scott Clifton, USMC



What do you get when you cross an H-1 ground-handling wheel (GHW), a hammer and a six-inch socket extension? An impressive explosion, especially with the wheel inflated at 40 to 60 psi.

Our mech was working inside the ground-handling wheel "cage"--a wire mesh cage 10 feet high, 10 feet across, and 15 feet long. The cage was outfitted with the normal accessories: two workbenches, a vise, and two racks of wheels.

It was a small workspace, but large enough to use an illegal procedure to change a set of bearings on the wheels. Our mech used a hammer to hit the socket extension against the old bearings. The results were quite spectacular when the wheel's split rim cracked, and the tire exploded. Two amazing events occurred: Our mech survived massive head trauma, and the tire could have won a high-jump contest.

The tire departed the workbench area, flew over the top of the cage, and landed approximately 30 feet away. Pieces of the split rim and hammer, not to be outdone by the tire, also were blown outside--remember, the cage is 10 feet high. The socket extension was the overall winner in the distance-flown contest. It flew over another cage (one of equal size and adjacent to the GHW cage) and finally landed on a set of shelves 33 feet away from the mishap site.

The hammer and one-half of the split rim cleared the fence and landed 10 feet from a workbench. What happened to the Marine? Well, he didn't travel too far from the workbench, not as far as the tire or the socket extension. One of the tools hit our mech between the eyes, causing a closed-skull fracture and severe bleeding. He remained conscious and staggered out of the cage, where the first Marines on the scene made him lie down.

After visits to a local hospital and a trauma center, the Marine underwent emergency surgery to stop the internal bleeding around his brain. Besides stopping the blood flow around his brain, doctors removed two blood clots: one from the impact of the tool and the other when his head hit the concrete floor. After multiple CAT scans, the doctor's prognosis was for a full recovery in about six to seven weeks. The Marine showed signs of improvement the next day, but he remained in the neurological-intensive-care unit.

How could this have happened to a trained 6072, ground-support-equipment mechanic? First, he was working on the tire while it was still inflated. The force of the explosion showed that the tire was inflated well above its storage inflation pressure of 15 psi (a requirement in a local Marine Aviation Logistics Squadron guideline). The squadron suspects the tire pressure was closer to its normal operating range of 40 to 60 psi. Secondly, he was not using the right tools or safety gear for the job. A socket extension and a hammer are not the correct tools to change wheel bearings.

Once again, we proved that tires are one of the most dangerous, yet simple items in our inventory. After all, how harmful can it be? It's just a tire. Our mech proved otherwise and, unfortunately, hurt himself like other maintainers in the past.

Safety Tips

When working with multi-piece and single-piece rimmed wheels:

Always use a cage or barrier to protect Marines and Sailors. There is **no greater safety measure** than a **protective barrier**.

Remind Marines and Sailors regularly of the dangers of working around single-piece and multi-piece rim wheels.

Marines and Sailors **must be extremely cautious** when mounting and demounting rim wheels.

A single-piece rim can be thrown across a maintenance shop by the sudden air release.

Multi-piece rims are even more dangerous.

Ensure that parts are not **mismatched**.

Inspect multi-piece and single-piece wheel components before assembly.

Damaged or leaky valves must be replaced.

Do not remove split rim wheels from vehicles or unscrew any nuts on the wheel until the tire is deflated and the valve centre (core) removed.

Do not remove tires from any wheels with detachable flanges or locking devices until the tire is deflated and the valve centre (core) removed.

Do not assemble tires and wheels unless flanges, rings and grooves are clean, undamaged and undistorted.

Do not inflate tires on split rim wheels unless the wheel is behind a restraining device.

Place wheels centrally behind the restraining device and inflate slowly.

Make sure that all flanges and rings are properly seated.

Continue inflation with the wheel behind restraining device.

Avoid overpressure. **Do not** leave an air line which is attached to a valve unattended.

What You Should Know When Disassembling Split Rim Wheels

Ensure that you are trained before working on a tire/rim assembly. Know, understand, and follow the proper safety procedures. Serious or fatal injuries can result if proper precautions are not followed. Obtain mechanical lifting and moving devices for tires and wheels. Follow manufacturers' assembly and disassembly procedures. Check tire/rim assembly for proper proper component seating prior to removing it from the vehicle. Stand to the side, out of the way of flying wheel parts, in case the assembly disassembles explosively. (continued)



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What You Should Know When Disassembling Split Rim Wheels (continued)



Deflate tires (both tires in a dual assembly) by first removing the valve core. Insert a wire in the valve stem to ensure that the stem is not blocked and that the tire is deflated completely before removing the rim/wheel from the axle.

Do not inflate any tire if it has been driven under-inflated by 80 percent or less of its recommended pressure or there is obvious or suspected damage to the tire or wheel components. Such tires should always be deflated completely, removed from the vehicle, disassembled, and inspected. If the tire is in a dual assembly, check the air pressure in both tires with an air pressure gauge; an under-inflated tire may not otherwise be detected when the other tire is supporting the weight of the vehicle or trailer.

Tips for rim inspections

Check that the proper tire size and construction matches the manufacturer's rim or wheel rating and size. The tire size must match the size of the rim. Rims or wheels may accommodate tires of various widths; check with the manufacturer's specifications.

Check rim parts against multi-piece rim/wheel matching chart.

Check all metal surfaces for rust, corrosion, cracks, bent flanges, sprung rings, and deep tool marks on rings or in gutter areas. Clean and repaint lightly rusted rims. Remove all dirt and

other foreign material from metal surfaces. Use parts that are in good condition; destroy and dispose of parts that are corroded, bent, out-of-round, cracked or otherwise damaged.

When Assembling Split Rims

Wear approved safety glasses.

Check tire for cracks, cuts and penetrating objects.

Ensure that removable rings are properly seated before inflating.

Use a suitable tire lubricant that is intended for use with rubber products and that will not promote the corrosion of the metal rims.

Place the tire in a safety cage large enough for tire expansion before inflating tire.

Inflate the tire using a clip-on air chuck and hose extension with an in-line pressure gauge and valve.

Use remote control inflation equipment.

Stand clear of the tire during inflation and ensure that no other person is in the trajectory path during inflation.

If the tire is under-inflated but has more than 80 percent of the recommended pressure, inflate the tire while the rim/wheel is on the vehicle. Inspect the tire, rims, and rings for proper seating after the tire is fully inflated. If the tire is not well-seated, deflate the tire, inspect all parts, follow proper re-assembly and inflation procedures. Remove the properly

inflated tire from the restraining device. Install the wheel of the vehicle correctly, ensuring that the correct parts are used; that the nuts are tightened in the proper order; and that the recommended torque is applied.

Avoid

Do not stand in front of or over the rim during inflation.

Do not attempt to seat rings while tire is partially or totally inflated.

Do not re-inflate or add inflation pressure to a tire that has been run flat or is seriously under-inflated without removing and checking for ring seating and rim damage.

Do not use damaged, worn or corroded rims/wheels or mounting hardware.

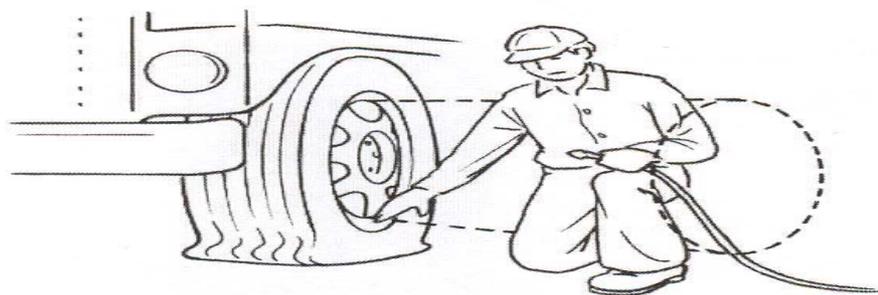
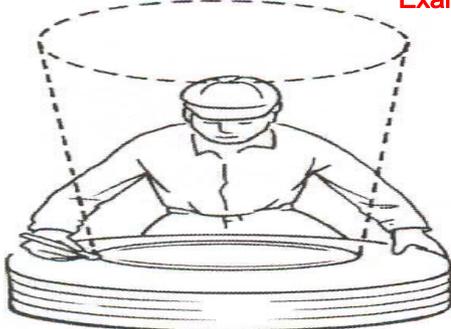
Do not use an assembly with excessive side ring play, wide gaps between ring ends or butting ring ends unless specified by manufacturer.

Do not use a rim/wheel component you cannot identify.

Do not rework, weld, braze, or otherwise heat wheel components.

Do not hammer on components of an inflated or partially inflated assembly

Examples of trajectories and dangerous work positions





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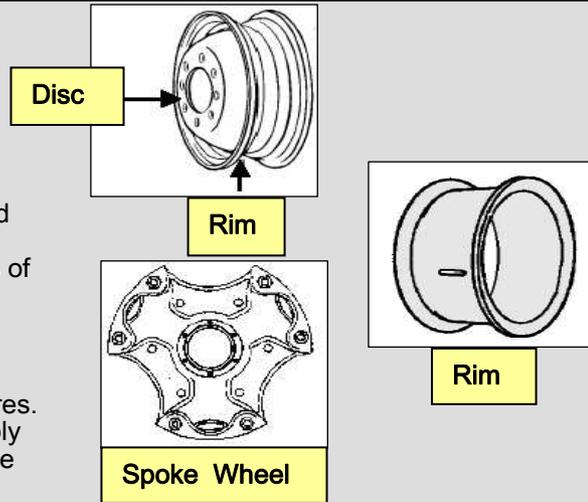


Rim and Wheel Components

Sometimes the terms "wheel" and "rim" are used out of context even though there are major differences. A wheel is not a rim and a rim is not a wheel. The following definitions will help you understand the differences between these components.

Wheel: Wheels are either a "disc wheel" type or "spoke wheel" type. A disk wheel, which is common with military vehicles, is a combination of a disc and rim and illustrated to the right. The disc is permanently attached (usually welded) to the rim and attaches to the vehicle hub with studs and nuts. A spoke wheel does not have a rim permanently attached and consists of a hub and either 3, 5, or 6 spokes with clamps which attach to demountable type rims.

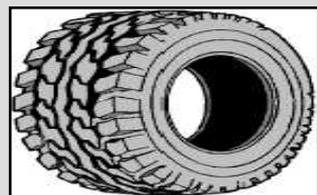
Rim: The rim is the part which supports the tire. By definition the rim does not include the disc portion of a wheel which mounts to the vehicle. The rim is either single piece (usually for tubeless tires) or multi-piece for tube-type tires. Multi-piece rims, depending on the type, will have a continuous base assembly and a side ring or a side and lock ring. A single piece rim is a continuous, one piece assembly without side or lock rings.



Technical Manuals for specific vehicles provide safety information and correct procedures for servicing the applicable tire and wheel assemblies. The required safety procedures when servicing these wheel assemblies are:

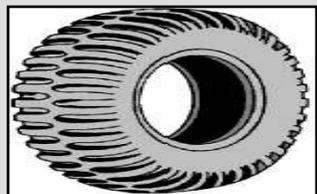
- Wear proper personal protective equipment.
- Train all personnel on the hazards and proper procedures of working with these tires.
- Deflate tires completely before service by removing the valve core.
- Inspect all components for proper type and damage before assembly.
- Use locking air chuck, calibrated gages, and hose extension when inflating tires.
- Always inflate tire assemblies in an approved restraint device.

Know Your Tires



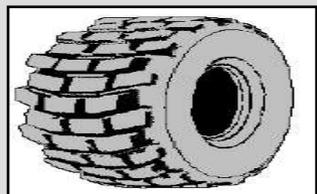
HMMWV Tire

The HMMWV tire has non-directional, all-terrain tread. It provides good traction in either mud or snow, on dirt or temporary roads, and cross-country. They are also practical for hard-surfaced roads. They are available as bias or radial construction. Because radial tires run cooler than bias constructed tires and due to their increased sidewall and tread deflection, HMMWV radials provide longer tread life and better sand and snow mobility than HMMWV bias tires.



NDCC Tire

Military Non-Directional, Cross Country (NDCC) tires give good traction in mud or snow, on dirt or temporary roads, and cross-country. They are also practical for hard-surfaced roads. These tires have non-directional cross-country or mud- and-snow tread design with bar-type lugs. Nondirectional tread indicates that the tread pattern is equally effective in either direction of rotation. On some NDCC tires, the direction of tread is the same no matter which way the tire is mounted. However, some of the newer model NDCC tires tread gives the appearance of being directional as their treads point in different directions when mounted differently. Even though these newer NDCC tires appear directional, they are not with regards to performance as the tread pattern is equally effective in either direction of rotation.



Hemtt Tire

As with many military tires, the HEMTT tire is available with various tire designs, tire brands and from various manufactures. These tires provide good traction in either mud or snow, on dirt or temporary roads, and cross-country. They are also practical for hard-surfaced roads. Even though some HEMTT tires brands appear to be directional, they are in fact non-directional, and tests have proven them to work well in either direction.



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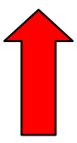
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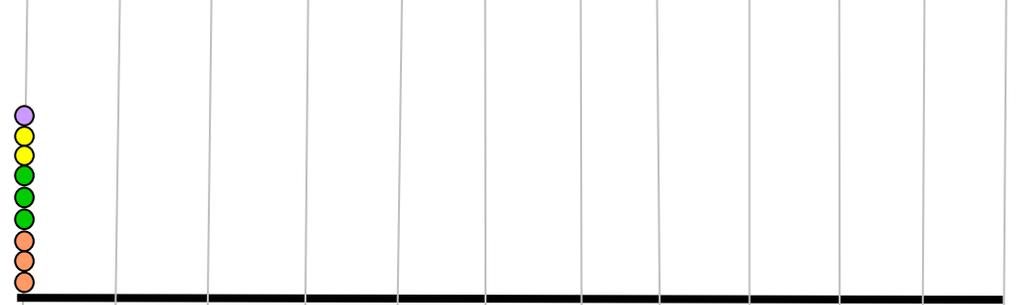
"People sleep peaceably in their beds at night only because rough men stand ready to do violence on their behalf." George Orwell

Navy and Marine Corps Non-Battle Fatalities

Month: Oct 07, Nov 07, Dec 07, Jan 08, Feb 08, Mar 08, Apr 08, May 08, Jun 08, Jul 08, Aug 08, Sep 08



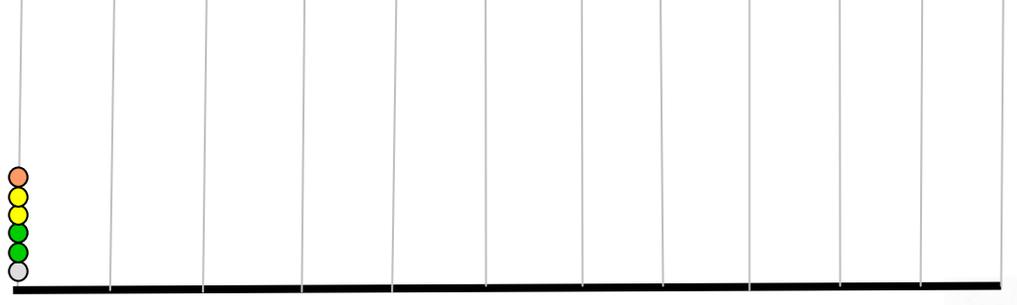
Marine Corps



Total Fatalities same period FY07: 5
Total Fatalities as of 21Oct07: 9



Navy

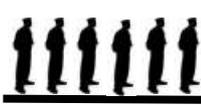


Total Fatalities same period FY07: 4
Total Fatalities as of 21Oct07: 6

Marine Totals



Navy Totals



PMV	GOV	Aviation	Motorcycle	Off Duty Sports/Rec	Misc.	Alcohol	PT	ND	Training
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