

# The Nuts and Bolts of USMC Fasteners

ASETS Defense  
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## Report Documentation Page

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# Background



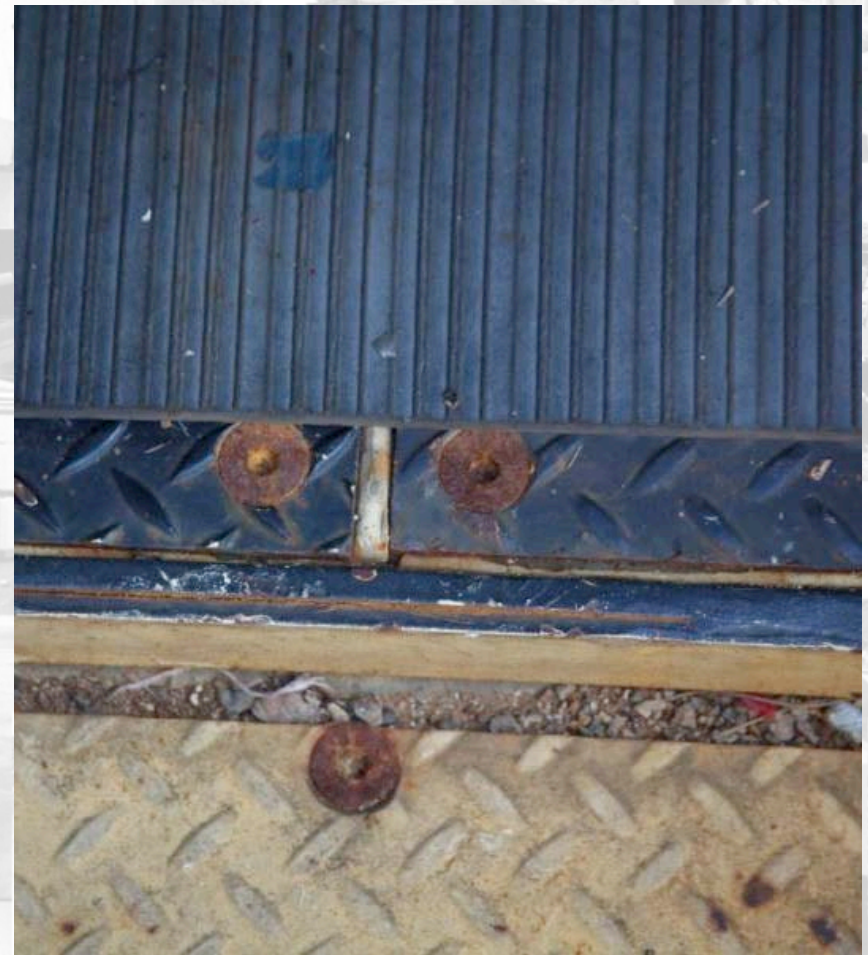
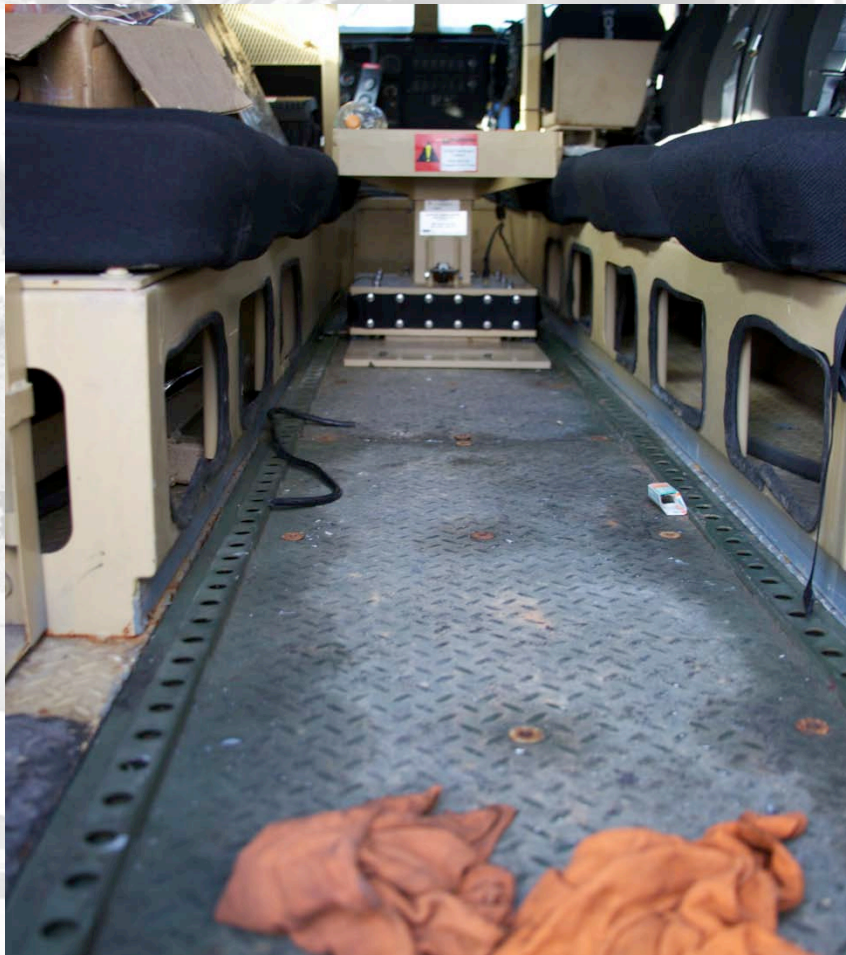
- Fasteners are the most common item corroding on USMC equipment
  - Specifically carbon steel fasteners which exhibit various degrees of corrosion at edges or along the shank and thread area.
- Fastener corrosion is observed on 25% of the USMC weapon systems inspected during annual assessments.
- Corrosion can eventually lead to failure of the bolt or difficulty in faster removal.
- This is not a new issue and is not unique to the USMC.

# Example: MRAP Floorboard Fasteners



- The Mine Resistant Ambush Protected (MRAP) vehicle floorboard fasteners illustrate the problem with using the current fasteners.
- The current fasteners are black oxide coated steel.
- On-site mechanics at several USMC maintenance facilities claim it takes up to 20 minutes to remove.
  - They must be broken out or drilled out.
  - USMC CPAC inspections confirmed the mechanics' observations.

# Example: MRAP Floorboard Fasteners



# Other Examples



Close up photo of Amphibious Assault Vehicle (AAV) Enhanced Applique Armor Kit (EEAK) fasteners corroding.



# Other Examples



Fasteners on a communications equipment box.

These fasteners are not only required to hold the equipment to the box, but also serve communications function.

All of these have to be replaced if they show any surface corrosion.



# Problem Definition



- Ordering fasteners can be a crap shoot
  - Some materials are licensed-commercial process and the end product supplied can be variable.
  - Many proprietary coatings have limited availability as a result of limited supplier base.
  - Concern exists with counterfeit supply as there are not approved, rapid methods to ensure product quality
  - Key issues include the increased cost of fasteners and material availability, especially in repair / rebuild situations.
  - A process is needed to increase sources of supply to reduce cost and ensure product quality when materials are received.



# Example of Ordering Issues

- OEM purchased a “brand-name” coated fastener and installed it in several early USMC vehicle prototypes for acceptance testing.
- The acceptance testing demonstrated poor corrosion performance of these fasteners despite the fact that they were of the recommended “brand.”
- The investigation and subsequent reworking of these vehicles was expensive.
- Eventually it was determined that the “brand-name” coating existed in several variants and that the supplied product was of an aesthetic grade as opposed to a corrosion control grade.

# Fastener Philosophy Conflicts



- USMC defaults to buying “brand-name” coated fasteners from the OEM supplier for several weapon systems, because this appears the only way to ensure quality of the coating.
- USMC would prefer to save money by being able to purchase coated fasteners via commercial specifications.
- Specifications do not contain any receipt QA provisions to ensure a proper coating.

# Background Research

## Ordering systems for fasteners



- ASTM has developed several specifications that cover fastener coatings for corrosion control.
  - ASTM F1136 (Zinc/Aluminum Protective Coatings)
  - ASTM F2833 (Zinc Rich Base Coat and Aluminum)
- Military specs - MIL-DTL-83488 (Coating, Aluminum, High Purity)
- SAE / ANSI have developed fastener-purchasing identification system.
  - Does not include the above coatings
- A concern remains over the quality of the coatings (product consistency mostly) and the potential that a new coating material, qualified to the ASTM specification but not previously tested by the military, may be supplied.

# Possible Future Solution To Be Developed



- Commercial spec and standards to order fasteners.
  - Size and thread requirements
  - Coatings and finishes → known performance
- Simple receipt inspection QA tests.
  - Appearance
  - Adhesion
  - Dry Film Thickness
  - Torque-Tension
  - Porosity
- Develop better process to procure fasteners in the USMC