

DoD Maintenance & Sustainment Costs



DoD Totals:

- **35,000 Combat Vehicles**
- **237 Ships**
- **14,000 Aircraft**
- **356,000 Tactical Vehicles**
+ **Communications Equipment**
+ **Support Equipment**
+ **Facilities Systems**

Maintenance Costs in FY15:

- **\$74.8 Billion**

Sustainment Costs in FY15:

- **Over \$200 Billion**
- **Nearly 30% of DoD Budget**

HMMWV Tow Hook Bracket

**Frequently
Breaks**

**Safety Deadlining:
Loss of control
when towing**

**Build Time:
16 Hours**

**Powder Bed
Fusion (EOS)**

**Stainless Steel
(316L)**

**18,000 lbs.
pull capacity**

15% Lighter



AM Original Design



Topology Optimized Design



NSN: 2590-01-316-0084

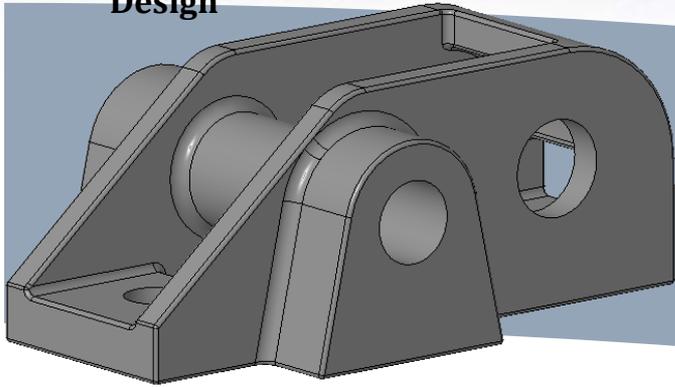
POINTS OF CONTACT

- PEO Program Manager: PM LTV
- HQMC I&L Advocate: CW05 Scott C. Gilman

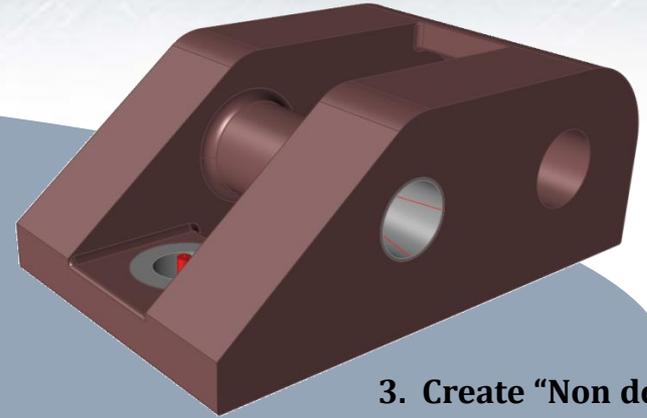
HMMWV Tow Hook Bracket

Topology Optimization Process

1. Original Design



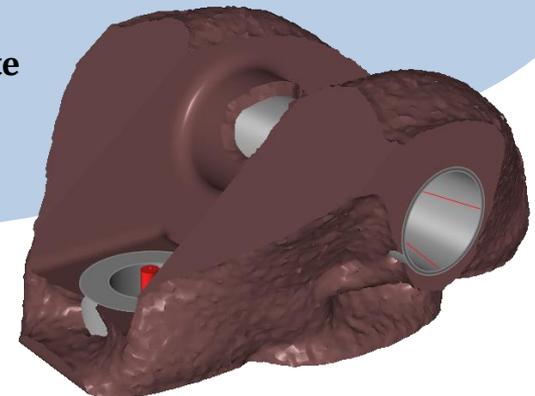
2. Create “design space”, which is the volume for topology optimization.



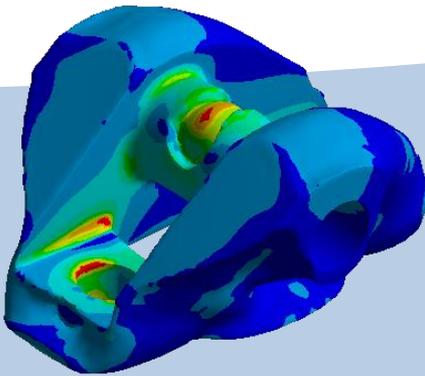
3. Create “Non design space” where boundary conditions or loads are applied.

4. Determine optimization criteria and targets.

5. Post processing optimization results create a solid model for Finite Element Analysis (FEA)

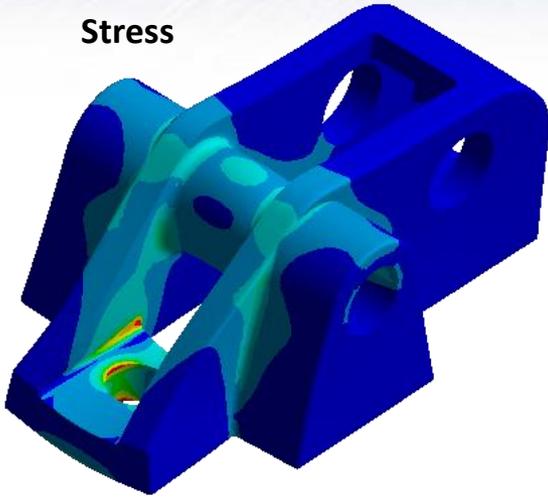


6. Verify Results in FEA

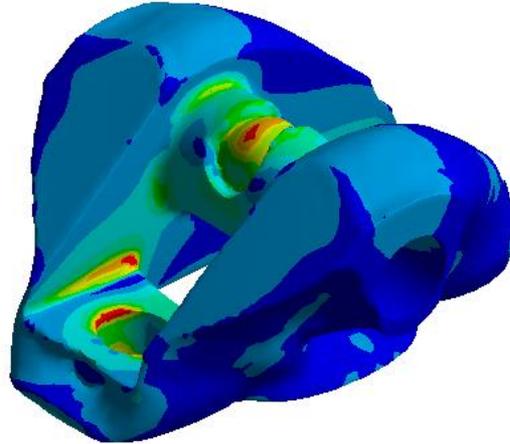


HMMWV Tow Hook Bracket

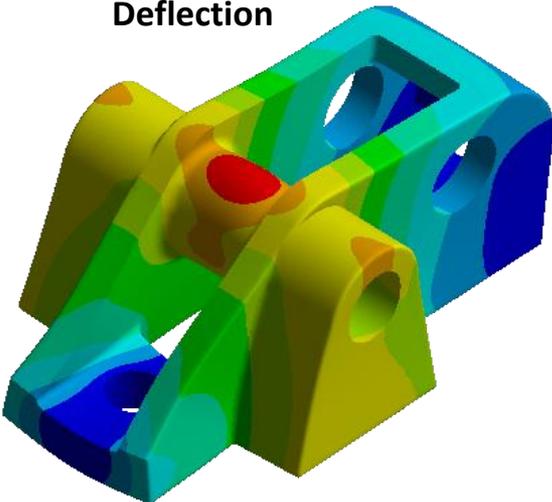
Stress



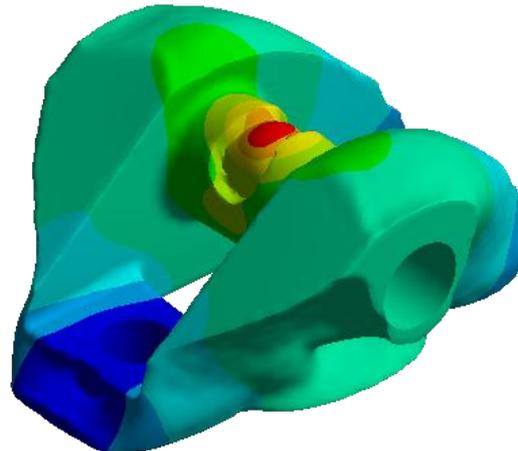
Stress



Deflection



Deflection



- Meets Operational Requirements
- 15% lighter
- Same stiffness

NSN: 2540-01-599-0075

	Original	Optimized
Load	18,000 LBS	
Material	Iron 130-90-09	Stainless Steel 316L
Yield Strength	90,068 PSI	68,167 PSI
Ultimate Strength	129,954 PSI	78,320 PSI
Part Weight	2.36 LBS	2.01 LBS
Max Stress	100,000 PSI	73,000 PSI
Max Deflection	0.0036 IN	0.0035 IN

Dust Cap With Connective Cord

**Frequently Lost:
Lens Damage**

**Existing Shoelace
Solution – Not Ideal**

**Marine Ingenuity:
Redesign Improves
Readiness**

**Build Time:
3 Hours**

**Material
Extrusion**

**Able To Print
Without Contract
Modifications**



Flip Cap Design



Top Cap Mount Design

POINTS OF CONTACT

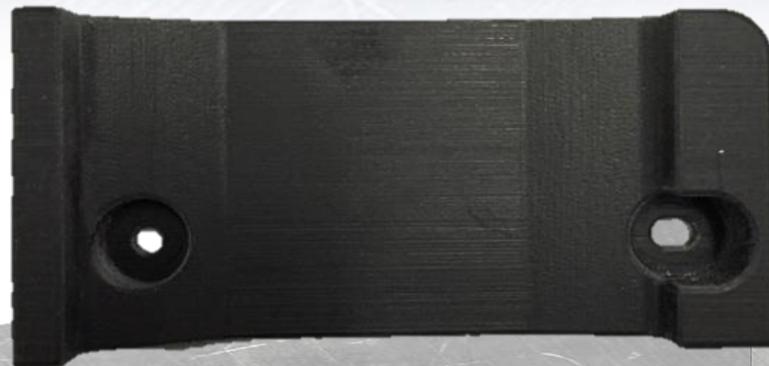
- MCSC Program Manager: PM IWS
- HQMC I&L Advocate: LPV-3, NEXLOG IPT

AN/VRC-110 Bracket

Must Order New Amplifier if Part Bracket Breaks

Print-on-demand

ABS Part Not Available For Order. Currently User Must Order Entire Amplifier Assembly



**Build Time:
1 Hour 14 Min.**

**Material
Extrusion**

**Low Risk,
Simple
Geometry.**

Cost: \$9.68



POINTS OF CONTACT

- MCSC Program Manager: PM MC3
- HQMC I&L Advocate: LPV-3, NEXLOG IPT

AN/PRC-152 Rotary Knob

Frequently Lost

**Radio Rendered
Inoperable Until
Replaced**

**Build Time:
42 Mins**

**Material
Jetting (Objet)**

**Numerous
systems with
similar knobs**

Cost: \$1.64



POINTS OF CONTACT

- MCSC Program Manager: PM MC3
- HQMC I&L Advocate: LPV-3, NEXLOG IPT

AN/PRC-152 Battery Latch

Frequently Lost

**Radio Rendered
Inoperable Until
Replaced**



**Build Time:
37 Mins**

**Material
Extrusion**

ABS Plastic

Cost: \$0.57

POINTS OF CONTACT

- MCSC Program Manager: PM MC3
- HQMC I&L Advocate: LPV-3, NEXLOG IPT

AN/PRC-117F COMSEC Pin

**Radio Rendered
Inoperable Until
Replaced**

**OEM Cost:
\$78.54/ea.**

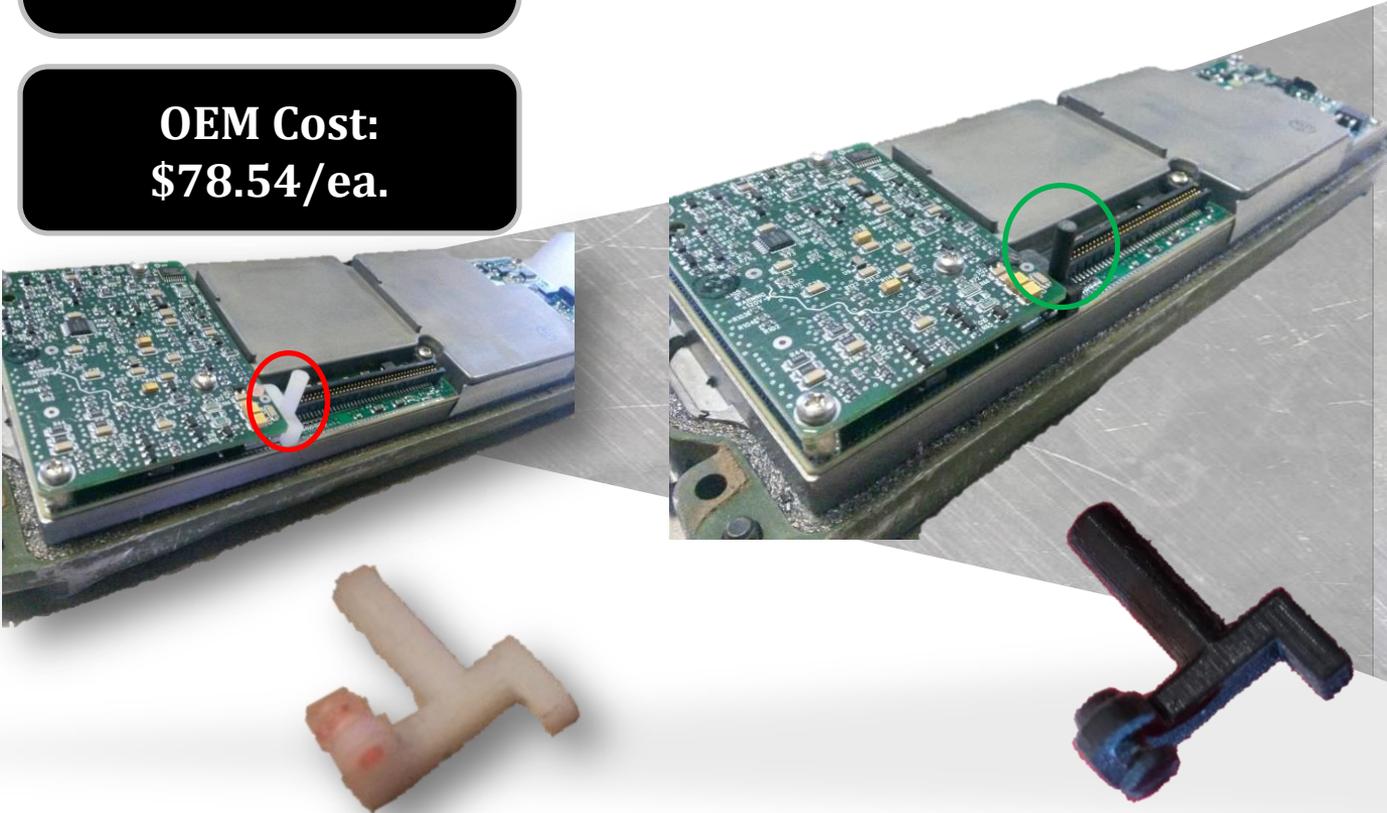
**Build Time:
37 min**

**Material Jetting
(Objet)**

Acrylic

**Functional
Check Verified**

AM Cost: \$1.22



POINTS OF CONTACT

- MCSC Program Manager: PM MC3
- HQMC I&L Advocate: LPV-3, NEXLOG IPT

AAV Exhaust Bellows

Vehicle Deadlined

136 Day Lead Time



**Build Time:
16 Hours**

**Powder Bed Fusion
(EOS)**

**Demonstrates ability
for AM to make
complex shapes that
are flexible**

**Metalized
Electroplating
1 Week Turn
Around**

**AM Print Before
Electroplating**

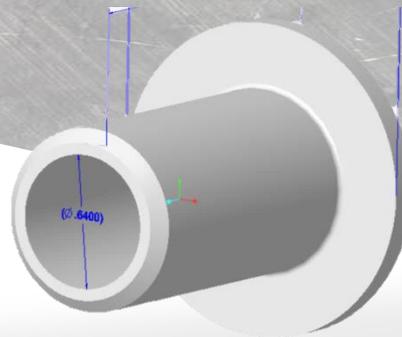
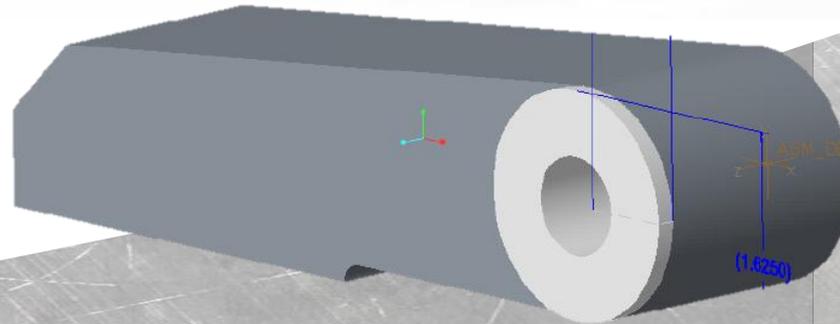
POINTS OF CONTACT

- PEO Program Manager: PM AAA
- HQMC I&L Advocate: LPV-3, NEXLOG IPT

AAV Ramp, Personnel Door

No manufacturer or supplier of record. Item not procured or stocked

AAV Ramp Personnel Door Is Inoperable And Rapid Egress From Vehicle Impacted



CAD Model: AM Part on Display

Direct Metal Laser Sintering (EOS)

Aluminum

High Stress Area. High Corrosion Area.

Weldability Study Underway

POINTS OF CONTACT

- PEO Program Manager: PM AAA
- HQMC I&L Advocate: LPV-3, NEXLOG IPT

Commander/Driver Seat Rail Guide

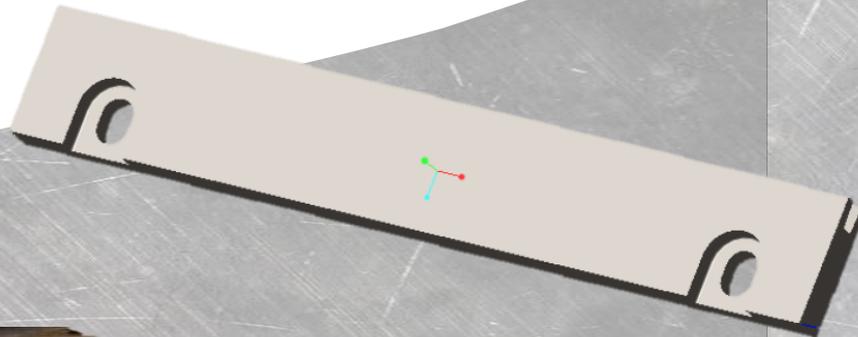
No manufacturer or supplier of record. Item not procured or stocked

Failure Renders AAV Seat Inoperable

Direct Metal Laser Sintering (EOS)

Aluminum

Reduces Weight



CAD Model: AM Part on Display



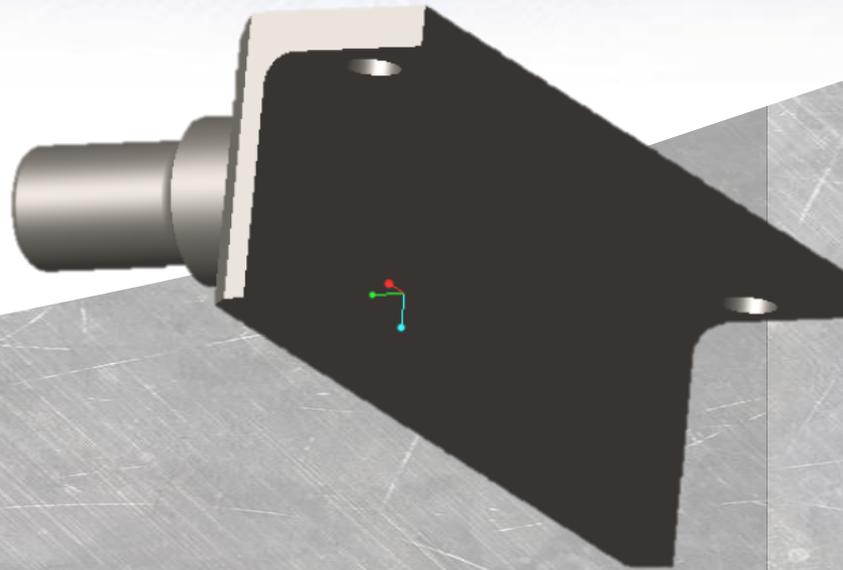
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Commander/Driver Seat Rail Guide

No manufacturer or supplier of record. Item not procured or stocked

Failure Renders AAV Seat Inoperable



CAD Model: AM Part on Display

Direct Metal Laser Sintering (EOS)

Aluminum

Reduces Weight

NSN: None, XB coded

POINTS OF CONTACT

- PEO Program Manager: PM AAA
- HQMC I&L Advocate: LPV-3, NEXLOG IPT