M10 Charger

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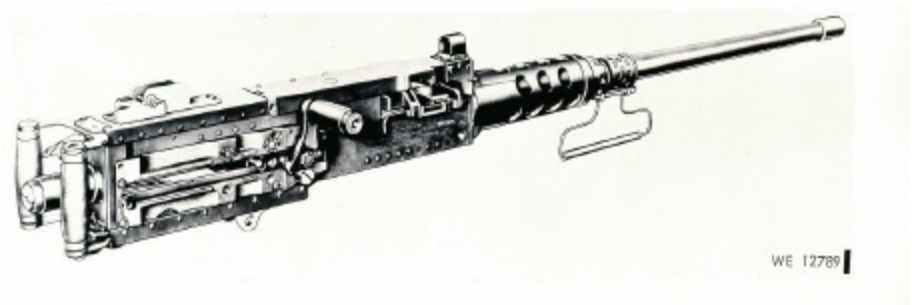
Overview

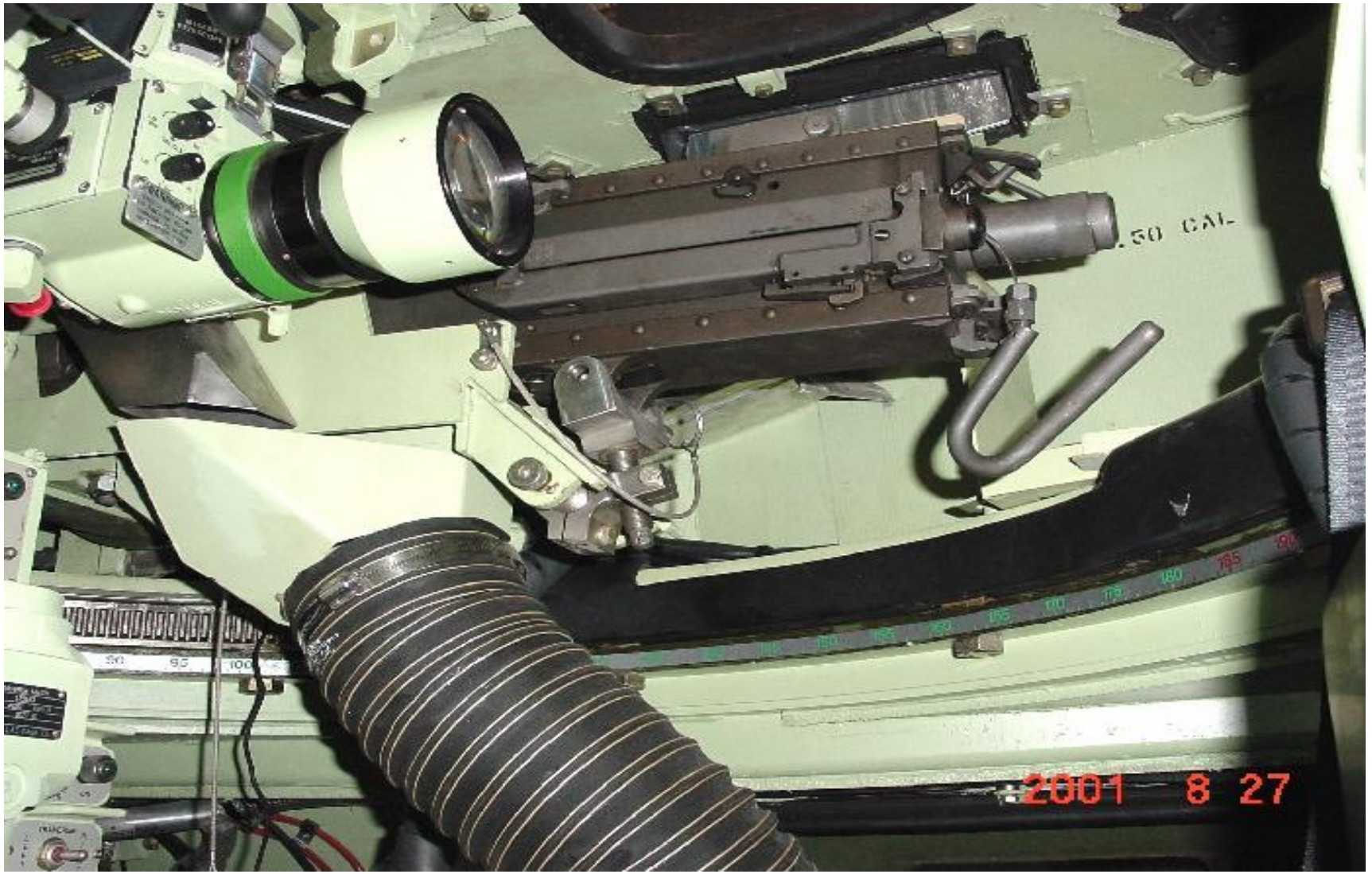
- Armored Security Vehicle (ASV)
- .50 Cal M2 Machine Gun
- M10 Charger
- Cable
- Conclusions



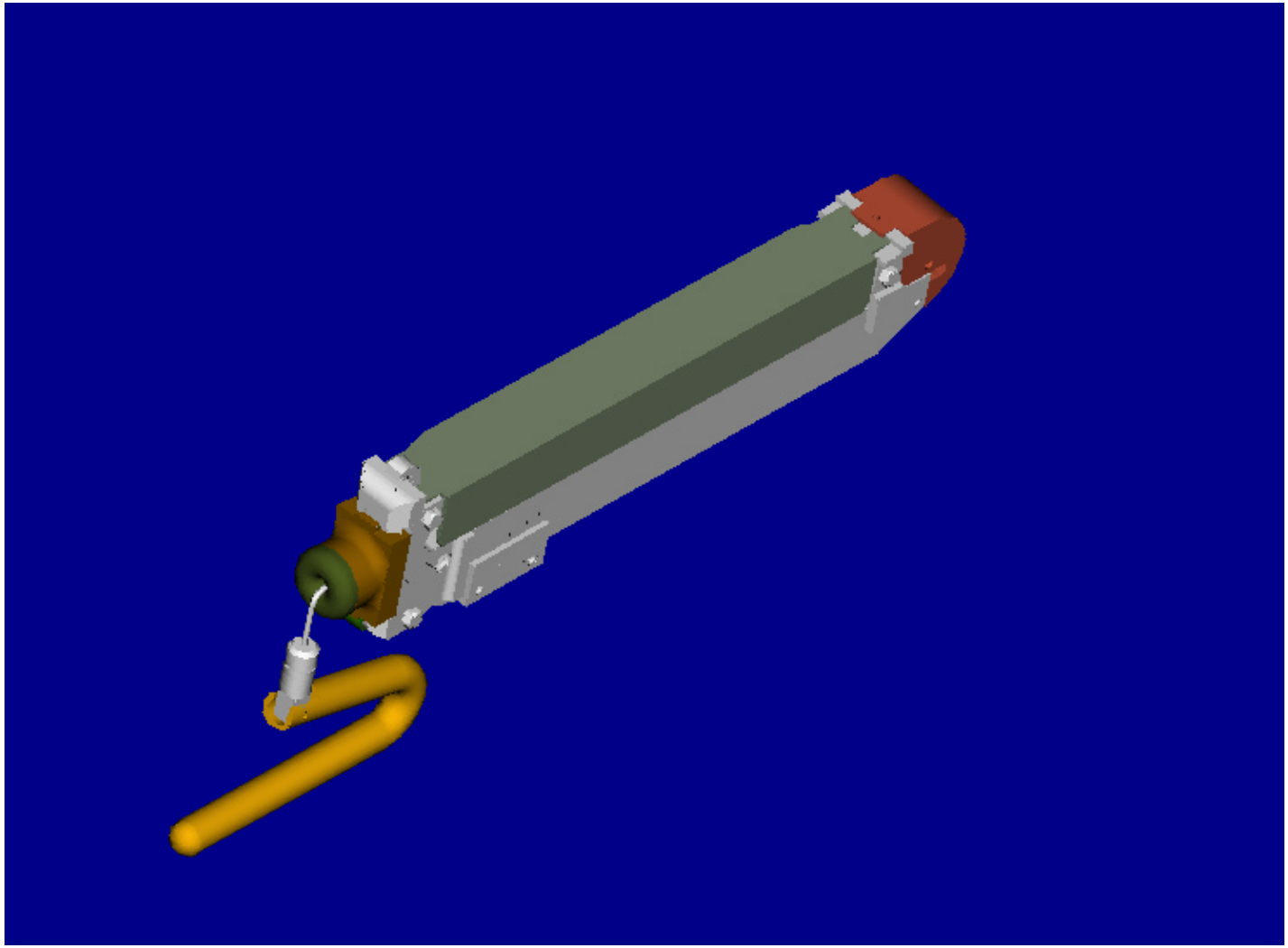
Armored Security Vehicle

M2 .50 Cal Machine Gun

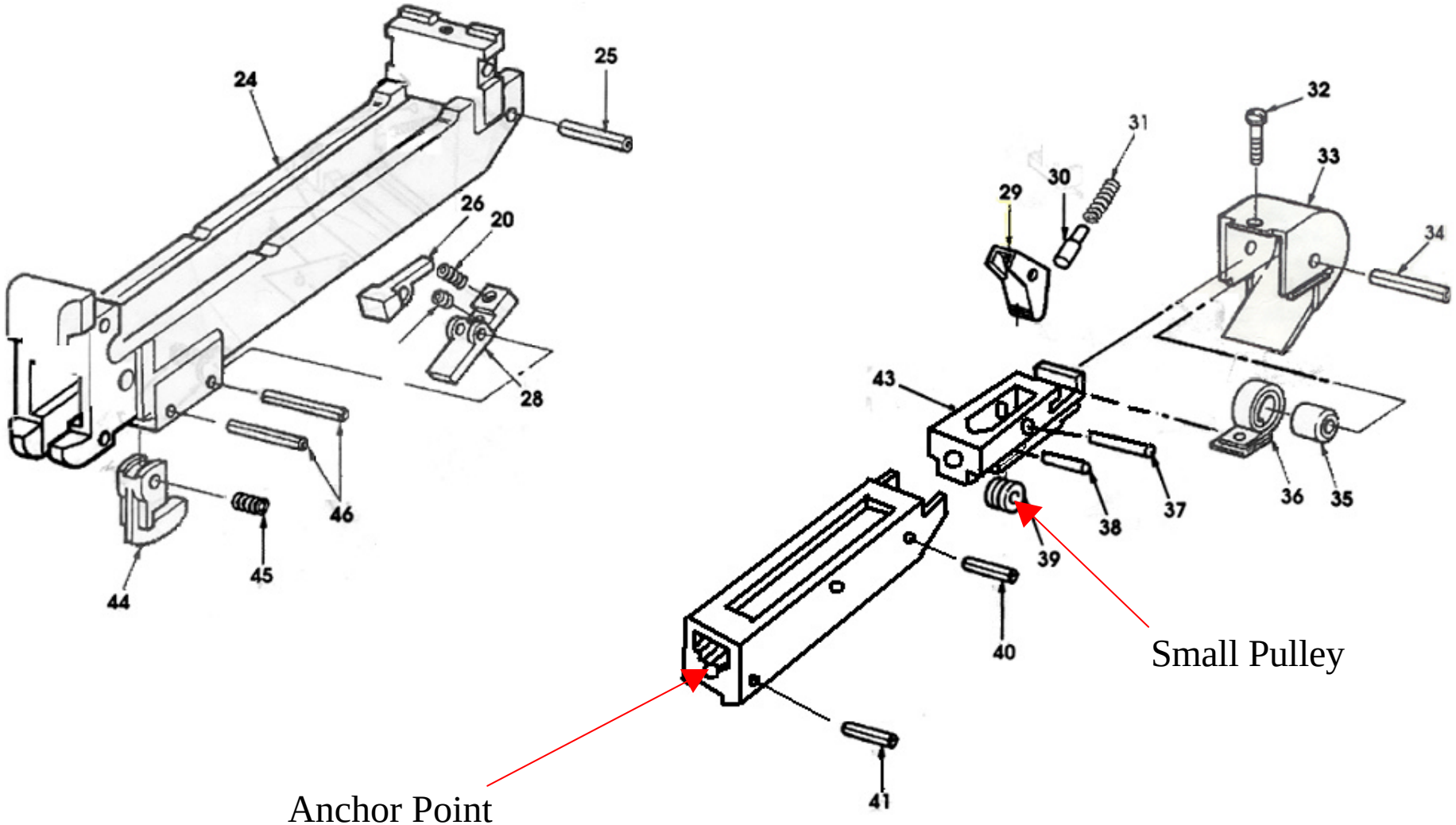
M2 .50 Cal in ASV



M10 Charger



M10 Charger Function



Two M10 Charger Designs

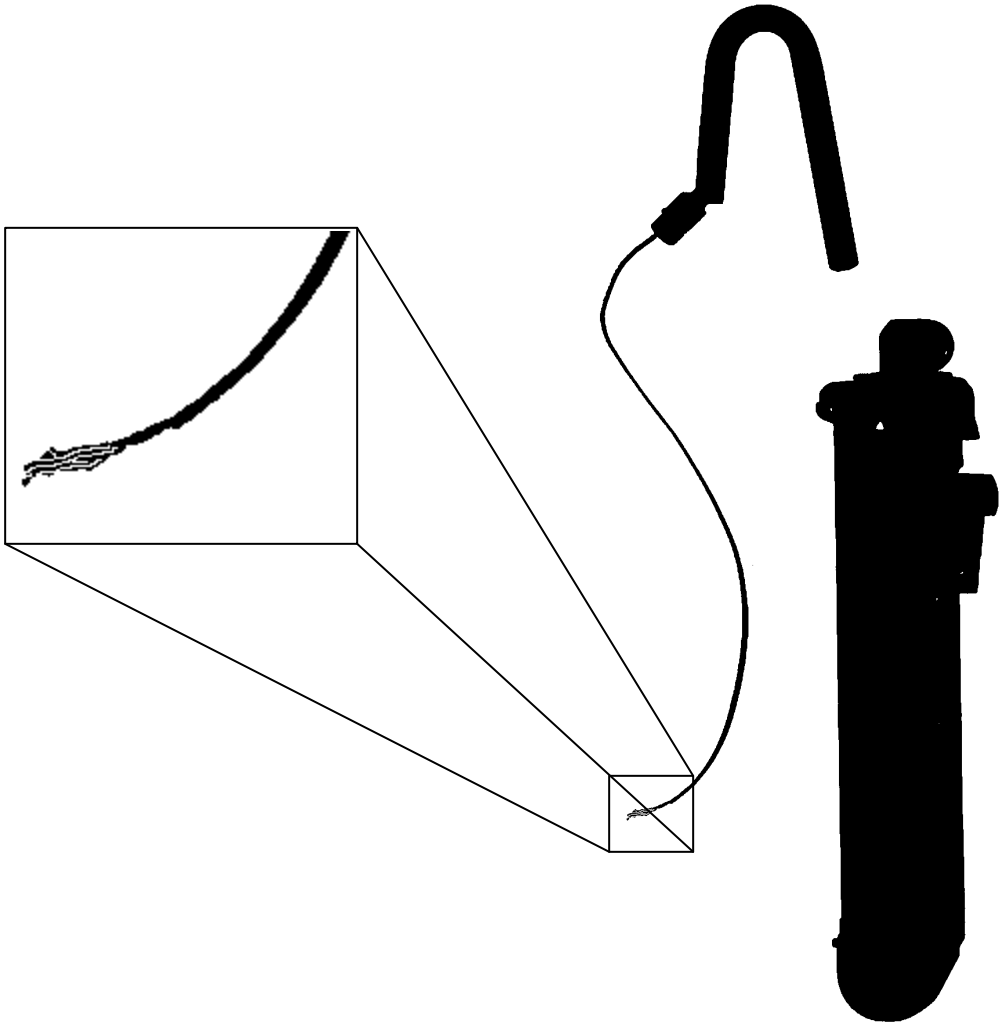
- 2 pulley system
- Pulley bushing system

M10 Charger in ASV

Ready to Charge

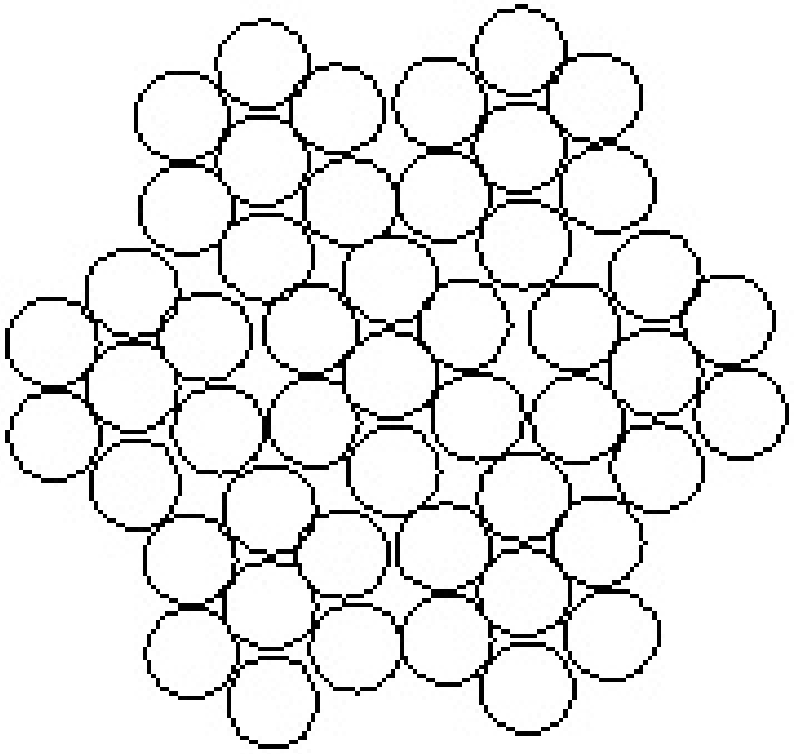
Charging

Cable Failure

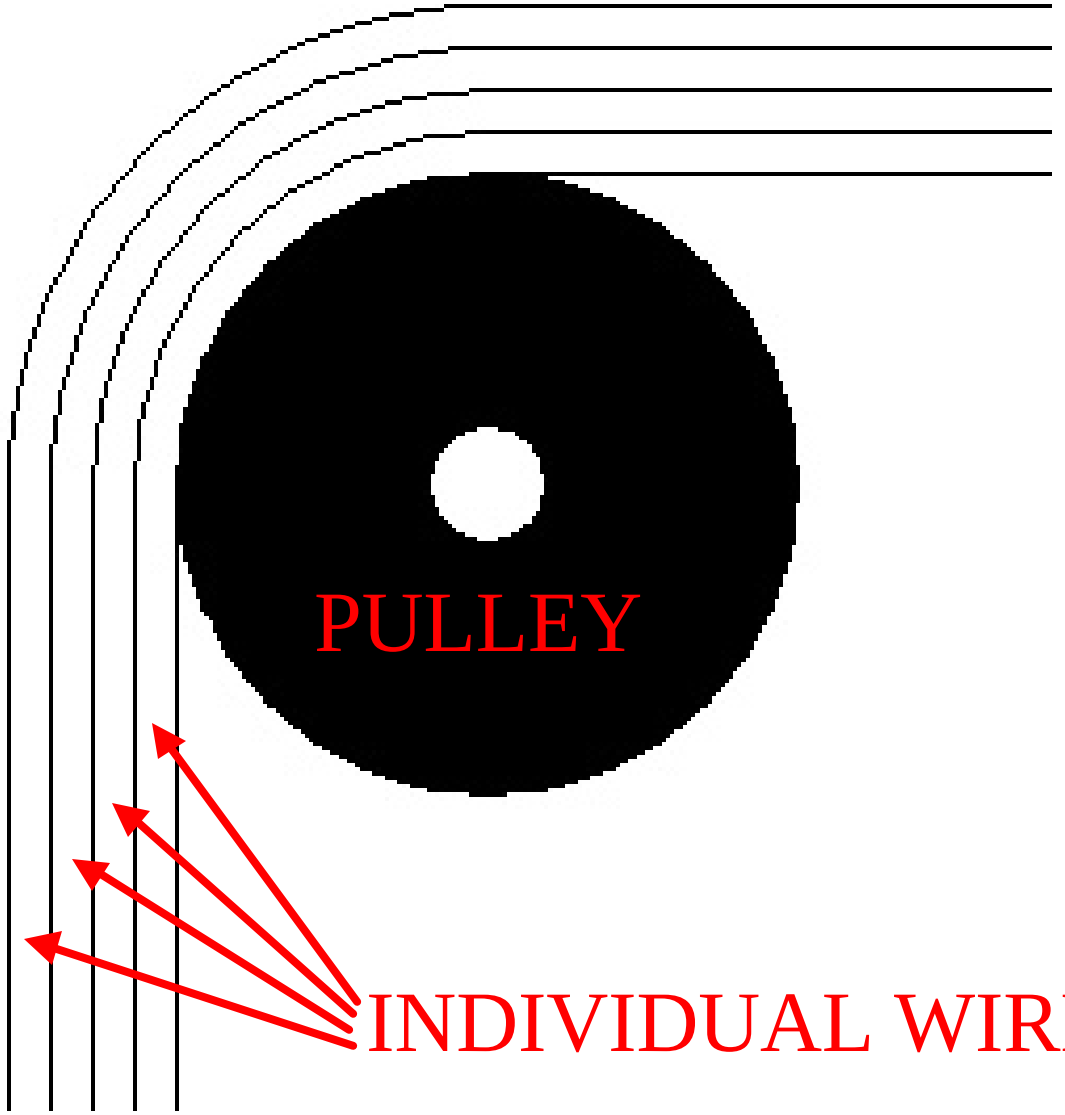


Cable Failure Causes

- **Tensile force**
- **Bending radius**



Bending Radius



Mathematical Proof

L_i =length of inner wire; L_o =length of neutral axis
R_{pb} = radius of pulley/bushing; R_w =radius of individual wires

$L_i = 2 \pi R_{pb}$;$L_o = 2 \pi (R_{pb} + R_w)$ Definition of circumference

$\varepsilon = [L_o - L_i] / L_o$ Definition of strain

$\varepsilon = [2 \pi (R_{pb} + R_w) - 2 \pi R_{pb}] / 2 \pi (R_{pb} + R_w)$

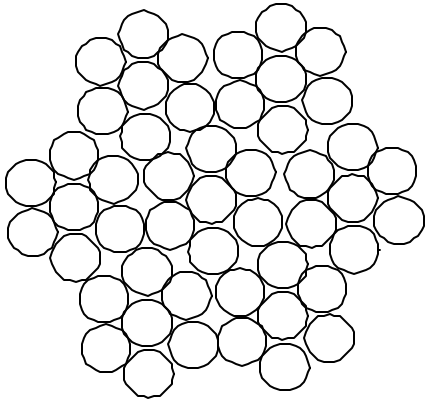
$\varepsilon = 2 \pi [(R_{pb} + R_w) - R_{pb}] / 2 \pi (R_{pb} + R_w)$

$\varepsilon = (R_{pb} + R_w - R_{pb}) / (R_{pb} + R_w)$

$\varepsilon = R_w / (R_{pb} + R_w)$ Final formula

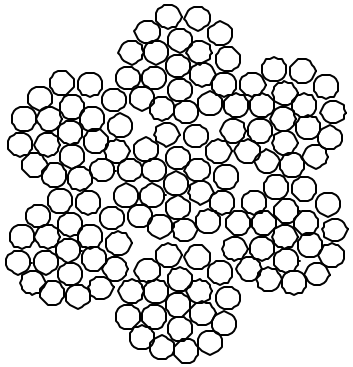
The amount of strain a cable undergoes when wrapped around a given radius directly depends on the radius of the individual wires making up the cable. The smaller the wire, the sharper the bend.

Cable Designs



7 X 7 CONSTRUCTION
7 BUNDLES MADE UP
OF 7 STRANDS EACH

Current Cable



7 X 19 CONSTRUCTION
7 BUNDLES MADE UP
OF 19 STRANDS EACH

Proposed Cable

Cable Comparison

- **Equal diameter**
- **Higher allowable stress**
- **More flexible**

Verification of Analysis

Proven 7X7 Failure	Stress	Comparison
Maximum Allowable	254,544 psi	100%
Large Pulley	290,859 psi	114%
Small Pulley	402,299 psi	158%
Bushing	515,971 psi	203%

Analytical Results

- **7X19 Cable operates below maximum limit on both the large and small pulley**
- **7X19 Cable operates above maximum limit over bushing radius without taking groove into account**

Conclusions

- **Over 3,000 pulls without failure of cable**
- **All the 7X7 cables have been replaced with 7X19 cables on all ASVs.**
- **ECP replacing the 7X7 cables with the 7X19 cables has been approved and an NSN has been assigned.**