

2010 SDSM&T Electric Snowmobile

Design Presentation

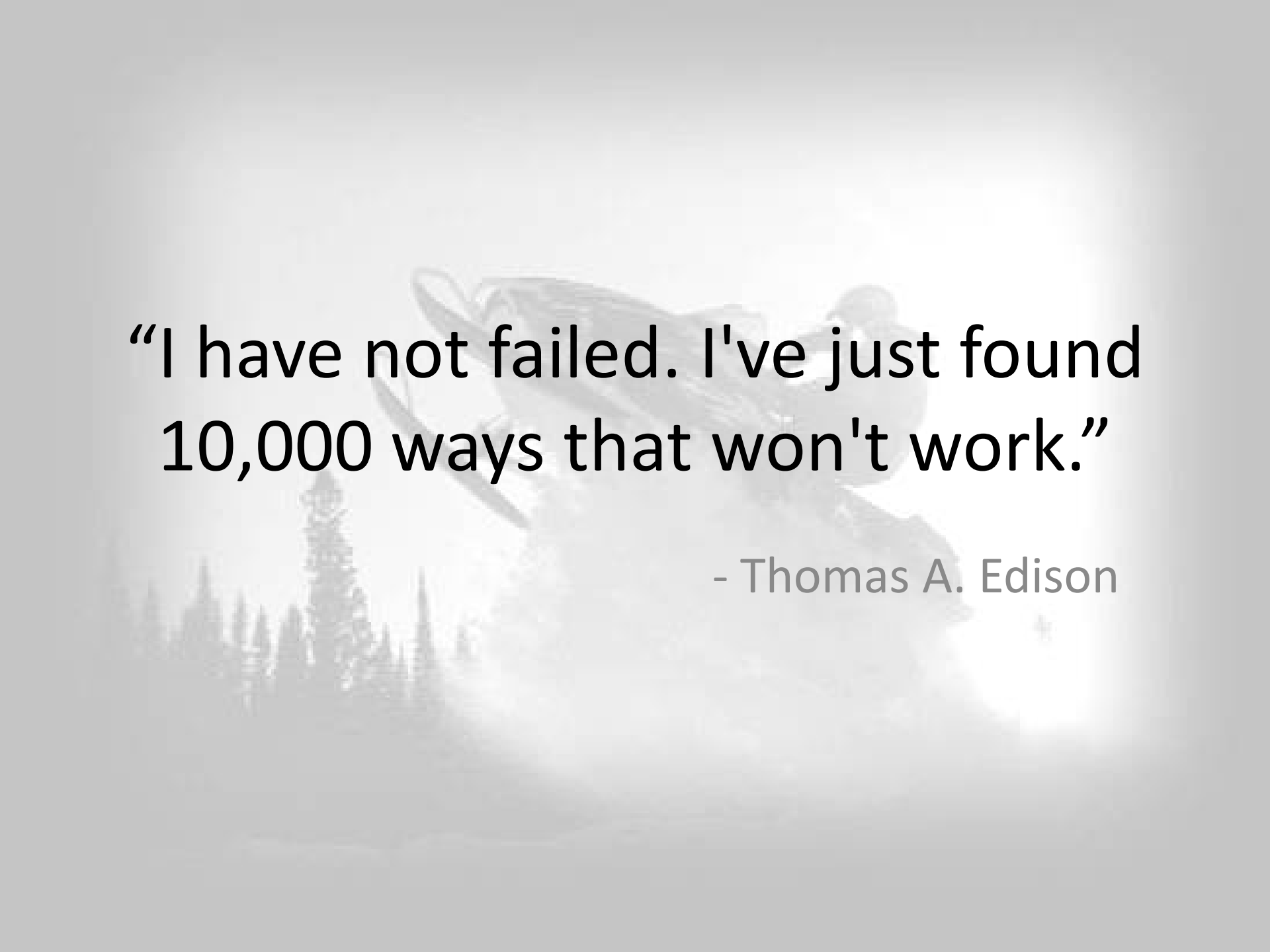
Charles Maupin and Erik Engelmeyer



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**“I have not failed. I've just found
10,000 ways that won't work.”**

- Thomas A. Edison

Outline

- Design Methodology
- Design Focus
- Technical Specifications
- Electrical System
- Mechanical System
- Serviceability
- Initial Testing
- Summary

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Design Methodology

- Safety First
- Engineered Elegance
- Commercial-Off-The-Shelf (COTS) Components
- Modular System Integration

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Design Focus

- Utility Electric Snowmobile to be Used at Summit Station, Greenland
- EV conversion Kit for Snowmobiles
- Modularity

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Technical Specifications

- 2008 Polaris IQ Touring FS
 - OEM Front and Rear Suspension
- Battery Pack
 - 96 V Nominal Pack Voltage
 - 30 – 3.2 V, 100 Ah Tenergy LiFePO4 Battery Cells
 - 100 Ah Pack Capacity
- NetGain Motors Impulse 9
- Curtis 1231C
- CMXDS Drive System
 - Synchronous Belt Drive

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Electrical System

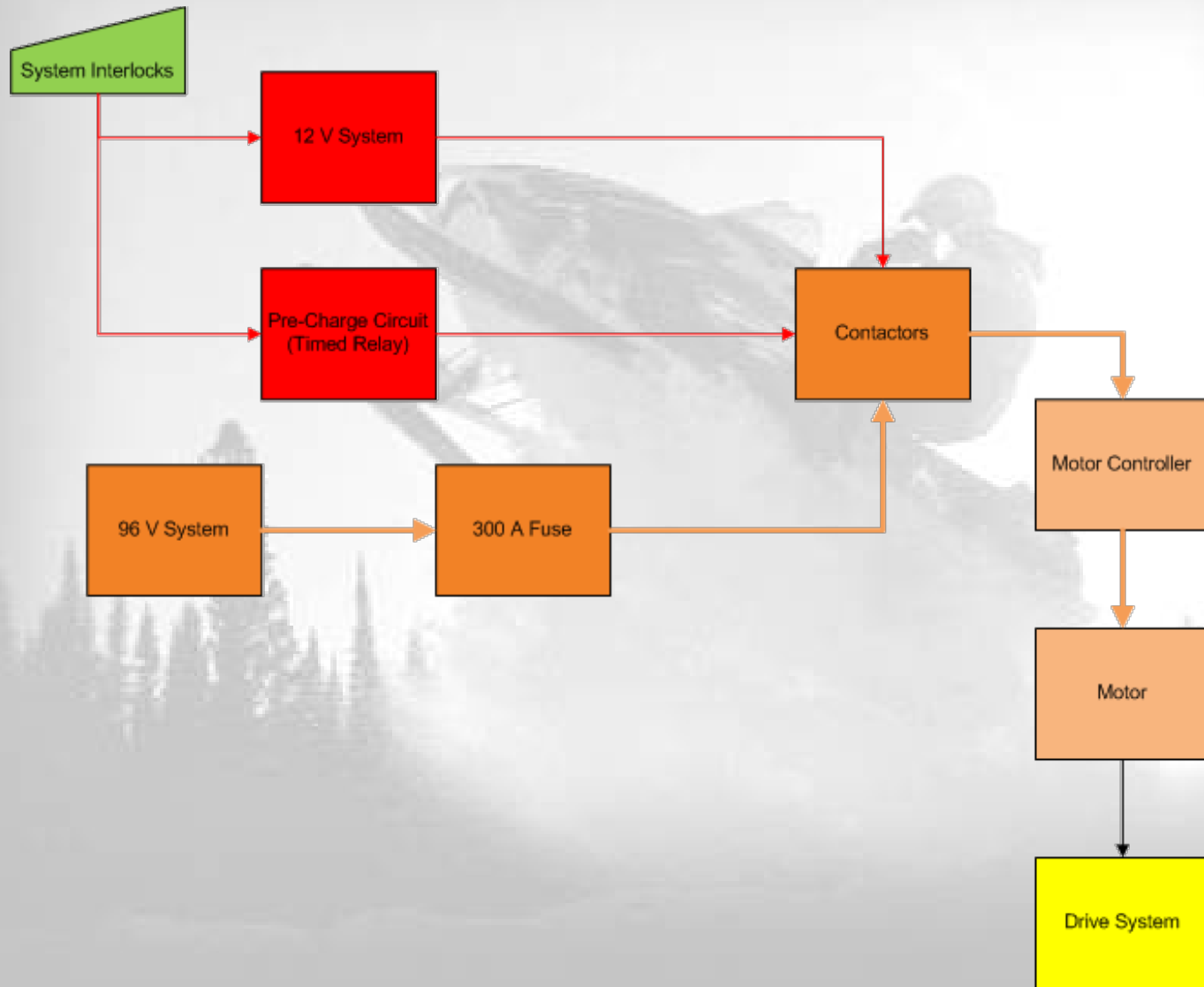
- Automated Pre-charge Circuit
- Isolated Systems
 - High Voltage
 - Low Voltage
- Stream Line Power Flow

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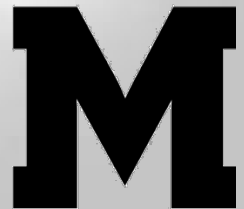


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Electrical System



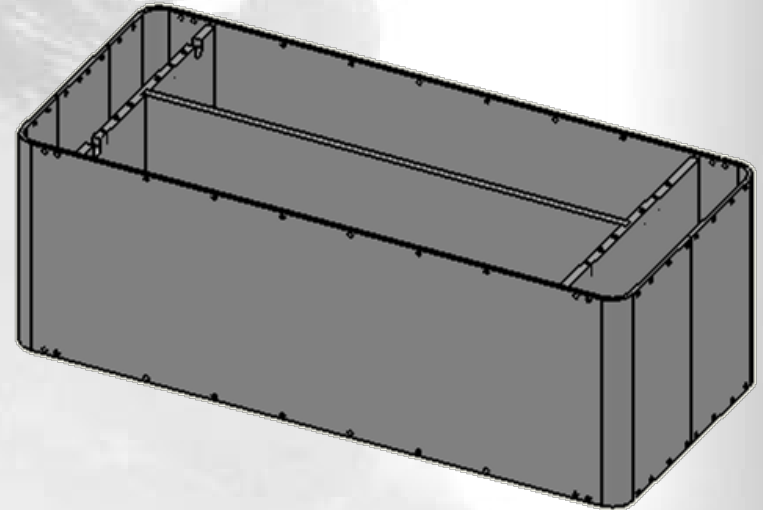
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Battery Box Design

- Modular Design
- Insulated Battery Banks
- Ultra-High-Molecular-Weight (UHMW) Polyethylene



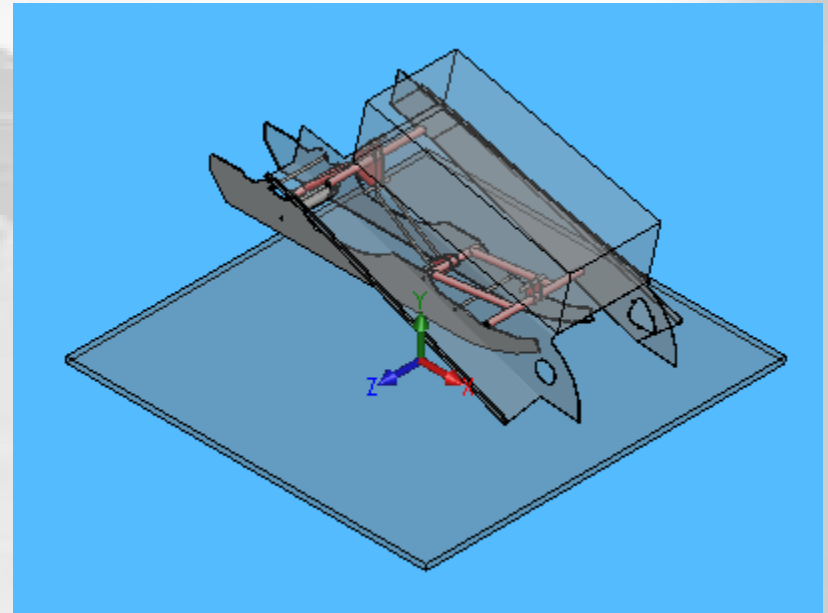
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Rear Suspension

- OEM Suspension
- SolidWorks Simulation Modeling
- Centralized Center of Gravity
- Instability with Non-Centralized



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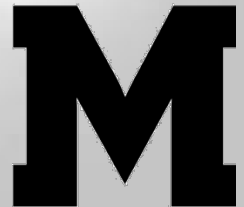
Drive System

- Crazy Mountain Xtreme CMXDS
 - Synchronous Drive Belt
 - 2:1 Gear Ratio
 - Relocated Brake to Track Shaft for Improved Safety
 - 35 lb Weight Reduction
 - 29% Rotating Component Reduction
 - Increased Efficiency



Source: Crazy Mountain Xtreme

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Serviceability

- Modular Design
- Component Replacement
 - Electric Motor (45 Minute Replacement)
 - Motor Controller (30 Minute Replacement)
- System Replacement
 - Energy Storage System (1 Hour, 30 Minute Replacement)
 - Electric Motor and Motor Controller (45 Minute Replacement)

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Initial Testing

A person wearing a helmet and winter gear is riding a snowmobile through a snowy, wooded area. The snowmobile is kicking up a large cloud of snow, partially obscuring the rider. The background shows a line of evergreen trees under a bright, overcast sky.

- Limited Testing
 - Component Delays
 - Weather Conditions
- 3 Mile Range on 15% Decrease in State of Charge
- 60 Mile per Hour Top Speed (on Asphalt)

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Thank You
Questions??

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