**WHO**

**SYSNOM:** ONR  
**Sponsoring Program:** Code 33  
**Transition Target:** EM Rail Gun  
**TPOC:** Mr. Donald Hoffman  
**Notes:** Additional Benefits/Goals:
  - TRL/MRL 5 @ 2 Qtr 2019
  - TRL 5/MRL 6 @ 2 Qtr 2020

**NEFWCF - Nanomaterial Enhanced Filament Wound Composite Flywheel**  
**DOD - Department of Defense**  
**CNT - Carbon Nanotube**  
**FEM - Finite Element Model**  
**INP - Innovative Naval Prototype**

**WHAT**

**Operational Need and Improvement:**  
The US Navy is looking to develop a composite flywheel energy storage system with improved capacity through CNT material integration for ultra-high density megawatt-scale pulse load power.  
SDC’s CNT integration manufacturing technique improves the strength of composite flywheel materials by up to 30% to avoid critical failure modes and improve maximum energy storage and power delivery.

**Specifications Required:**

- Energy storage: 50 MJ  
- Power delivery: 5+ MW  
- Minimum usage lifetime: 60000 hours, Support >20000 cycles  
- Power storage density > 3 MW/m3  
- Continuously online charge-discharge of up to 50% duty cycle  
- 26” shipboard hatchable design for easy removal or installation of components  
- Modular installation and operation capability to multi-MW levels

**Technology Developed:**

- SDC has designed a NEFWCF rotor that meets all Navy requirements  
- Design is scalable for high production rates  
- Provides 30% energy storage improvement over current technology

**Warfighter Value:**

- Improved energy storage/pulse power delivery  
- Modular design allows for mission specific configurations  
- Easy installation and reconfiguration through hatchable design  
- Interference fit design reduces manufacturing cost  
- Quick design reconfiguration for new systems through proven and tested FEM

**WHEN**

**Contract Number:** N68335-17-C-0135  
**Ending on:** April 12, 2019

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Risk Level</th>
<th>Measure of Success</th>
<th>Ending TRL</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Design Review (PDR)</td>
<td>N/A</td>
<td>Design review with ONR buy off</td>
<td>3</td>
<td>3rd QTR FY18</td>
</tr>
<tr>
<td>Initial Test Article Failure Test</td>
<td>N/A</td>
<td>Article performance compared to FEM</td>
<td>4</td>
<td>3rd QTR FY18</td>
</tr>
<tr>
<td>Critical Design Review (CDR)</td>
<td>Med</td>
<td>Design review with ONR buy off</td>
<td>4</td>
<td>4th QTR FY18</td>
</tr>
<tr>
<td>Prototype Manufacture and Preliminary Testing</td>
<td>High</td>
<td>Successful testing correlated with model</td>
<td>5</td>
<td>2nd QTR FY19</td>
</tr>
<tr>
<td>High Acceleration and Cyclic Fatigue Testing</td>
<td>High</td>
<td>Successful testing</td>
<td>6</td>
<td>1st QTR FY20</td>
</tr>
</tbody>
</table>

**HOW**

**Projected Business Model:**

- SDC will manufacture NEFWCF composite rotors in our state-of-the-art 70,000 sqft. composite manufacturing production facility  
- Production rate is expected to begin at 100 rotors/year for the first year and scale up to 400 rotors/year or market required rate over three years  
- SDC will assemble deliverable assemblies at our production facility  
- SDC will sell rotor assemblies to the pulse power system prime contractor  
- SDC will work with the pulse power system prime to coordinate integration strategies

**Company Objectives:**

- Integrate ultra-high-speed/acceleration NEFWCF rotor technology into future pulsed power systems  
- Secondary objective is to identify alternative insertion opportunities including high-speed rotary structures

**Potential Commercial Applications:**

- Power grid support for alternative power generation (solar, wind, etc.)  
- Performance and commercial transport vehicle power and stability  
- Construction equipment remote power

**Contact:** Jeremy Senne, Principal Investigator  
**jsenne@sdcomposites.com**  
**888-751-0450 x 126**