Briefing Chart

NASA SBIR/STTR Technologies

A Hybrid Machining Approach for Affordable CVD SiC Optics
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Proposal No.: S2.05-9744

## Background and Phase I Results

- Large aperture, lightweight optical mirror technologies are critical for the future of lightweight telescopes
- Cost-effective manufacturing techniques to pre-finish the desired material (CVD SiC or single crystal Si) have not been sufficiently developed
- During our Phase I project, we established the feasibility of the low-rate step of our hybrid machining approach
- Produced a surface with 45 nm $R_a$
- Demonstrated cost savings relative to a RAP-based and laser ablation based process of 30% and 46%, respectively

**Expected TRL Range at the End of Contract (1-9): 5**

Results from Phase I Machining Tests. This result demonstrates the potential of our approach to produce an optical (or near-optical) quality surface in CVD SiC using single-point diamond turning (SPDT). A detailed cost study demonstrated that our hybrid machining approach will reduce the cost of fabricating a finished 250 mm diameter mirror by 30% with respect to reactive atom plasma (RAP) based-process and by 46% with respect to a laser ablation-based process.

## Phase II Objectives and Approach

Our Phase II Objectives are:

- Optimize the hybrid machining approach
- Evaluate the performance
- Demonstrate on prototypical NASA configuration

Our Phase II Technical Tasks are:

- Task 1: Set Specifications
- Task 2: Develop Process
- Task 3: Test, Evaluate, and Optimize
- Task 4: Demonstrate and Deliver

## Schedule and Deliverables

Task 1 – Complete by 3/09
Task 2 – Complete by 11/09
Task 3 – Complete by 6/10
Task 4 – Complete by 12/10

## NASA & Commercial Applications

Lightweight telescopes, commercial aircraft, automobiles, cutting tools, artificial joints

## Subcontractors/Partners

Technical Consultant: Professor John Patten, Western Michigan University
Partner: Edge Technologies
Commercialization Partner: Precitech