RESEARCH & DEVELOPMENT

Creare

Low-Cost, Environmentally Friendly Beryllium Manufacturing

Phase I SBIR Project

TPOC: Dr. Douglas Deason, Army SMDC

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SMD Conference and Exhibition
Von Braun Center
Huntsville, Alabama

Presented by:
Jay C. Rozzi, Ph.D. Creare

Presentation Outline

- Introduction to Creare
- The Goal and Approach
- The Innovation
- Features and Benefits
- Phase I Technical Achievements
- Program Overview

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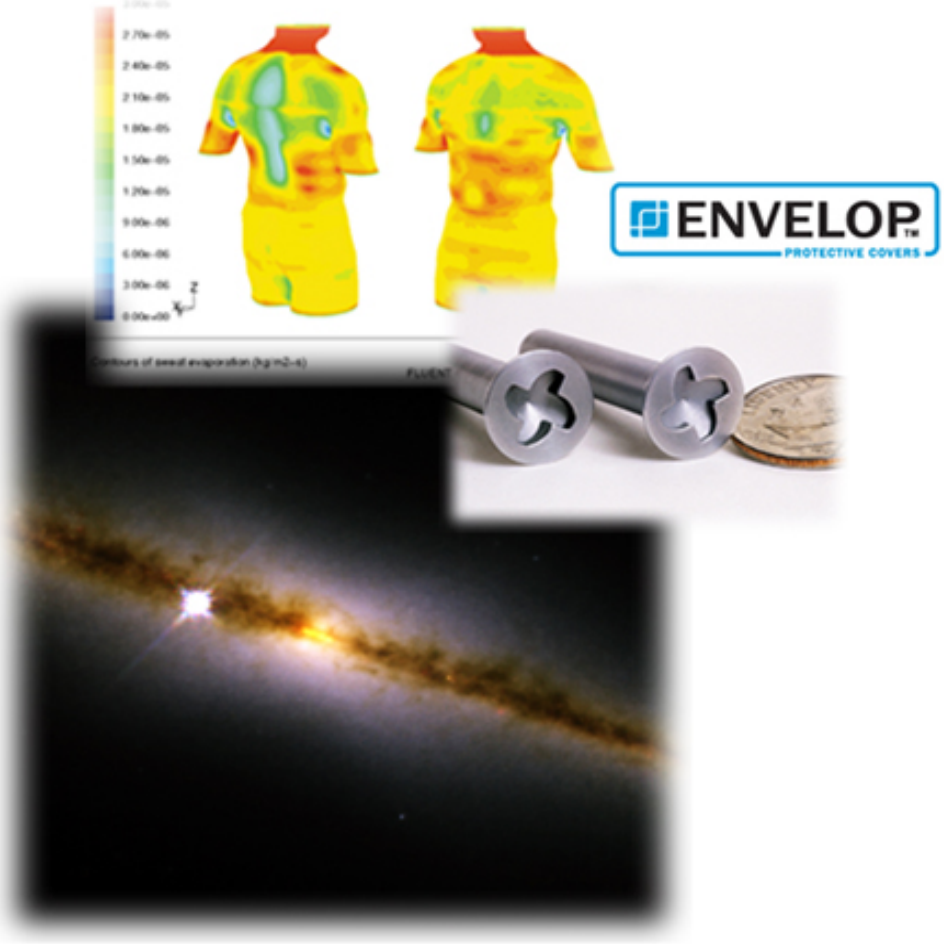
Company Profile

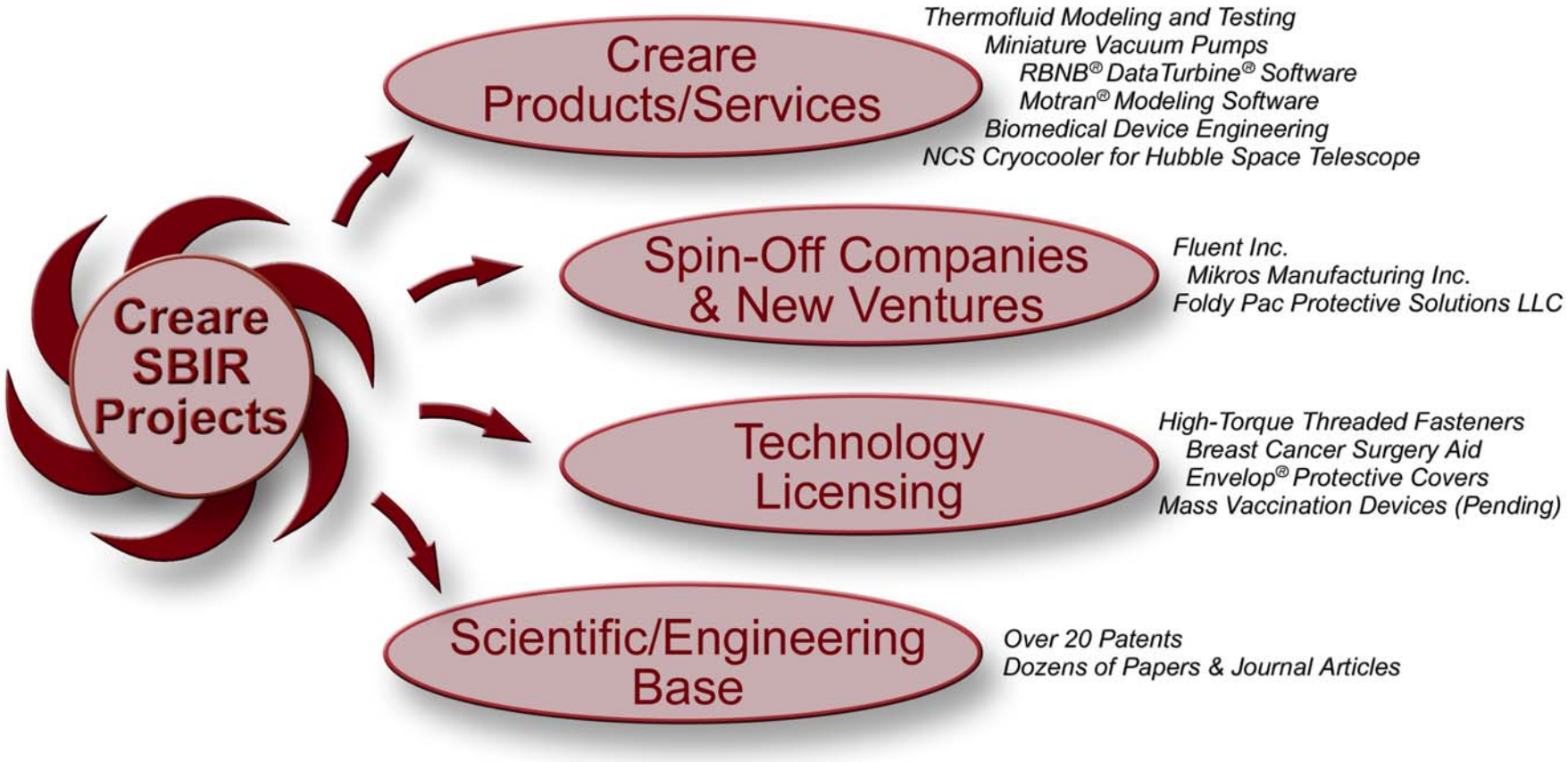
- Established in 1961
- Located in Hanover, NH
- Owned by Partnership of Engineers
- Diverse Technical Expertise
- Extensive Facilities
- 100 Employees

Corporate Accomplishments

- Patents
- Spin-off Companies
- Licenses
- Professional Awards



Commercialization



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BIOMEDICAL APPLICATIONS
CRYOGENICS
FLUID DYNAMICS & HEAT TRANSFER
SENSORS & CONTROLS
SOFTWARE & DATA SYSTEMS
MANUFACTURING TECHNOLOGY

Sampling of Relevant Projects

- **Environmentally Friendly Manufacturing**
- **Indirect Cutting Tool Cooling**
- **High-Speed Titanium Milling**
- **Laser-Assisted Machining of Super-Hard Ceramics for Missile Ogives**
- **Robotic Control of Titanium Welding**
- **Plasma Spraying**
- **Etc.**

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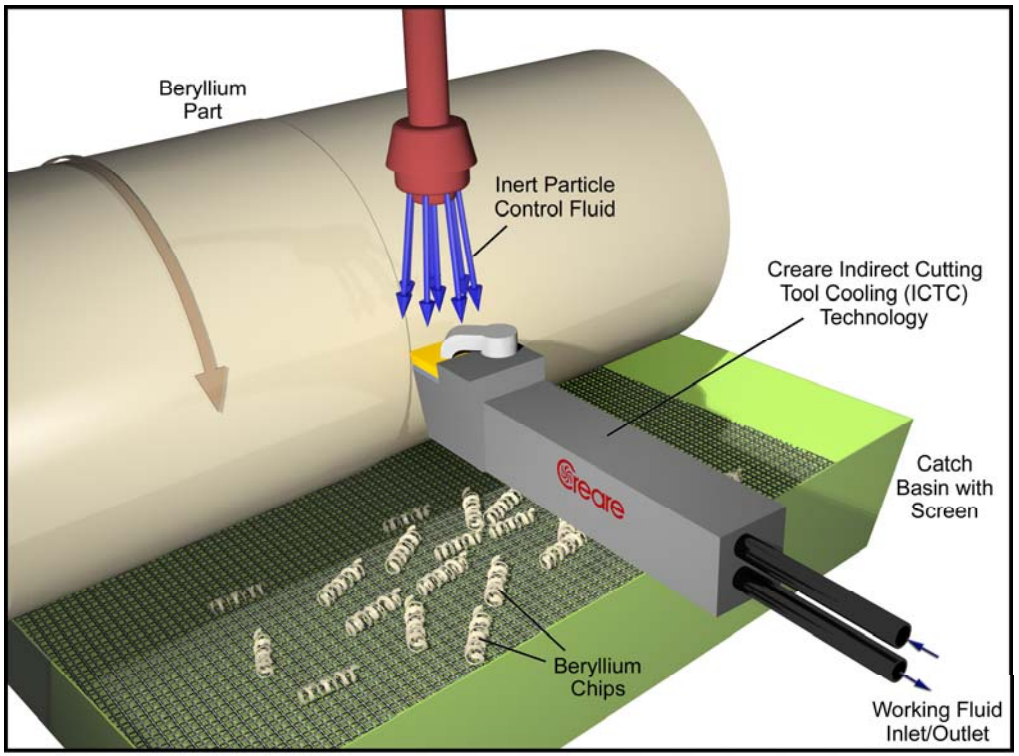
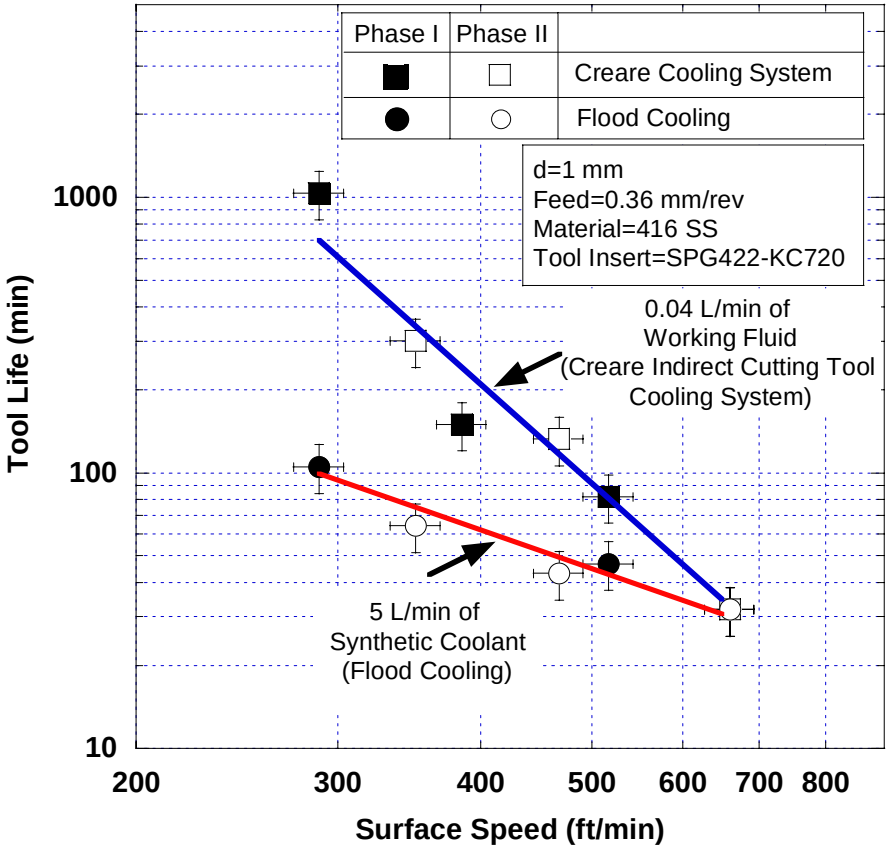
- **The Goal**
  - To develop a Beryllium Machining System (BMS) that reduces the total acquisition cost for key hardware
- **The Approach**
  - Use indirect cutting tool cooling to eliminate the need for conventional coolants and potentially increase material removal rate (MRR)
  - Combine our tool cooling approach with a particle control system that is based on an inert fluid
  - Develop a retro-fit BMS for existing machine tools
  - Commercialize and transfer the technology

The Innovation

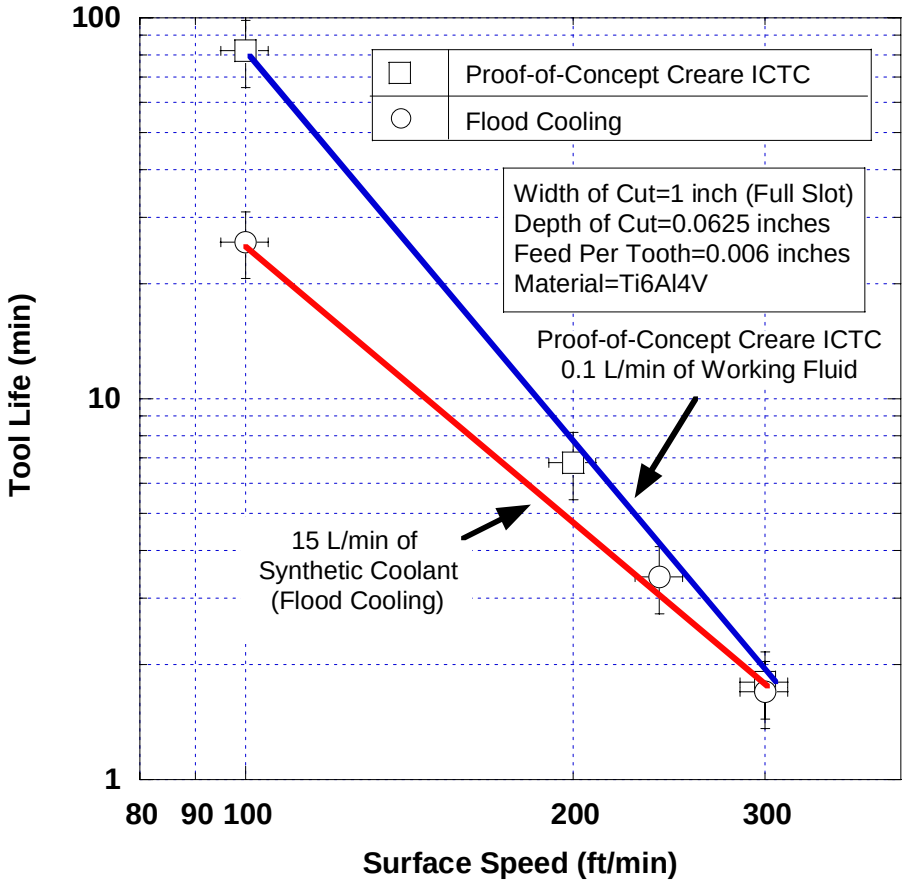
- **Indirect Cutting Tool Cooling (ICTC) system removes heat from the cutting edge much more efficiently than a conventional flood coolant**
- **Increased machining speeds-reduced cost**
- **Elimination of coolants and infrastructure**
- **Less costly scrap recovery**
  - **Perchloroethelyene is used to clean and degrease coolant-laden chips**
  - **Dry cleaning fluid, known carcinogen**



Proven Results



Lathe Turning



Milling

Features and Benefits

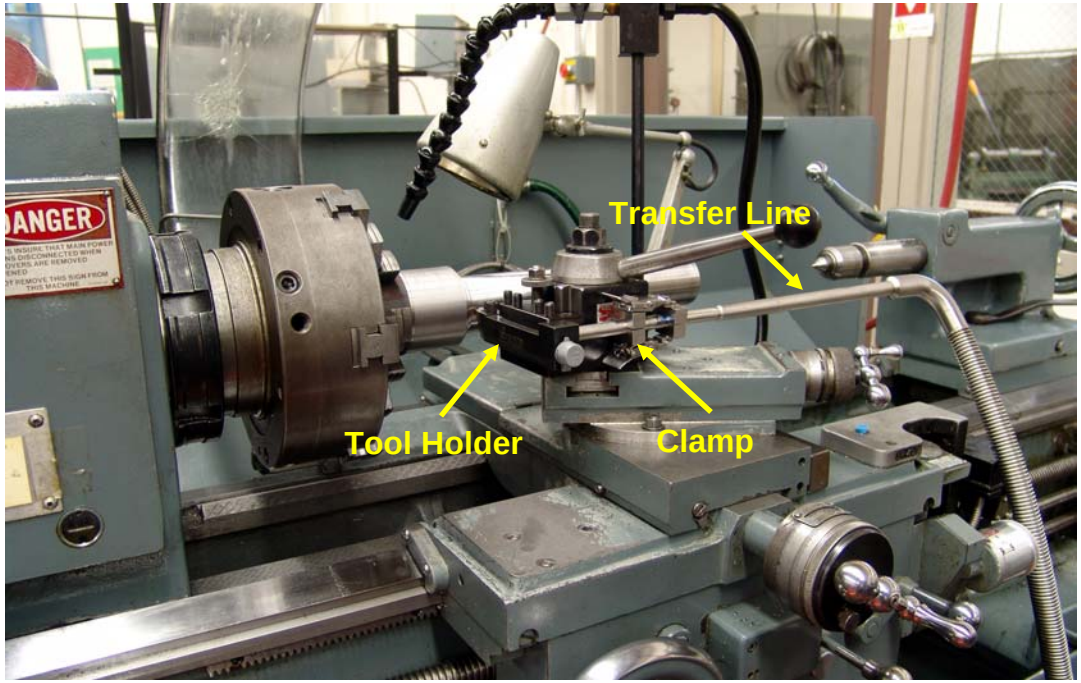
Features, Advantages, & Benefits of Creare's Beryllium Machining System (BMS)		
Features	Advantages	Benefits
Indirect Cooling of Cutting Tool	(1) Effectively cools near the tool-chip interface (2) Low flow rate of working fluid required (3) Easy to implement on new or existing machine tools	(1) Dramatic improvements in processing speed (2) Reduced production costs (3) Low capital and operating cost
Benign Particle Control Fluids	(1) Lowers cost of scrap recovery (2) Increases available rebate from material supplier	(1) Improved worker health and safety (2) Lower costs
"Fluidless" Cutting Solution	Dramatically reduces or eliminates the use of toxic and costly cutting fluids	(1) Eliminates potentially toxic mists (2) Eliminates toxic solvents currently needed to clean scrap
Compact System	Easily installed on an existing machine tool or integrated with a new tool	(1) Simple integration (2) Enables new possibilities for beryllium products

Phase I Technical Achievements

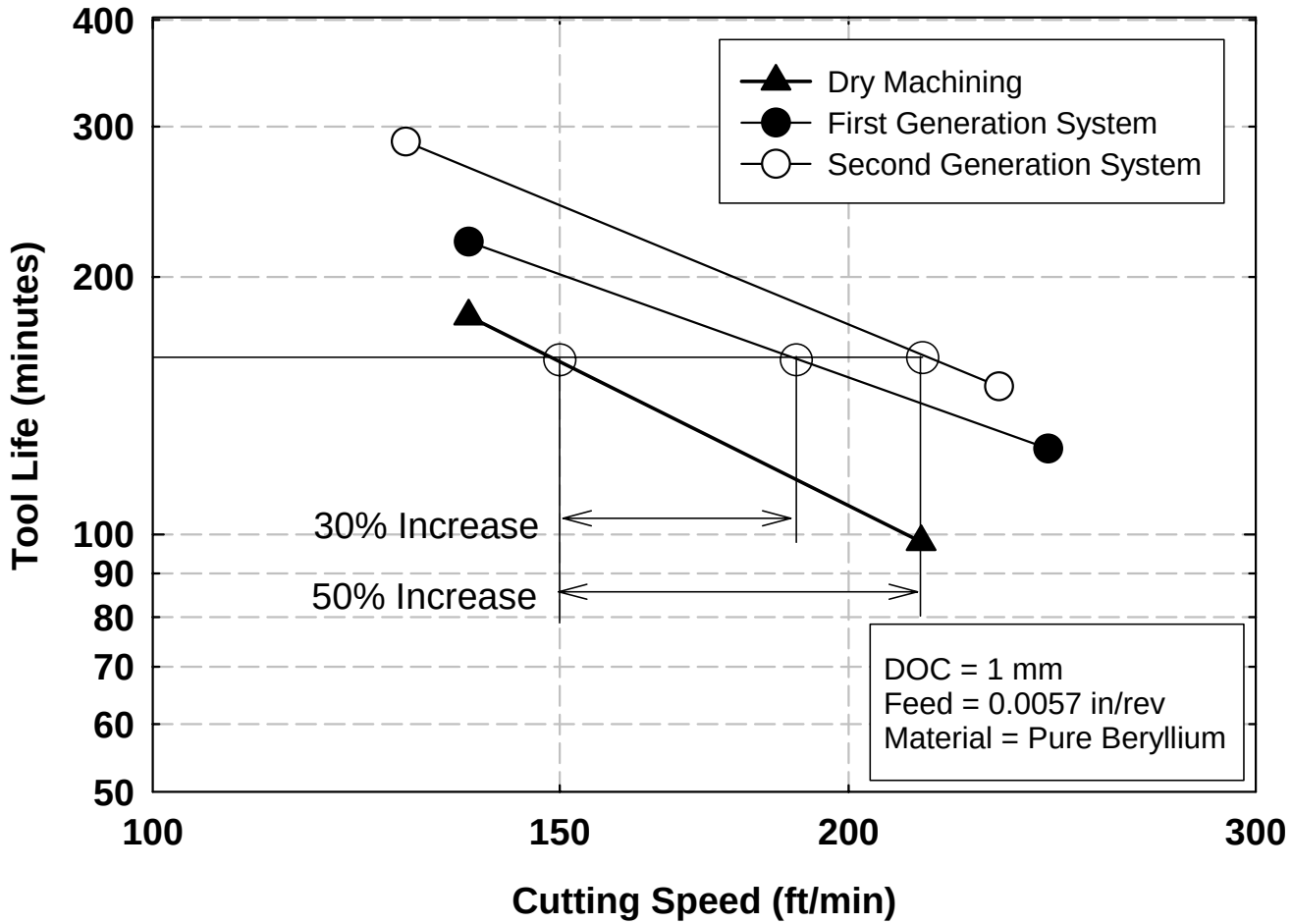
- **Fabricated a proof-of-concept system for testing at beryllium manufacturer**
- **Machining tests on pure beryllium at roughing conditions**
- **Increased processing speed by 50% with second generation device**
- **Including cost of working fluid and other fixed costs, translates to a 30% machining cost reduction per part**
- **Future tests will focus on increasing tool life/processing speed to achieve greater cost savings**

Phase I Technical Achievements

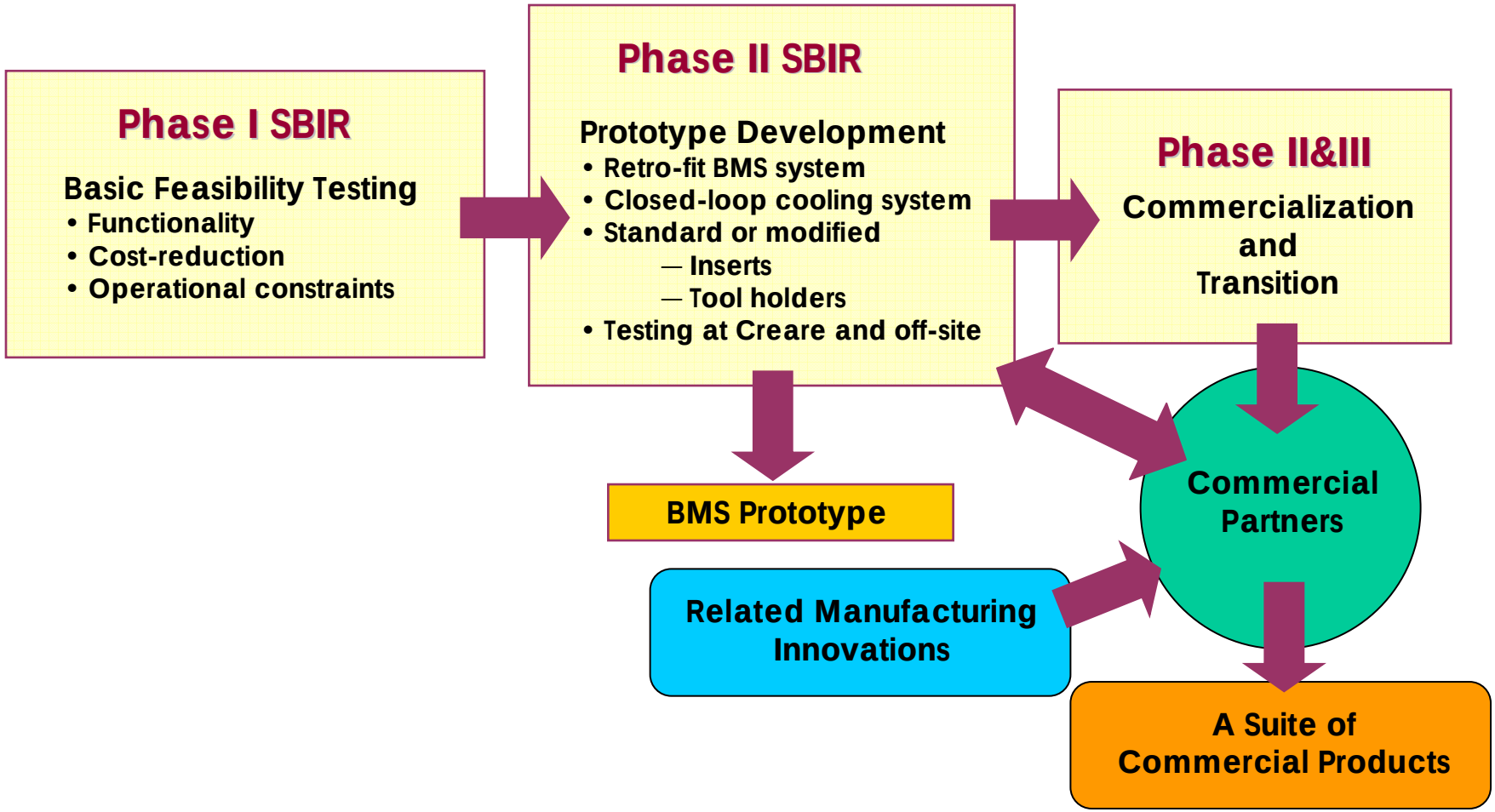
- Majority of testing on a manual lathe at premier beryllium manufacturer (shown at Creare)
- Some testing on CNC-based lathes planned
- Additional internal cooling configurations to optimize performance and prepare for Phase II
- Teamed with key supplier of metal working tools for commercialization



Phase I Technical Achievements



Program Overview



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Address: P.O. Box 71, 16 Great Hollow Road, Hanover, NH 03755
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