

Department of the Navy SBIR/STTR Transition Program

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ONR Approval # 43-2203-16

Topic # N13A-T012

Mechanical Property Characterization and Modeling for Structural Mo-Si-B Alloys for High Temperature Applications
Imaging Systems Technology

WHO

SYSCOM: ONR

Sponsoring Program: Propulsion Materials Program

Transition Target: Jet engine hot gas stream static components.

TPOC:

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Other transition opportunities:

AFRL/RXCM has expressed interest in Mo-Si-B and has purchased small test panels for the CRDE (Continuous Rotary Detonation Engine) test rig.



F-35B Lightning II , 03/08/2016, 160308-M-BL734-845,
U.S. Marine Corps Photo by Cpl. Jonah Lovy/Released

WHAT

Operational Need and Improvement: Currently Mo-Si-B can only be manufactured by a handful of lab scale production techniques. Transitioning Mo-Si-B to a "production ready" state requires development of a robust scaleable process.

Specifications Required: Ultimate Tensile Strength 60ksi.
Tensile Strength Characterization RT to 1370 degrees C.
Static Oxidation Resistance between 815 to 1370 degrees C.

Technology Developed: The team is investigating controlled atmosphere spray drying and post processing steps of the Mo-Si-B alloy. These techniques enable the ability to produce controlled microstructure as well maintain quality in the scaled process.

Warfighter Value: US military aircraft can realize significant (20-40%) fuel savings from jet engine components made of Mo-Si-B materials. Aircraft will benefit from tough, oxidation resistant alloy composites, usable in air to 1370 degrees C.

WHEN

Contract Number: N00014-15-C-0069 **Ending on:** January 30, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Oxidation resistance at 1,200 degrees C	N/A	300 mg/cm ² weight loss at 500 hours.	3	January 2012
Oxidation resistance at 1,300 degrees C	N/A	20 hour weight loss rate below 0.05 mg/cm ² -hr	3	May 2015
Small billet production	N/A	Billet over 200g with density beyond 95% of theoretical	3	March 2016
Test of Mo-Si-B panel on Continuous Rotary Detonation Engine.	N/A	Component survived the full duration of the test at maximum temperature.	5	March 2016
Testing of Mo-Si-B component on static jet engine rig	Med	Component meets or exceeds required test metrics	7	June 2017

HOW

Projected Business Model: Imaging Systems Technology (IST) will team with prime contractors to supply raw materials for part manufacturing.

Company Objectives: Imaging Systems Technology desires to become a strategic supplier of the Mo-Si-B technology and finished alloy powder to the aviation industry.

Potential Commercial Applications: Components of future engine designs such as the Continuous Rotary Engine (CRDE), Current engine combustor panels, flaps and seals are likely applications of the Mo-Si-B technology.

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