

Advanced Deposition Capability for Oxidation & Corrosion Protection Coatings, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

NASA's long range goals of reducing fuel consumption by 30% and increasing fuel efficiency by 35% can be partially accomplished through increasing the operation temperatures of gas turbine engines. The advent of advanced alloys, coatings, cooling technologies and ceramic components has created the potential for significant increases in the hot section of these engines; however, these advances will also lead to elevated temperatures in other regions of the engine. For example, the turbine disk section would also need to operate at increasingly higher temperatures that would subject it to oxidation and hot corrosion degradation mechanisms not currently experienced. One approach to enhance the temperature capability of these systems is through the incorporation of environmental protective coatings. Research is proposed here to employ advanced coating manufacturing techniques designed to enable the affordable application of environmental protective coatings having enhanced resistance to hot corrosion and oxidation. Advanced testing approaches will be used that simulate real-world conditions and demonstrate the performance advantages of the deposited coatings. The coating systems will be applied in this work onto coupons and components to demonstrate coating capability and allow simulated engine environment testing in follow-on programs.

ANTICIPATED BENEFITS

To NASA funded missions:

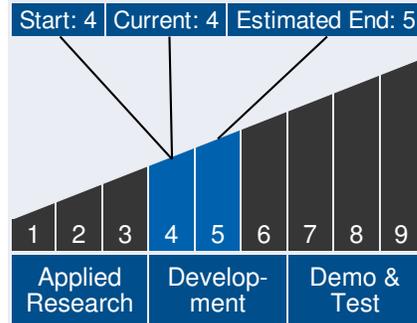
This research is anticipated to result in advanced coatings for turbine disk components that provide higher temperature capability than is possible with uncoated alloys. These advancements will help turbine disk components survive the high temperature operation desired for enhanced thrust and fuel efficiency goals. These advances will potentially benefit all gas turbine engines requiring greater performance and efficiency. In addition, this research specifically supports the goals of NASA's



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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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Aeronautics Research Mission Directorate (ARMD) which seeks to expand the boundaries of aeronautical knowledge for the benefit of the nation and the broad aeronautics community and in particular NASA ARMD's Subsonic Fixed Wing Project which has a goal of conducting long term research in technologies which promote, among other things, higher performance and higher efficiency gas turbine engines.

To the commercial space industry:

The development of high temperature turbine disk coatings using DVTI's advanced coatings processing techniques will enable not only new environmentally-protective for use in future military and commercial aircraft platforms, but also new deposition processes to enable affordable coating application onto engines components. DVD coaters are envisioned to be small with low capital costs and tailorable volumes so that small volumes of parts can be deposited at low cost. The soft vacuum required and the high deposition rates also have the potential to facilitate low cost, assembly line like part coating for some geometries. The non-line-of-sight capabilities of this approach enable coatings to be applied onto complex components thus expanding their use. Other components which may require enhanced environmental protection, such as the below platform region of turbine blades, represent additional application areas for this technology.

Management Team *(cont.)*

Project Manager:

- Jack Telesman

Principal Investigator:

- Derek Hass

Technology Areas

Primary Technology Area:

Materials, Structures, Mechanical Systems and Manufacturing (TA 12)

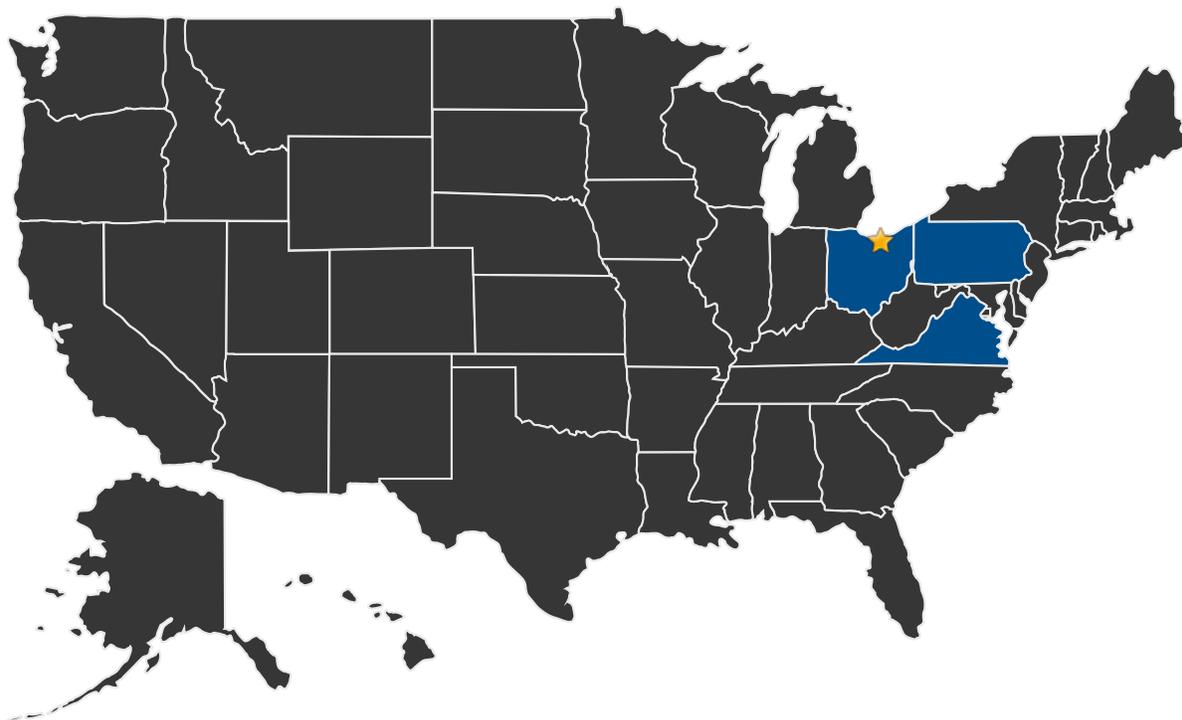
- └ Materials (TA 12.1)
 - └ Materials for Extreme Environments (TA 12.1.4)
 - └ Coatings (TA 12.1.4.3)

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U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States With Work

★ **Lead Center:**
Glenn Research Center

Other Organizations Performing Work:

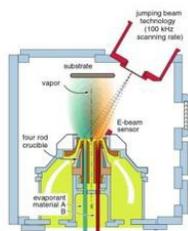
- Directed Vapor Technologies International, Inc (Charlottesville, VA)
- University of Pittsburgh

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IMAGE GALLERY



Novel processing technique used to apply advanced environmental coatings onto turbine engine disks to enable high temperature use.

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DETAILS FOR TECHNOLOGY 1

Technology Title

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