Task Order Plan Request

Task Order Title:
Technology Opportunity Sheets (TOPS)
Outline Agreement Number: TBD
Task Order Number: TBD

Scope/Description:

1. **TOPS (Technology Opportunity Sheets) (SOW 3.12).** The contractor shall prepare TOPS in compliance with the specified agency format for Glenn's patented technologies. The contractor shall develop the text using existing information and inventor interviews. Images shall be obtained from inventors or stock. All text and images shall be submitted in the appropriate format, and resolution for NASA website uploads. ***The contractor shall deliver approximately 20 TOPS over the period of performance.***

Schedules and Deliverables:

1. Deliver approximately 20 Technology Opportunity Sheets by September 30, 2015
2. Provide management and communications support, including reporting requirements (throughout period of performance).

Reporting Requirements:

1. Monthly updates on status of each major milestone.
2. Written report at the conclusion of each major milestone.
3. Monthly breakdown of labor categories, hours utilized and dollars, including task cumulative.

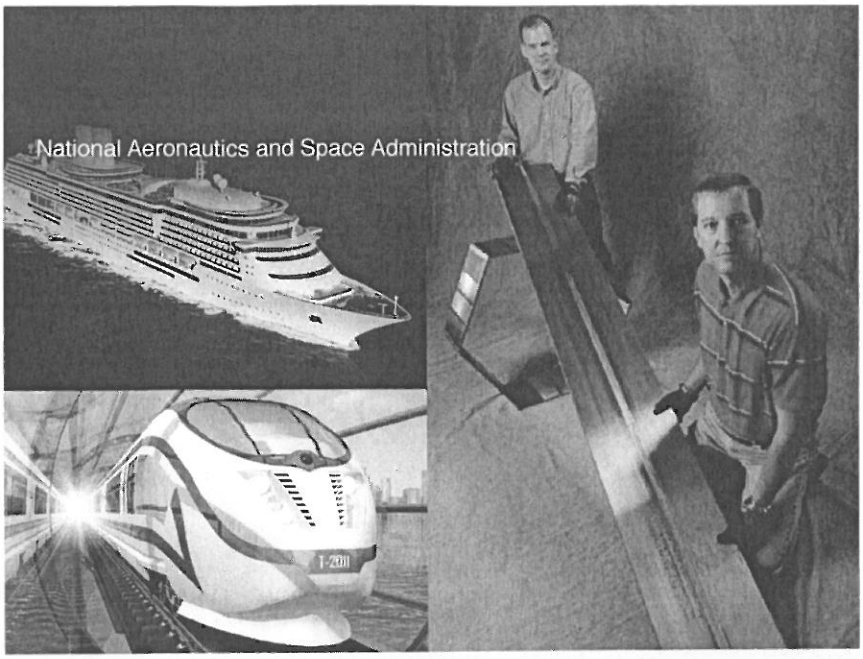
Travel Requirements:

No travel is expected for this task.

Period of Performance:

Contract award through September 30, 2015

*Two Technology Opportunity Sheets (TOPS) samples Included for reference



Materials and Coatings

Ultrasonic Stir Welding

A new solid-state weld process for better weld quality and longer tool life

NASA Marshall Space Flight Center (MSFC) developed Ultrasonic Stir Welding (USW) to join large pieces of very high-strength metals such as titanium and Inconel. USW, a solid-state weld process, improves current thermal stir welding processes by adding high-power ultrasonic (HPU) energy at 20 kHz frequency. The addition of ultrasonic energy significantly reduces axial, frictional, and shear forces; increases travel rates; and reduces wear on the stir rod, which results in extended stir rod life. The USW process decouples the heating, stirring, and forging elements found in the friction stir welding process allowing for independent control of each process element and, ultimately, greater process control and repeatability. Because of the independent control of USW process elements, closed-loop temperature control can be integrated into the system so that a constant weld nugget temperature can be maintained during welding.

BENEFITS

- Improved weld properties
- Increased tool life (stir rods, bushings, containment plates)
- Automated closed-loop feedback control
- Potential for integration into robotic welders
- Reduced axial and shear consolidation forces
- Potential for handheld version
- Reduced friction without lubricants

APPLICATIONS

The technology has several potential applications:

Aerospace – hardware for severe environments, launch vehicles, aircraft

Automotive –pistons, struts, vehicle structure

Marine – shipbuilding, platforms

Civil – bridges, trains, pressure vehicles

technology solution

THE TECHNOLOGY

Ultrasonic Stir Welding is a solid state stir welding process, meaning that the weld work piece does not melt during the welding process. The process uses a stir rod to "stir" the plasticized abutting surfaces of two pieces of metallic alloy that forms the weld joint. Heating is done using a specially designed induction coil. The control system has the capability to pulse the high-power ultrasonic (HPU) energy of the stir rod on and off at different rates from 1-second pulses to 60-millisecond pulses. This pulsing capability allows the stir rod to act as a mechanical device (moving and stirring plasticized nugget material) when the HPU energy is off, and allowing the energized stir rod to transfer HPU energy into the weld nugget (to reduce forces, increase stir rod life, etc.) when the HPU energy is on. The process can be used to join high-melting-temperature alloys such as titanium, Inconel, and steel.

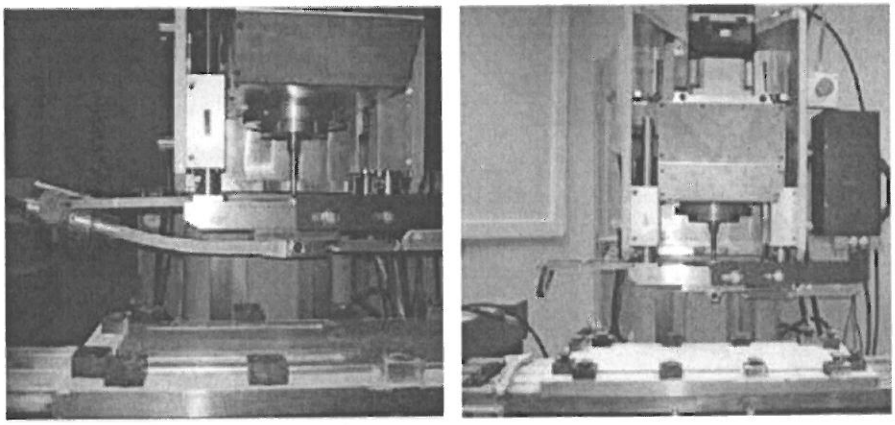


FIGURE – Photographs of the Ultrasonic Stir W elding equipment

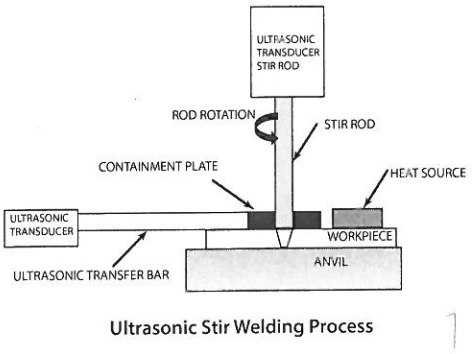


FIGURE – Diagram of the basic components of the Ultrasonic Stir W elding technology

PUBLICATIONS

MFS-32859-1, US 8,393,520, Pulsed ultrasonic stir welding system

MFS-32859-1-DIV, US 8,393,523, Pulsed ultrasonic stir welding method

MFS-32105-1-DIV, US 7,568,608, Ultrasonic stir welding process and apparatus

MFS-32895-1, Nonprovisional patent filed, Ultrasonically-assisted thermal stir welding system

More Information

National Aeronautics and Space Administration

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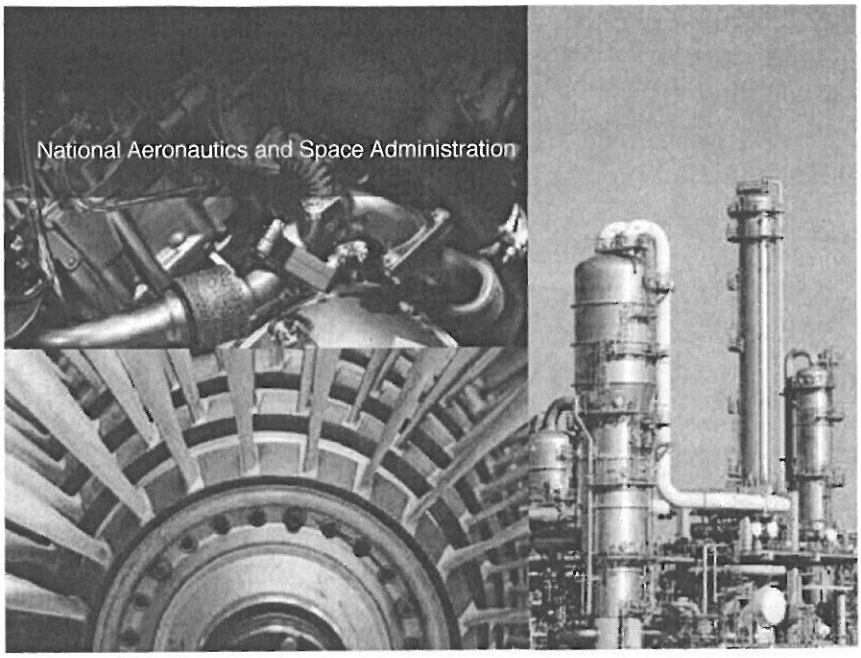
NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

TOP2-010-030514



Mechanical and Fluid Systems

Advanced Magnetostrictive Regulator and Valve

An all-electric, highly reliable and accurate regulator and valve system

NASA Marshall Space Flight Center has developed a set of unique magnetostrictive (MS) technologies for utilization in pressure regulation and valve systems. By combining MS-based sensors with a newly designed MS-based valve, Marshall has developed an advanced MS regulator. This innovative approach provides both a regulator and a valve with rapid response times. In addition, the components are lightweight, compact, highly precise, and can operate over a wide range of temperatures and pressures. A prototype of the MS valve has been developed and NASA is seeking partners for licensure of this novel technology.

BENEFITS

- Fast Response: Offers precise operation with response times up to an order of magnitude faster than current technologies.
- Increased Reliability: By using fewer moving parts and no external or dynamic seals, friction, wear, and leaks are reduced.
- Increased Redundancy: Novel design allows alternate parallel pathways to be implemented.
- Self-Adjusting: Continuously senses conditions to maintain precise control and reduce setpoint drift.

technology solution

THE TECHNOLOGY

Magnetostrictive materials used in valves developed at Marshall allow the valve to be opened and closed via application of a magnetic field to the outside of the valve envelope. This process contains all moving parts inside the pressure shell, eliminating the need for feedthroughs or mechanical seals. Marshall's valve concept moves the valve coil outside a fluid boundary, keeping the coil from contacting the fluid under flow. This concept features a small valve design – no greater than 1/16" OD, and accommodates a digital design whereby multiple elements are used to accommodate larger throughput needs. This results in a highly effective, redundant valve system.

Building on this concept, Marshall's MS regulator is comprised of the MS valve element, an MS-based pressure transducer, and a servo-circuit to control the current to the valve coil. This all-electric design enables highly accurate and highly reactive regulation. As the current changes, the magnetic field strength adjusts, causing the valve poppet to reposition, bringing the pressure back to the setpoint.

NASA developed the regulator for controlling flow in rocket propulsion systems. The technology may also be useful in other applications that require mixing or throttling gas supplies. NASA seeks partners to license and develop the regulators for their particular applications.

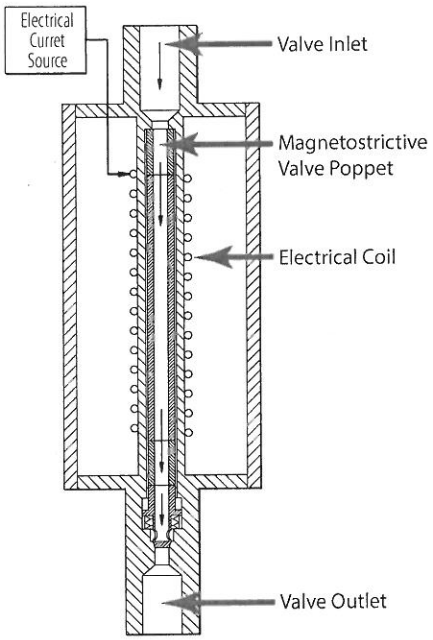


FIGURE – Diagram illustrating the operation of the NASA magnetostrictive valve technology. A curr ent applied via an electric coil to the magnetostrictive valve poppet closes the nor mally-open valve.

APPLICATIONS

The technology has several potential applications:

Pressure-fed rocket propulsion systems

Aircraft engines

Automotive fuel systems

Industrial Systems – oil-flow control, air and gas compressors, steam turbines, power recovery, power-generating equipment

Biomedical Devices – Device implants requiring pressure/flow control, Drug metering systems

PUBLICATIONS

Relevant NTRs
MFS-32253, MFS-32638, MFS-32614

Patents:
US Patent No. 8,464,750
US Patent No. 8,291,776
US Patent No. 7,469,878.

More Information

National Aeronautics and Space Administration

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