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NSMMMS

NATIONAL SPACE & MISSILE MATERIALS SYMPOSIUM

CRASTE

COMMERCIAL AND GOVERNMENT RESPONSIVE ACCESS TO SPACE TECHNOLOGY EXCHANGE

Call for Abstracts

Abstract Due Date: 17 January 2023

Please Join Us!

You are invited to participate in the National Space & Missile Materials Symposium (NSMMS) and the Commercial and Government Responsive Access to Space Technology Exchange (CRASTE) to be held from 26 - 29 June, 2023 at the Hilton El Conquistador in Tucson, AZ. These co-located Symposia continue their outstanding legacy in bringing together technologists, users, and decision makers from across the Nation. Discussions involve key technology issues related to space, missiles, hypersonic systems, and a variety of ground-breaking commercial space topics necessary for our country's defense and research and development pursuits.

NSMMS focuses on the material industry's needs and most recent advances to enable new capabilities for challenges associated with new and future space and missile systems. A special focus is given to advanced materials technology, manufacturing and producibility, and development which is crucial to improve performance and reliability of both defense and commercial systems.

CRASTE brings system integrators and subsystem technology experts together to improve space access capabilities and responsiveness. Special focus is given to the integration of emerging technologies, including advanced concepts, with space-access architectures, to create new markets and improve existing systems for government and commercial users.

The 2023 forum will feature senior level keynote presentations; a variety of technical sessions covering ground-breaking research and technology; a deep dive into special topics via tutorials and workshops; a small business forum designed to match small business capabilities with OEM and agency needs; a student grant program which promotes college-level participation in science and technology; a work-share and job board program to promote workforce development; an exhibit show; a technical poster session; and a variety of networking and collaboration events.

NSMMS & CRASTE attendees will have access to all the technical sessions at both events. These events share significant support from DoD, DOE, FAA, and NASA with an effort to promote the commercial and government space, missile, and space launch communities. Each year, our industry and academic partners help ensure that we focus on the latest advancements and challenges affecting the industry.

We invite you to submit an abstract that discusses the leading-edge technology or research your organization is working on, as well as engage your organization through exhibiting, sponsoring, or participating in our outreach programs.

Event Security Information

These Symposia are restricted to U.S. citizens only who work for a U.S. company or organization; are ITAR Restricted in accordance with DoD Directive 5230.25 under the provisions of the Arms Export Control Act; and contain Military Critical data. This event is not open to the general public. Green Card holders are not permitted to attend; born or naturalized United States' citizenship is required.

All non-government attendees must have an active DD 2345 (Military Critical Certification) at the time of the event to attend. Please make it a priority to check the status of your DD 2345. If you do not have one, you should start the process of obtaining one as soon as possible. If yours is expiring prior to the event, start the renewal process right away. The process to obtain or update one has become increasingly complex and processing time is unpredictable. All non-government attendees must have an active DD 2345 at the time of the event to attend and the processing time can be unpredictable. For more information about this and other security aspects of the event, please visit our website at www.usasymposium.com/space/security.php.

Thank You to Our NSMMS & CRASTE Supporters!

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TOPIC AREAS

Topic 1 (NSMMS): Additive Manufacturing for Space & Missile Materials

This topic area focuses on recent developments in additive manufacturing (AM) methods and materials for diverse aerospace applications including structural, thermal management, energy storage, and propulsion components. Some areas of emphasis include:

- » Correlation of processing parameters with materials properties and performance;
- » Integrated computational and materials engineering tools;
- » Refractory metals, super alloys, and fiber reinforced polymer and ceramic composites;
- » Part/process qualification, certification, verification, and validation;
- » Nondestructive inspection and in-situ monitoring with or without machine learning;
- » Case studies in design and development of AM processed components; and
- » In-space manufacturing.

Topic 2 (CRASTE): Advances in Ground System & Range Operations

This topic area focuses on the ground segment and how to reduce costs while improving operability. This includes advanced and/or low-cost range concepts. Abstracts are encouraged but not limited to include:

- » Data collection technologies;
- » Air & launch traffic control;
- » Sensors for vehicle tracking and characterization;
- » Clean pad concepts;
- » Vertical versus horizontal integration;
- » Innovative ground test methods;
- » Technologies that will reduce cost per launch (or re-entry), turn-around time, and overall life cycle cost;
- » FAA commercial launch license and (experimental) permit process issues;
- » Range utilization of autonomy/automation and/or artificial intelligence to streamline and reduce ground operation costs or timelines; and
- » Developments/initiatives to minimize impact of launch (orbital and sub-orbital) and re-entry on other National Airspace (NAS) users.

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TOPIC AREAS

Topic 3 (NSMMS): Development, Processing & Testing of Advanced Materials

This topic area addresses emerging materials innovations at lower TRL level (1-3), encompassing both materials science and process development. Topic areas include next generation materials with improved properties, novel materials processing, and integrated computational materials engineering.

Next Generation Materials – This area focuses on the development of new materials that provide unique combinations of properties and/or demonstrate property retention in extreme environments. This includes multifunctional materials, ceramics, UHTCs, metal alloys, shape memory alloys, composites, high temperature fiber development, power transmission, thermoelectrics, innovative thermal protection materials (ablative and non-ablative), sensor & nanomaterials.

Novel Materials Processing – This area focuses on novel materials processing methods to improve material properties. Special focus areas include electronic, optical, and structural metamaterials, flash sintering, microwave sintering, and spark plasma sintering (SPS).

Integrated Computational Materials Engineering – This area focuses on novel approaches to computationally driven materials design, verification of predicted structure/property relationships models to accelerate materials development and lower materials development costs. Tools that support digital engineering and digital twin sustainment concepts are encouraged.

Topic 4 (CRASTE): Emerging Entry, Descent, and Recovery Systems & Technologies

This topic covers emerging concepts to permit safe, low cost, efficient recovery of on-orbit payloads. The emphasis will be on mission need, system description, uniqueness, and roadmap towards developing the capability. Abstracts are encouraged but not limited to include:

- » Reusable upper stages;
- » Hot structures for entry;
- » Fairing recovery;
- » Lunar;
- » Planetary;
- » Comet & asteroid;
- » Decelerators;
- » Unique CONOPS approaches;
- » Emerging methods for disposal of on-orbit assets; and
- » Recent or near-term flight test activities.

Topic 5 (CRASTE): Future Space Architectures

This topic area encompasses industry and government concepts for future space architectures. A major focus of this area is on the opportunities and challenges to multi-vehicle aggregation to achieve both commercial and DoD missions. Regimes of interest include suborbital and orbital access (land/sea/air launch), in-space (VLEO/LEO/MEO/GEO/XGEO), or any combination. Abstracts are encouraged but not limited to include:

- » Modularity and interoperability;
- » Potential on-orbit servicing constructs (hub-spoke, distributed);
- » Responsive versus scheduled launch;
- » Economics of space logistics (tech upgrade/repair, on-orbit refueling);
- » The role of emerging technologies on space architectures operations;
- » Value proposition for suborbital demonstration; and
- » Government regulations, practices, and technologies to accelerate adoption of promising space architectures.

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Topic 6 (NSMMS): Ground & Flight Test Methodologies

This topic area focuses on the development and utilization of ground and flight test capabilities to support material, component, and system development. The renewed interest in hypersonics, as well as space access has resulted in the identification of gaps in the available test and evaluation infrastructure, as well as work force attrition. The Aerospace Community has recognized these gaps and invested funding to improve the test capability and capacity supporting flight and space system development. These investments are focused on risk reduction to ensure that technology maturation can be adequately accomplished prior to operational fielding. System component T&E capabilities of interest include seekers, nose tips, leading edges, thermal protection systems, control surfaces, and propulsion systems. Topics covered in this session include test and evaluation capability with respect to:

- » Test and evaluation infrastructure modernization and work force development within DoD, industry, and academia;
- » Simulation of environments to address aerodynamics, aerothermodynamics, combined thermostructural, electromagnetic and radiation effects, boundary layer transition, space environments, environmental extremes, and weather encounter; and
- » Ground and flight test and evaluation methodologies including digital engineering, modeling and simulation, test plan development, test fixture design, instrumentation, test diagnostics, and modeling and simulation validation.

Topic 7 (NSMMS & CRASTE): High Altitude/Sub-Orbital Platforms & Experiments

This topic area addresses lessons learned and information gathered from recent flight test experiments on high-altitude balloons, sub-orbital rockets, and other relevant platforms. Abstracts are encouraged, but not limited to include:

- » Commercial and government high altitude/sub-orbital platforms;
- » Lessons learned on test methodology, safety, and mission performance;
- » Capabilities for future test and upgrades;
- » Material research and test results; and
- » NASA and commercial flight opportunities.

Topic 8 (NSMMS): Hypersonics

This topic area addresses hypersonic systems and requirements, component testing, leading edges and nose tips, acreage TPS and hot structures, and control surfaces and windows/apertures. Abstracts may cover design, analysis, materials, processing, manufacturing & (re)producibility, non-destructive investigation & quality, and test.

Topic 9 (CRASTE): Innovative Test Methodologies & Platforms

This topic covers innovative test methodologies and platforms to mature small-sat and vehicle technologies in flight. Emphasis will be on the test and demonstration capabilities of test platforms to improve technology readiness levels (TRLs) of systems and components that may be useful to future satellites, launch vehicles, and upper stages such as guidance, communication, and propulsion in relevant environment. Abstracts are encouraged but not limited to include:

- » Test platform descriptions;
- » Hypersonic testing techniques;
- » Payloads preparation and integration methods;
- » Results from previous flight tests;
- » Payload recovery methods; and
- » Approaches to increase flight cadence.

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TOPIC AREAS

Topic 10 (NSMMS & CRASTE): Integrated Vehicle Health Management (IVHM) & Integrated System Health Monitoring (ISHM)

This topic area addresses current use and perspectives of IVHM/ISHM as an integral part of space systems. Applications will include, but are not limited to electric, hypersonic, liquid rocket, nuclear, and solid motor propulsion. Abstracts are encouraged, but not limited, to include:

- » Additive manufacturing technologies for enabling IVHM/ISHM;
- » Business cases for IVHM/ISHM;
- » Challenges during the IVHM/ISHM process, including requirements definition, design, integration, and test activities;
- » Digital twin;
- » Flight data collection and retrieval methods;
- » Recent IVHM/ISHM application success stories;
- » Sensor suite optimization for enabling IVHM/ISHM including fiber optic and wireless options;
- » Solutions for closing IVHM/ISHM requirement gaps in affordability, performance, reliability, reusability, and safety; and
- » Technology advancement needs to enable future IVHM/ISHM capabilities.

Topic 11 (NSMMS): Missiles & Missile Defense

This topic area is focused on addressing material technology development and transition for tactical, strategic, and missile defense applications (to address both ballistic and hypersonic threats). Specific topics of interest include:

- » Program and system overviews describing dependence on material technologies;
- » Ground and flight test material evaluations;
- » Innovative manufacturing and producibility advancements;
- » Strategic reentry system material technology development;
- » Modeling and simulation validation;
- » Emerging material technologies applicable to:
 - › Seeker windows (IR/RF)
 - › Thermal protection systems
 - › Lightning protection and weather effects
 - › Propulsion technology
 - › Composites; and
- » Metals such as Be alloys, metal matrix composites, and refractory metals.

Topic 12 (NSMMS): Novel Spaceflight Payloads, Instruments & Mission Operations

This topic area addresses key materials technologies, requirements, novel designs, or materials innovations for current and future space payloads, instruments, and mission operations including:

- » Lunar and Martian Mission Development (Commercial Payload Services, Human Landing Systems): Technology developments in robotics missions, landing and redeployment, space suits, in-situ resource development, environmental qualification;
- » Development of novel Smallsat and Cubesat material applications, instruments, upcoming and completed MISSE-FF payloads and payloads for cost-efficient commercial missions;
- » Development of structural and thermal applications, contamination and radiation effects, material degradation in the space environment;
- » In-space assembly and servicing of telescopes and satellites, and mission extension;
- » Flight material applications and testing: nanomaterials, additively manufactured hardware and satellite structures; and
- » Laser applications, LIDAR, and associated materials testing.

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Topic 13 (CRASTE): Orbital Access for Small Payloads

This topic includes existing and emerging platforms for delivering small payloads and experiments into their desired location (high altitude, sub-orbital or orbital environments). Abstracts are encouraged but not limited to include:

- » Near term capabilities in development for delivering payloads up to 1000 lbs into the desired environment for less than \$5M per launch;
- » Responsive launch;
- » Pico/nano systems;
- » Requirements and understanding of projected payloads, orbits, and capabilities of emerging systems including associated technical challenges and timelines; and
- » Government practices, programs, and technologies which potentially benefit the emerging sub-orbital and small launch industry.

Topic 14 (CRASTE): Reducing Cost, Increasing Safety & Improving Reliability

This topic area will cover concepts and/or progress in developing low cost (or lower cost) subsystems, systems or architectures that will help increase safety and/or flight rate of launch (orbital and sub-orbital), and future “commercial aircraft like” re-entry. Abstracts are encouraged but not limited to include:

- » Non-toxic propellants/monopropellants;
- » Minimization of launch and re-entry noise;
- » Improved noise modeling of launch and re-entry operations;
- » Subsystem and vehicle integrated health management systems;
- » Associated sensors for severe environments;
- » Increased reliability and public safety; and
- » Safety of crew and other occupants for manned vehicles.

Topic 15 (NSMMS & CRASTE): Space Access & Propulsion

This topic area addresses launch vehicles and their propulsion systems that improve space access. Areas that emphasize system level advancement, critical materials, and processing technologies are desired. Of particular interest are commercial space development efforts applied to government requirements with a focus on modularity and agility. Additional topics of interest include innovative vehicle concepts and designs, structures and designs, materials and processes, and manufacturing fabrication concepts for:

- » Existing and novel launch vehicles and propulsion technologies (liquids/solids/hybrids/other);
- » Turbopumps/cryogenic/fluid management/propellant tanks;
- » Thermal management/protection systems;
- » High-temperature, oxidation-resistant coatings and materials;
- » Long-lifetime, cost-effective, high heat flux materials;
- » Case/binder/insulation concepts; and
- » Reusability and modular design.

Topic 16 (NSMMS & CRASTE): Spacecraft & Space Mobility

This topic area addresses launch vehicles and their propulsion systems that improve space access. Areas that emphasize system level advancement, critical materials, and processing technologies are desired. Of particular interest are commercial space development efforts applied to government requirements with a focus on modularity and agility. Additional topics of interest include innovative vehicle concepts and designs, structures and designs, materials and processes, and manufacturing fabrication concepts for:

- » Spacecraft coatings (thermal, ESD control);
- » Lightweight space structures and assembly;

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- » Existing and novel in-space propulsion technologies (chemical/electrical/nuclear electric/nuclear thermal propulsion);
- » On-orbit fluids management and transfer (tanks/valves/PMD/etc.);
- » Oxygen-compatible cathodes for electric propulsion;
- » Additive manufacturing and digital engineering;
- » High-temperature, oxidation-resistant catalysts, coatings and materials; and
- » Materials compatibility with emerging propellants.

Poster Session

If you are selected to give an oral presentation, you can present a poster on another topic as well. The poster session is an important and alternative way to present the results of your research and technology, and in some cases, is a more effective way to present your material. Poster presentations will be available to attendees Monday evening through Wednesday evening in the joint NSMMS & CRASTE exhibit hall.

Abstract Submission Process

We look forward to receiving your abstract(s) via online submission, for the 2023 NSMMS & CRASTE at <https://www.usasymposium.com/space/cfaForm.php>. As a reminder, these Symposia are restricted to U.S. citizens working for a U.S. company only, therefore submitters must also meet these criteria. Abstracts must be unclassified and may include ITAR or Military Critical information, if they are PASSWORD PROTECTED. Acceptable distribution levels for abstracts include A or C ONLY. It is the responsibility of all authors to ensure the materials they submit and/or present conform to security classification guides, if applicable. Though abstract submission is done online, passwords for the password protected documents should be emailed to Sherry Johnson at sjohnson@blue52productions.com. For information on how to password protect your abstract, visit <https://www.usasymposium.com/space/cfa.php>. Non-restricted (Distribution A) documents do not need to be password protected. For questions concerning submission of your abstract, please contact Sherry Johnson at sjohnson@blue52productions.com, 937-554-4671. Be sure to include the title of your abstract and the distribution level in the body of the submission (this does not count against the 300 word count). All abstracts should fall into one or more of the described topics on the previous pages.

In late February 2023, you will be contacted regarding the status of your acceptance. Please note that selected abstract titles will be included on the website and in the program, which is freely distributed. Therefore, abstract titles must be cleared for public release (Distribution A).

Final presentations will be due 31 May 2023. Presentations and papers cannot contain proprietary information and may not be more restrictive than Distribution C (Distribution authorized to U.S. Government Agencies and their contractors). Distro F presentations may be accepted with special permission. Controlled Unclassified Information (CUI) markings must be adhered to as appropriate. Please note, presentation of an abstract does not waive any applicable registration fees.

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