



Rockville, MD
22-25 June

2020

NSMMMS

NATIONAL SPACE & MISSILE MATERIALS SYMPOSIUM

CRASTE

COMMERCIAL AND GOVERNMENT RESPONSIVE ACCESS TO SPACE TECHNOLOGY EXCHANGE

DUE: 6 JAN 2020

Call for Abstracts

Join Us

You are invited to participate in both the 2020 National Space & Missile Materials Symposium (NSMMS) and the 2020 Commercial and Government Responsive Access to Space Technology Exchange (CRASTE) from 22 – 25 June, 2020 in Rockville, MD at the Bethesda North Marriott Hotel & Conference Center. These co-located symposia continue their outstanding legacy in bringing together technologists, users, and decision makers from across the Nation. Discussion involves 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 materials 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 development which is crucial to improve performance and reliability of both defense and commercial systems.

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

The 2020 forum will have a joint senior level Plenary Session, a variety of technical sessions covering ground-breaking research and technology, tutorials and workshops, a poster session, an exhibit show, a small business forum, a student grant program, and multiple networking events.

NSMMS & CRASTE attendees will have unlimited 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.**

Thank You to Our NSMMS & CRASTE Supporters!

- Aerojet Rocketdyne
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- Integration Innovation, Inc.
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Event Security Information

These Symposia are restricted to U.S. citizens only; 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.** For more information about this and other security aspects of the conference, please visit our website at www.usasymposium.com/space/security.php.

TOPIC AREAS

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

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

- » Post processing heat treatments,
- » Residual stresses,
- » In-situ monitoring,
- » Integrated computational and materials engineering tools,
- » Development methodology of new AM materials (monolithic, graded, composites, or coatings),
- » Results of design and development of AM processed components,
- » Database development and processes for assessment,
- » Non-destructive inspection,
- » Verification/certification,
- » Man-rated and spacecraft validation,
- » Part/process qualification, and
- » In space manufacturing specific topics:
 - > Additive Manufacturing Facility (AMF) characterization data,
 - > Recycling of materials for feedstock generation,
 - > Printed electronics,
 - > Metals updates, and
 - > FabLab status.

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 for, 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.

Abstract Due Date: 6 January 2020

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, and 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, as well as verification of predicted structure/property relationships models to accelerate materials development and lower materials development costs.

Topic 4 (CRASTE): Emerging Entry, Descent, & 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 roadmaps towards developing the capability. Abstracts are encouraged for, but not limited to:

- » Reusable upper stages,
- » Fairing recovery,
- » Unique CONOPS approaches,
- » Emerging methods for disposal of on-orbit assets, and
- » Recent or near-term flight test activities.

Topic 5 (CRASTE): Emerging Propulsion Systems

This topic area addresses industry and government propulsion development programs that can support future responsive space access needs. Recommended technology roadmaps and demonstrations are also encouraged. Abstracts are encouraged for, but not limited to:

- » Traditional rocket engines and emerging technologies to develop lower cost propulsion solutions for small (<1k lb), medium (1k - 10k lb), and large (10k+ lb) orbital payloads,
- » Rocket engines and propulsion technologies that can be used in support of next generation National Security Space Launch (NSSL),
- » Reusable boost system architectures,
- » Low-cost expendable engines (experimental demonstrators and emerging operational systems),
- » Inter-planetary propulsion,
- » Emerging nuclear technologies, and
- » Propellant development.

TOPIC AREAS

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 addressing pretest 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 Experiments & Capabilities

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 for, but not limited to include:

- » Overview of commercial or government high altitude/sub-orbital platforms,
- » Lessons learned on test conduct, safety, and mission performance, and
- » Capabilities for future test and upgrades.

Topic 8 (NSMMS): Hypersonics

This topic addresses hypersonic systems and requirements, component testing, leading edges and nose tips, acreage TPS and hot structures, and windows/apertures. Abstracts may cover analysis, materials, processing, manufacturing, and testing.

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 for, but not limited to:

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

TOPIC AREAS

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

This topic area will address current use and perspectives of IVHM/ISHM as an integral part of space systems. Applications will include, but are not limited to, solid motor, liquid rocket, hypersonic, nuclear, and electric propulsion. This topic area is seeking abstracts which address one of the following IVHM/ISHM topics:

- » Additive manufacturing technologies for enabling IVHM/ISHM,
- » Business cases for IVHM/ISHM,
- » Recent IVHM/ISHM application success stories,
- » Sensor suite optimization for enabling IVHM/ISHM, and
- » Solutions for closing IVHM/ISHM requirement gaps.

Topic 11 (NSMMS): Missiles & Missile Defense

The topic area is focused on addressing material technology development and transition for Missiles and Missile Defense applications, including the new area of interest in hypersonic defense. Topics include characterization of material/component (excluding propellant) performance, properties, analysis, and material producibility; ground- and flight-test materials evaluations; material manufacturing advancements; and innovative techniques. Of interest are program and system overviews with pertinent materials issues, and updates related to current missile programs.

Topic 12 (NSMMS): Mission Operations & Experiments in Space

This topic area addresses key materials technologies, requirements, novel designs, or materials innovations for current and future space missions/operations and planetary exploration including:

- » Lunar missions (commercial lunar payload services, human landing systems): Technology developments in robotics missions, landing and redeployment, space suits, and studies with regolith or simulated environmental hazards,
- » In-space assembly of telescopes and satellites,
- » Environmental effects and sensing: radiation, atomic oxygen (MISSE), and high and cryogenic temperature testing,
- » Contamination concerns: outgassing, photopolymerization, effects on thermal and optical properties, and regolith,
- » Smallsat and cubesat materials, missions and packaging,
- » New developments in flight materials: nanomaterials, additively manufactured hardware, and satellite materials,
- » Modeling of structural and thermal applications, and
- » Laser applications, LIDAR, and associated materials testing.

Travel Restrictions & Approval

For those working for government agencies, you are encouraged to submit your travel requests now. Though travel restrictions for many government agencies are loosening, some still require many months advance notice for conference travel. Because of this, we encourage you to get your paperwork submitted ASAP and contact us if you need any additional information or justification.

TOPIC AREAS

Topic 13 (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:

- » 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 14 (CRASTE): Responsive Access for Pico/Nano/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:

- » Near term capabilities in development for delivering payloads up to 1000 lbs into the desired environment for less than \$5M per launch,
- » 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 15 (NSMMS & CRASTE): Space Access & Propulsion

This topic area addresses space access, satellite systems, and propulsion to address system level advancement, and critical materials and processing technologies enabling access to space, including single use or reusable crewed and robotic launch and orbital boost systems. Of particular interest this year, is commercial space development efforts applied to government requirements and needs 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:

- » Launch vehicle and in-space propulsion system structures,
- » Engine systems,
- » Solid and liquid rocket boosters,
- » Nuclear thermal/electric propulsion,
- » Propellant tanks,
- » Thermal management/protection systems, and
- » Pressure gain propulsion.

Poster Session Participation

Consider submitting one or more abstracts for the poster session in order to better take advantage of your time at the event. Even if you give an oral presentation, you can increase your exposure by presenting a poster 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. Extra emphasis will be placed on posters during the two receptions on Monday and Wednesday when the authors are required to be present.

Other Ways to Engage

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These events are largely made possible by industry sponsorships. Why sponsor? ...prominent organizational recognition...position yourself for the future...involve your organization in influencing the direction of the industry, and many other valuable return on investment reasons. A variety of sponsorship packages are available for all budgets. For more information, contact Erin Foster, efoster@blue52productions.com or visit our website at <https://www.usasymposium.com/space/sponsorship.php>. **Thank you to these industry leaders who have already joined the NSMMS & CRASTE sponsorship team for 2020!**



Solving the world's hardest problems.



Exhibit

We expect a sold out show. Sign up now to reserve your space for this great networking and marketing opportunity. To register for an exhibit, visit <https://usasymposium.com/space/exhibitor.php>.

Small Business Forum Participation

One of the many noteworthy elements of NSMMS & CRASTE is the Small Business Forum and its numerous opportunities to network. We invite you to engage and maximize your opportunities to team with other companies and engage with the government. The goal of this forum is to facilitate the interaction of small businesses and universities with larger "prime" contractors and government SBIR agencies based on similar interests that relate to specific materials/performance metrics relevant to NASA and the Department of Defense. We will provide you with connections and resources with primes and government SBIR agencies to start your interaction (or assist you along the path of meaningful interactions) with them. We are confident you will broaden your contacts with regard to technology needs and transfer in order to foster future communication, innovation, and partnerships. The participating primes and SBIR agencies will be announced on the website in the coming months. Small businesses and universities may sign up for one-on-one appointments starting in early February. For more information, please visit <https://www.usasymposium.com/space/sbf.php>.

Abstract Due Date: 6 January 2020

Abstract Submission Process

We look forward to receiving your abstract(s) for the 2020 NSMMS & CRASTE via online submission at <https://www.usasymposium.com/space/cfa.php>. 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 early February 2020, 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).

PLEASE DO NOT WAIT FOR NOTIFICATION ACCEPTANCE TO SUBMIT A TRAVEL APPROVAL REQUEST WITHIN YOUR ORGANIZATION. START THAT PROCESS NOW.

Final presentations will be due 29 May 2020. Final 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). Please note, presentation of an abstract does not waive any applicable registration fees.

Submission Site: <https://www.usasymposium.com/space/cfa.php>

Abstract Due Date: 6 January 2020

Attention Non-Government Attendees!

Please make it a priority to check the status of your DD 2345 (Military Critical Certification). 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. 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.