JANNAF INTERAGENCY PROPULSION COMMITTEE
JOINT ARMY-NAVY-NASA-AIR FORCE

ANNOUNCEMENT & CALL FOR PAPERS

67th JANNAF Propulsion Meeting
Programmatic & Industrial Base Meeting (PIB)
46th Structures and Mechanical Behavior (SMBS)
42nd Propellant and Explosives Development and Characterization (PEDCS)
33rd Rocket Nozzle Technology (RNTS)
31st Safety and Environmental Protection (SEPS)
14th Modeling and Simulation (MSS)

JOINT SUBCOMMITTEE MEETING

ABSTRACT DEADLINE: 9 DECEMBER 2019

18-22 MAY 2020
PITTSBURGH, PENNSYLVANIA

last updated 10/23/2019
The May 2020 meeting of the Joint Army-Navy-NASA-Air Force (JANNAF) will consist of the Joint Meeting of the 46th Structures and Mechanical Behavior / 42nd Propellant and Explosives Development and Characterization / 33rd Rocket Nozzle Technology / 31st Safety and Environmental Protection / 14th Modeling and Simulation Subcommittees; as well as the 67th JANNAF Propulsion Meeting (JPM) and the Programmatic and Industrial Base (PIB) meeting. Mr. Paul Conroy with the CCDC Army Research Laboratory, Aberdeen Proving Ground, MD, is the Meeting Chair. This meeting will be held Monday through Friday, 18 - 22 May 2020, at the Wyndham Grand Pittsburgh Downtown in Pittsburgh, Pennsylvania. Please refer to page 4 for hotel and area information.

ATTENDANCE REQUIREMENTS

The overall security level of the meeting is Unclassified. All sessions will be held at the Wyndham Grand Pittsburgh Downtown in Pittsburgh, PA. Attendance, applicable to presenters as well, is restricted to invited U.S. citizens qualified to receive unclassified, limited-distribution information. No foreign nationals are permitted to attend.

ALL non-government attendees (which includes contractors, consultants and universities) attending this meeting must:

1. Be working on a current government contract or certified by a Sponsoring Government Official
2. Provide their organization’s DD 2345 Certification Number for receipt of militarily-critical technical data

DD 2345: For additional information, contact the Joint Certification Program Office (JCP) at 1-800-352-3572 or visit their Web site at https://www.dla.mil/HQ/LogisticsOperations/Services/JCP/.

ALL Attendees: To register, you must first have a JANNAF Secure Portal account. Please visit the Registration page of the meeting website for additional information and important links. All presenters are required to register and pay the registration fee.

Questions concerning attendance eligibility should be directed to the JANNAF Security Team, Mary Gannaway (mtg@jhu.edu) or Tricia Frey (tfrey@erg.jhu.edu) or by calling (410) 992-7300.
Office of the President (EOP) leadership; and information provided to decision makers for either situational awareness or policy decisions.

**Structures and Mechanical Behavior Subcommittee**

The SMBS addresses the development, application, and verification of experimental, analytical, and statistical techniques required in the preliminary or detailed structural design of solid propellant rocket motors and gun ammunition, the assessment of their structural integrity, and the prediction of their service life based on structural or chemical aging mechanisms.

**Propellant and Explosives Development and Characterization Subcommittee**

The scope of PEDCS comprises work and issues associated with propellants, explosives, and other energetic formulations used in the development, manufacture, performance, and operation of weapons, propulsion systems, and gas generator devices. This subcommittee covers the technology areas required to develop, manufacture, and characterize propellants and ingredients. The manufacturing technologies of interest include mixing procedures, sampling and quality control, safety and handling practices, and the design and operation of mixing equipment. The characterization tests involve classical wet chemistry, instrumental analysis, chemical stability, compatibility, and calorimetric measurements.

**Rocket Nozzle Technology Subcommittee**

The RNTS focuses on the application of advanced composite materials, including carbon-carbon, ceramic matrix, and carbon phenolic composites, and other advanced materials, as applied to solid rocket nozzles and their components, nozzle-based propulsion control systems; and related technology developments for liquid and electric propulsion.

**Safety and Environmental Protection Subcommittee**

The 31st SEPS meeting will address issues related to the safety, health and environmental impacts associated with the manufacture, storage and use of propellants, explosives and pyrotechnics. Papers are invited that address all health effects associated with energetic compounds, precursors, combustion products, and waste products as well as safety concerns present during their intentional use, demilitarization, and accidents. New and emerging areas of interest include additive manufacturing (3D Printing) of energetic materials, nanomaterials, and insensitive high explosive formulations.

**Modeling and Simulation Subcommittee**

The 14th MSS activities include modeling and simulation of systems; virtual engineering; development of software analogs of propulsion devices or systems; software integration-coupling of diverse simulation tools to enable more detailed, system-of-systems analysis and simulation; simulation credibility-uncertainty, verification, validation, reliability, and risk; and integrated health management of off-nominal conditions in propulsion.

---

**JPM/PIB/SMBS/PEDCS/RNTS/SEPS/MSS AUTHOR TIMELINE**

<table>
<thead>
<tr>
<th>Week of Meeting</th>
<th>Weeks before Meeting</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Dec 2019</td>
<td>23</td>
<td>Deadline for receipt of Abstract Submittal Forms.</td>
</tr>
<tr>
<td>3 Feb 2020</td>
<td>15</td>
<td>Acceptance/rejection letters sent to authors.</td>
</tr>
<tr>
<td>10 Feb 2020</td>
<td>14</td>
<td>Deadline for changes to Meeting Invitation and Preliminary Program.</td>
</tr>
<tr>
<td>24 Feb 2020</td>
<td>12</td>
<td>Meeting Invitation, Preliminary Program, and registration materials forwarded to propulsion community.</td>
</tr>
<tr>
<td>16 March 2020</td>
<td>9</td>
<td>Deadline for award nominations and submittal of Student papers for Best Student Paper award consideration.</td>
</tr>
<tr>
<td>6 April 2020</td>
<td>6</td>
<td>Deadline for submission of changes to the Final Program.</td>
</tr>
<tr>
<td>20 April 2020</td>
<td>4</td>
<td>Deadline for receipt of papers and paper/presentation clearance forms. <strong>Papers not received by this date may be removed from the program.</strong></td>
</tr>
<tr>
<td>27 April 2020</td>
<td>3</td>
<td>Deadline for reservations at host hotel.</td>
</tr>
<tr>
<td>4 May 2020</td>
<td>2</td>
<td>Deadline for receipt of presentations.</td>
</tr>
<tr>
<td>15 May 2020</td>
<td>1</td>
<td>Deadline for completion of online Registration Form. Deadline for reduced registration fee</td>
</tr>
<tr>
<td>18 May 2020</td>
<td>0</td>
<td>Start date for JPM/PIB/SMBS/PEDCS/RNTS/SEPS/MSS Joint Subcommittee Meeting</td>
</tr>
</tbody>
</table>
ABSTRACT SUBMITTAL INSTRUCTIONS

• The technical areas to be addressed are defined in this announcement. Individuals who wish to submit an abstract should carefully review the topic areas listed on pages 6 - 17.

• The submission of an abstract represents an agreement to submit a final paper for publication by 9 December 2019, attend the meeting, and deliver a 30-minute presentation. Your presentation will be heard by all qualified individuals within industry, government, and university organizations. If your paper cannot be presented to all qualified attendees, it cannot be presented in this program without specific approval from members of the JANNAF Technical Executive Committee.

• Submit only unclassified abstracts. Abstracts will not be published and will only be used by the program committee members for paper selection purposes.

• Limit the abstract to 250-300 words and exclude tables and figures. State the objective of the work. Describe the scope, method of approach, and any new advances in the state of the art. Highlight important conclusions, and include a brief summary of the data used to substantiate them.

• Please submit using the Abstract Submittal Form, which can be downloaded from the May meeting website.

• Indicate confirmation of management support on the Abstract Submittal Form to ensure availability of resources for your participation in the meeting. This is NOT related to security review/approval to submit the abstract or submit/present the paper.

• Many organizations require abstracts to be processed through an approval system prior to submission. This process takes additional time, so authors should plan accordingly and begin the process early in an effort to meet the abstract deadline date.

• Remember, you must be an invited and qualified U.S. Citizen to attend and present at this meeting. No foreign nationals are permitted to attend.

• The deadline date for submission of completed Abstract Submittal Forms to JHU WSE ERG is 9 December 2019. JHU WSE ERG accepts only electronic submission of abstracts and papers. Abstracts must be submitted on the Abstract Submittal Form:

  - Via email to: meetings@erg.jhu.edu (Distribution A only);
  - OR

• Uploaded to the ERG secure server as follows:

  1. Go to https://webdatabase.cvia.jhu.edu/docorg/program/cgi-bin/Login.pl

  2. Choose Infobase: JANNAF Mtg Abstract Uploads

  3. Type in User Name: Abstract

  4. Type in Password [contact ERG at (410) 992-7300 or 7302 for current password, changed daily]

  5. Click the "Login" button

  6. Click on "May 2020 JANNAF Meeting"; choose "Add Document" (to the left of the screen)

  7. Complete the “Add Document” form, being sure to Title your Document, select "Upload from Client", click the “Browse” button and navigate to where you have saved your completed Abstract Submittal Form on your computer. Select the file and click "Open". Choose the appropriate file format (MS Word or PDF) under Document Type, and click on “Apply”.

**NOTE:** The upload site does not send a confirmation. To verify that your upload was successful, click the refresh button in your browser.

  8. Email meetings@erg.jhu.edu to notify that the file has been successfully uploaded.

RECOMMENDATIONS FOR WORKSHOPS OR SPECIALIST SESSIONS

Recommendations for workshops or specialist sessions are solicited at this time. Individuals interested in organizing and chairing a workshop or specialist session should contact the JHU WSE ERG Technical Staff member in their respective subcommittee with suggestions for topics by 9 December 2019. See page 17 for additional information and requirements.

AWARDS

Nominations for JANNAF Technical Executive Committee (TEC), PIB Executive Committee (PEC), SMBS, PEDCS, RNTS, SEPS, and MSS recognition awards are being solicited. Individuals interested in nominating an award recipient should follow the guidelines and instructions on pages 17-18.

HOTEL & AREA INFORMATION

Sleeping rooms have been reserved with the Wyndham Grand Pittsburgh Downtown in Pittsburgh, Pennsylvania, where all sessions will be held. The hotel is located across the street from Point State Park—the convergence point of the Three Rivers—and within walking distance of a variety of restaurants and entertainment options.

Hotel

The JANNAF room block is not yet open for reservations. When reservations open in late February, the room rate per night for all meeting attendees will be at the GSA FY 2020 per diem rate, $126 plus tax (currently 14%) per day, for single or double occupancy. More information and the link to reserve your room in the JANNAF discounted room block will be posted on the Hotel page of the May meeting website when the Meeting Invitation and Preliminary Program have been posted online, and registration has been opened.

Transportation

Pittsburgh International Airport (PIT) is located approximately 17 miles from the Wyndham Grand Pittsburgh Downtown, with public transportation, shared ride van service, and vehicle rental options to suit your needs as you arrive to and depart from Pittsburgh. More information regarding these options will be provided on the Hotel page of the May meeting website when the Meeting Invitation and Preliminary Program have been posted online, and registration has been opened.
## SUBCOMMITTEES / MISSION AREAS AT THIS MEETING

Click on the Mission Area of interest in the chart below to jump to that section in this Call for Papers.

<table>
<thead>
<tr>
<th>Mission Area</th>
<th>JPM</th>
<th>SMBS</th>
<th>PEDCS</th>
<th>RNTS</th>
<th>SEPS</th>
<th>MSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Tactical Propulsion</td>
<td>Service Life / Missile Sustainment</td>
<td>Liquid Propellants</td>
<td>Nozzle Thermal, Structural, Fluids Analysis and Modeling</td>
<td>Toxicology</td>
<td>Model-Based Engineering</td>
</tr>
<tr>
<td>III</td>
<td>Propulsion Systems for Space Access</td>
<td>Structural Analysis and Design</td>
<td>Propellant and Explosives Process Engineering</td>
<td>Thrust Control</td>
<td>Instrumentation</td>
<td>Simulation Credibility: Verification, Validation, and Uncertainty Quantification</td>
</tr>
<tr>
<td>V</td>
<td>Propulsion and Energetics Test Facilities</td>
<td>Nondestructive Evaluation</td>
<td>Solid Propellant Ingredients and Formulations</td>
<td>Damage Tolerance / Fracture / Failure [Joint Mission Area with SMBS]</td>
<td>Industrial Hygiene</td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Sensors for Propulsion Measurement Applications</td>
<td>Damage Tolerance / Fracture / Failure [Joint Mission Area with RNTS]</td>
<td>Propellant and Explosive Surveillance and Aging</td>
<td>Range Safety and Explosives Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>System-wide Application of Additive Manufacturing for Propulsion Applications</td>
<td>Gun Propulsion</td>
<td></td>
<td>Green Energetic Materials (GEM) Joint PEDCS - SEPS Mission Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td></td>
<td>Green Energetic Materials (GEM) Joint PEDCS - SEPS Mission Area</td>
<td></td>
<td>Demilitarization, Reclamation, and Reuse Technologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IX</td>
<td></td>
<td></td>
<td></td>
<td>Review of Accidents and Incidents</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**JPM MISSION AREAS**

The 67th JANNAF Propulsion Meeting sessions will cover systems development within the seven mission areas described below. Questions concerning these areas or the topics being solicited should be directed to the respective Area Chair.

**Mission Area I: Tactical Propulsion**
*Co-Chairs:* Dr. Jeremy R. Rice, CCDC Aviation & Missile Center / Redstone Arsenal, AL

**Co-Chairs:**
- Dr. Jeremy R. Rice, CCDC Aviation & Missile Center / Redstone Arsenal, AL
- Dr. David R. Gonzalez, NSWC IHEODTD / Indian Head, MD

**Telephone:** (256) 876-6077
**Email:** jeremy.r.rice4.civ@mail.mil
**Email:** david.r.gonzalez@navy.mil

This area encompasses all tactical propulsion systems including those applicable to air-to-air; air-to-surface, surface launched and underwater missions. Typical systems include tactical missile boosters or sustainers, kinetic energy missiles, free-flight rockets, anti-radiation, anti-ship, anti-armor, anti-personnel/materiel missiles, ramjets, scramjets, and combined cycle propulsion. System studies that evaluate advanced propulsion concepts and demonstrations that incorporate one or more component technologies applicable to tactical propulsion are of interest. Examples of component technologies include propellants and fuels, fuel management systems, cases and combustors, inlets, nozzles, thrust vector control systems, thrust management systems, and advanced materials applications. Life cycle cost and demilitarization are also topics of interest.

**Manufacturing technologies and fabrication techniques:** Papers are requested that emphasize manufacturing technologies and fabrication techniques. Papers need not be associated with a particular system but should be applicable to materials associated with such vehicles and their corresponding flight environment. Abstracts are especially sought on the following topics:
- Airbreathing propulsion systems
- Hybrid propulsion systems
- Solid propellant rocket propulsion systems
- Demilitarization
- Hypersonic propulsion systems
- Improved missile kinematics
- Insensitive munitions (from a systems perspective)
- Propulsion system product improvement
- Manufacturing technologies and fabrication techniques

**Airframe Structures and Materials:** Materials development and characterization, and structural concepts, design, test, and validation for Airframe applications and components exposed to extreme environments as found in atmospheric high speed or reentry conditions. Topics of interest include: TPS and hot structures, materials, structures and related technology for leading edges, exterior acreage surfaces, control surfaces, hot structures, and seals (penetrations). Further topics include hot and integrated structures; acreage thermal protection systems, including ceramic matrix composites, tiles, blankets, ablators, and metallics; fuel tanks, including cryogenic and hydrocarbon, composite and metallic; leading edges, including active, passive, and heat-pipe-cooled; design and analysis methods; and seals. Papers are encouraged on structures and materials that have recently flown, or are planned for flight on flight vehicles.

**Mission Area II: Missile Defense / Strategic Propulsion**
*Chair:* Dr. Robert J. Jensen, Sierra Lobo, Incorporated / Edwards AFB, CA

**Telephone:** (661) 275-5468
**Email:** robert.jensen.12.ctr@us.af.mil

This area includes technology applicable to ballistic missiles, trans-atmospheric vehicles, and missile defense. Emphasis should be on system-level papers discussing propulsion technology for new vehicle systems, upgrades, modernization and sustainment; failure investigations; and economic considerations that include evolving business practices, life cycle cost estimation, and approaches that reduce development and operations costs and schedules. Papers are requested that emphasize sustainable manufacturing technologies and fabrication techniques. Papers need not be associated with a particular system but should be applicable to materials associated with such vehicles and their corresponding flight environment. Abstracts are especially sought in the areas of:
- Ground-based and sea-based strategic systems
- Ground-based, aircraft-based and sea-based missile defense
- Anti-satellite systems
- Advanced (including low or non-toxic) propellants
- Advanced (including light weight and/or high temperature) materials
- Insensitive munitions technologies
- Energy management approaches
- Dual mode systems (airbreathing/rocket)
- Unconventional propulsion
- Divert propulsion/attitude control propulsion
- Post boost control system propulsion
- Innovative propellant tank and valve technologies (including hot gas valves/pintles)
- Aging and Surveillance of propulsion systems
- Manufacturing technologies and fabrication techniques including the use of 3D printing for strategic and missile defense propulsion system components
- US-sourced sustainable materials
- Demilitarization or alternative applications of heritage propulsion systems
Mission Area III: Propulsion Systems for Space Access
Chair: Mr. Bruce R. Askins, NASA MSFC / Huntsville, AL
Telephone: (256) 544-1096
Email: bruce.askins@nasa.gov

This area focuses on existing or potential primary and auxiliary government, commercial or foreign propulsion systems for earth-to-orbit vehicles or in-space propulsion systems. Emphasis should be on system-level papers discussing propulsion technologies for new vehicle systems, upgrades and modernization, failure investigations, and evolving business practices that reduce development and operations costs while increasing mission reliability. Papers should address future access to space missions, future exploration missions and needs, vehicle system architectures, and the identification of critical propulsion requirements technologies that must be enabled to support these new system requirements.

Manufacturing technologies and fabrication techniques: Papers are requested that emphasize manufacturing technologies and fabrication techniques. Papers need not be associated with a particular system but should be applicable to materials associated with such vehicles and their corresponding flight environment. Abstracts are especially sought in the following areas:
- Methods for development of design reference missions and vehicle systems architecture
- Future or current Vehicle systems that use either solid or liquid or both propulsion
- Description of vehicle systems analysis models and assumptions
- Details of architecture studies and descriptions of promising vehicle architectures
- Uncertainty evaluation of vehicle systems analysis
- Results of sensitivity analysis of key parameters on vehicle dry mass fraction margin, gross take-off weight, cost, reliability, and safety, with emphasis on propulsion
- Methods for identification and prioritization of critical enabling propulsion technologies
- Approaches for utilizing higher fidelity propulsion analyses in the overall systems architecture model(s)
- Methods to standardize model assumptions and fidelity in order to make relevant comparisons between vehicle architectures and various propulsion system options
- Description of promising new propulsion systems
- Description and status of the access to space propulsion system technology or development activities
- Small launch vehicle mission analysis
- System analysis for responsive space access
- Manufacturing technologies and fabrication techniques
- Manufacturing use of 3D printing for propulsion hardware
- Testing use of 3D printing for propulsion hardware

Mission Area IV: Gun and Gun-Launched Propulsion
Chair: Mr. Edward G. Tersine, NSWC IHEODTD / Indian Head, MD
Telephone: (301) 542-9569
Email: edward.tertine@navy.mil

This area embraces technologies applicable to small-, intermediate-, or large-caliber guns, as well as gun-launched rocket propulsion, for air, sea, or ground/mobile weapons systems. Typical rocket assisted systems include kinetic energy missiles and extended range projectiles, both guided and unguided. Abstracts are especially sought in the following areas:
- Conventional gun propulsion concepts to include solids and liquids
- Unconventional gun propulsion concepts
- System-level gun propulsion studies (gun tube wear and erosion, blast/flash mitigation, improved system survivability)
- Concepts to enable rocket systems to achieve high operating pressures (gun barrel and motor case)
- Assisted projectiles
- Assisted guided munitions
- Insensitive munitions

Mission Area V: Propulsion and Energetics Test Facilities
Co-Chairs: Mr. Michael D. Owen, NASA WSTF / Las Cruces, NM
Telephone: (575) 524-5403
Email: michael.d.owen@nasa.gov
Ms. Julie A. Carlile, AFRL / Edwards AFB, CA
Telephone: (661) 275-5098
Email: julie.carlile@us.af.mil

This area targets issues, technologies and achievements relevant to the operation and use of rocket propulsion test facilities for demonstration, development, characterization, and qualification of rocket, spacecraft, and gun propulsion systems, energetics, and materials for propulsion applications. Eligible test facilities include static test facilities for liquid rocket engines, solid rocket motors, electric and in-space propulsion systems, hypersonic test facilities, gel motors, hybrid propulsion systems, explosives, insensitive munitions, wind tunnels, altitude/vacuum chambers, and other rocket propulsion technologies; laboratory test facilities for energetics and materials science characterization; and test ranges for missiles, guns and rocket sleds. Abstracts are specifically solicited on the following topics:
- Best practices and testing standards
- Integrating instrumentation, controls and data acquisition systems
- Static thrust measurement systems
- Propellant and materials handling and safety
- Accident and incident lessons learned
- Test facility modeling

Abstracts on improvements in base infrastructure, updates and upgrades of test stand capabilities, new propellant inventories, or other general advertisements of capabilities or assets will not be considered for this area.
Mission Area VI: Sensors for Propulsion Measurement Applications

Chair:  Dr. Gary W. Hunter, NASA GRC / Cleveland, OH
Telephone:  (216) 433-6459
Email:  gary.w.hunter@nasa.gov

This area captures technologies and advancements in sensors and measurement devices for rocket and gun propulsion applications. Emphasis should be on development, application, modeling and integration of sensors for use in various propulsion applications. Abstracts are specifically sought on systems and sensors for:

• Storage, tanking and cryogenic systems, including true cryogenic mass flow, cryogenic temperature measurement, mass and level measurement in micro and zero gravity, pump and turbomachinery induced pressure fluctuations, leak and tank integrity monitoring, and other propelellant feed and storage measurements

• High-temperature systems and hostile environments, including: extreme high-temperature measurements, real-time nozzle erosions and fuel regression, material ablation, flame propagation, high temperature electronics, packaging, and communications, and measurement and analysis of thermal effects on pressure transducers

• In-chamber diagnostics, including development of methods to make measurements of velocity, temperature, pressure, and/or other flow quantities inside of firing combustion chambers

• Plume measurement technology, including methods to utilize plume measurements to understand chamber operating conditions and spacecraft contamination issues

• Systems health monitoring and non-destructive evaluation (NDE) and repair, including: test stand characterization and control, structure and sense line frequency characterization, micro and nanotechnologies, systems for conversion of sensor data into actionable knowledge, technologies for intelligent health management systems, integrated fiber optics, electromagnetic NDE technologies, NDE data processing and analysis, life cycle monitoring of solid rocket motors, and monitoring of aeroshells and ballutes during reentry

• Smart sensing technology, including the development of sensors capable of automatic calibration and fault detection; intelligent sensors that are calibrated in situ and provide dynamic compensation for environmental changes (temperature, humidity, etc.); fault detection also including any fault that would cause a sensor to provide inaccurate information such as sensor damage, lead wire damage or disconnection, and the disbonding or detorquing of the sensor; smart and distributed sensor system approaches, systems architectures, and applications

• Chemical sensors suitable for solid rocket motor environments and applications (sensors of interest include those for measuring the chemical state or composition of a solid, including gaseous diffusion, liquid diffusion, changes in free volume, direct measurement of changes in molecular weight or molecular weight per crosslink due to chain scission or the reaction products which result from chain scission); and development and applications of sensors that do not alter the chemical equilibrium of the solid solution are of particular interest

• Sensor modeling and simulation including modeling and simulation methods for sensor selection and data validation approaches; and recent advances in micro/nano technology, embedded sensor systems, optical diagnostics, and multiparameter measurement technologies

Mission Area VII: System-wide Application of Additive Manufacturing for Propulsion Applications

Chair:  Mr. James L. Cannon, NASA MSFC / Huntsville, AL
Telephone:  (256) 544-7072
Email:  james.l.cannon@nasa.gov

This area focuses on the use of Additive Manufacturing (AM) as an enabling technology from both an organizational and a systems perspective. Additive manufacturing is critical for reducing manufacturing time and cost to produce specific components for propulsion systems, and multiple JANNAF Subcommittees are addressing the specific application challenges within their areas. Affordability is a critical element for both government and commercial systems. New and innovative manufacturing techniques are working their way into mainstream manufacturing. Before additive manufacturing is widely accepted for general use, it is necessary to understand the technology well enough to proceed with a high level of confidence. This Mission Area emphasizes how the various JANNAF organizations are planning to address the challenges of integrating AM into propulsion systems. What are the synergies between the JANNAF organizations’ AM plans and the AM centers of excellence such as America Makes (as well as others)? How are the JANNAF organizations addressing the integration of AM hardware into existing or new systems? Other areas to consider are overall cost considerations and ROI when incorporating AM hardware into new systems.

Papers should address AM technology roadmaps (government, industry, AM centers), AM integration challenges, strategies for incorporating AM hardware into new or existing systems, and economic considerations.

Additive Manufacturing Technology:
• Government AM Technology Road Maps/Plans
• AM Centers of Excellence Technology Road Maps/Plans
• Industry AM Technology Road Maps
• Synergy between roadmaps, what is missing?
• Challenges for incorporating AM hardware into systems
• Economic considerations of incorporating AM hardware into new systems
• Are we investing enough into AM?
• Are we investing in the right areas?

JHU WSE ERG Technical Representative
Mr. Pete Zeender, JHU WSE Energetics Research Group / Columbia, MD
Telephone:  (443) 718-5001
Email:  pzeender@erg.jhu.edu
JANNAF Program Planning Committee
Mr. Bruce R. Askins, NASA MSFC / Huntsville, AL
Telephone: (256) 544-1096
Email: bruce.askins@nasa.gov
Mr. Ryan E. Hunter, NAWCWD / China Lake, CA
Telephone: (760) 939-7893
Email: ryan.hunter@navy.mil
Dr. Christopher G. Murawski, AFRL / Wright-Patterson AFB, OH
Telephone: (937) 255-1237
Email: christopher.murawski.2@us.af.mil
Mr. Paul J. Conroy, CCDC Army Research Laboratory / Aberdeen Proving Ground, MD
Telephone: (410) 278-6114
Email: paul.j.conroy4.civ@mail.mil
Dr. Jeremy R. Rice, CCDC Aviation & Missile Center / Redstone Arsenal, AL
Telephone: (256) 876-6077
Email: jeremy.r.rice4.civ@mail.mil
Lt Col William Evans, AFRL / Edwards AFB, CA
Telephone: (661) 275-5069
Email: william.evans.27@us.af.mil
Dr. Charles J. Trefny, NASA GRC / Cleveland, OH
Telephone: (216) 433-2162
Email: charles.j.trefny@nasa.gov
Dr. David R. Gonzalez, NSWC IHEODTD / Indian Head, MD
Telephone: (301) 744-1513
Email: david.r.gonzalez@navy.mil

SMBS MISSION AREAS
The 46th Structures and Mechanical Behavior Subcommittee sessions relate to the structures and materials comprising propulsion systems, including composite structures. Papers are solicited on developing, applying, and verifying techniques for preliminary or detailed structural design of propulsion units (rocket motors, liquid- or gel-fueled engines and gun propulsion) and related composite structures, for assessing their structural integrity and reliability, and for predicting their service life. Additional information concerning these areas or the topics being solicited should be directed to the appropriate Area Chair. Specific areas of interest are listed below.

Mission Area I: Service Life / Missile Sustainment
Chair: Mr. Geoffrey E. Trapp, AFRL / Edwards AFB, CA
Telephone: (661) 275-6224
Email: geoffrey.trapp@us.af.mil
Methodology for service life prediction and assessment.
- Aging systems - surveillance, service life prediction, extension
- Factors which limit the service life of propulsion systems and propellants, such as chemical/structural aging, changes in binder/filler interaction, crystallization, migration/diffusion of ingredients or moisture
- Development approaches for improving service life of solid rocket motors and liquid rocket components
- Motor monitoring - NDE methodologies applicable to service life evaluation
- Factors which limit service life of structural sub-components (nozzles, cases, igniters, combustion chambers, tanks, etc.)
- Hazards related to service life and aging

Mission Area II: Materials Properties and Characterization
Co-Chairs: Dr. Soe T. (Tom) Bhe, Aerojet Rocketdyne / Rancho Cordova, CA
Telephone: (916) 355-4159
Email: soe.bhe@rocket.com
Mr. David J. Braithwaite, Northrop Grumman Corporation / Brigham City, UT
Telephone: (435) 863-6904
Email: david.braithwaite@ngc.com
New developments or application experiences related to mechanical properties and characterization.
- Effects of propellant formulation on gun tube wear and erosion (GTWE)
- Fundamental molecular modeling related to gun tube wear and erosion
- New and/or improved test methods for evaluating materials used in liquid engine components or liquid engine propellant tanks
- New and/or improved test methods for evaluating propellant and case or component construction materials mechanical properties including tensile, shear, friability, dilatation and bulk, fracture, microstructure, aging, propellant/case bond, etc.
- New and/or improved approaches to material properties optimization during solid rocket motor or gun propellant development
- Advancements in test equipment and procedures, test instrumentation, data acquisition and processing techniques, and data reduction and analysis
- Test specimen preparation techniques and dynamic characterization
- Mechanical properties related to propulsion systems hazards, e.g., material characterization under impact loads or high loading rates
**Mission Area III: Structural Analysis and Design**

**Co-Chairs:** Dr. Brian C. Liechty, Northrop Grumman Corporation / Brigham City, UT

**Telephone:** (435) 863-3459

**Email:** brian.liechty@ngc.com

Mr. Colton Cevering, Northrop Grumman Corporation / Brigham City, UT

**Telephone:** (435) 863-8346

**Email:** colton.cevering@ngc.com

Evaluation and validation of structural analysis methods applicable to initial design, structural integrity, and service life prediction of propulsion systems.

- Advancements in the state-of-the-art in structural analysis, particularly in nonlinear viscoelastic analysis and incorporation of nonlinear constitutive behavior
- Cumulative damage, failure criteria, and thermal and moisture diffusion analysis are included in these areas
- Structural reliability analyses and analysis of nondestructive evaluation results relative to structural reliability are two areas of particular interest
- Approaches to incorporating the results of NDE in a structural analysis code and methods of evaluating the effects of defects on structural integrity are of particular interest
- Applications of nonlinear elastic-plastic analysis to design of metal components, such as cases and pressure vessels
- Application of structural analysis methods to health-monitoring sensors, including sensor design, influence of sensors on motor integrity, and interpretation and application of sensor data

**Mission Area IV: Experimental Structural and Mechanical Analysis and Test Methods**

**Chair:** Mr. Vincent McDonald, NSWC IHEODTD / Indian Head, MD

**Telephone:** (301) 744-1463

**Email:** vincent.mcdonald1@navy.mil

Evaluation of stress measurement tools and techniques for liquid rocket engines and solid rocket motors, analog rocket motor design, analysis and testing.

- State-of-the-art experimental structural methods
- Technology for experimental stress analysis
- Experimental validation of stress analyses and failure analyses
- Experimental investigation of rocket motor structural/ballistic interactions operating pressures (gun barrel and motor case)
- Statistical considerations in experimental stress analysis
- Experimental structural analysis and test methods for rocket motor cases, nozzles, and gun propulsion systems
- Experiments related to the fundamental chemistry occurring between gun barrel materials and combustion products
- Macroscopic erosion experiments leading to chemical mechanisms occurring in gun tube wear and erosion

**Mission Area V: Nondestructive Evaluation**

**Chair:** Mr. Scott H. McClain, CCDC Armaments Center / Picatinny Arsenal, NJ

**Telephone:** (973) 724-8428

**Email:** scott.mcclain3.civ@mail.mil

Nondestructive evaluation and inspection techniques to solid propellant rocket motors, liquid or gel engines, and gun propulsion systems and components.

- Application of NDE techniques during any portion of the life cycle of the propulsion components
- Application of NDE technology and methods for enhancing propulsion system and/or subcomponent quality and reliability
- Use of NDE methods during the propulsion system life cycle from manufacturing to acceptance (buy-off)
- The monitoring and control of manufacturing processes
- Automated NDE sensing systems for quality control and conformance testing
- Use of embedded sensing system (including Micro-Electromechanical Systems – MEMS) for performance testing
- NDE methods used during static test
- NDE standards for system or component acceptance
- NDE methods for health management
- Role of NDE in service life assessment and extension
- Evaluation of propulsion system aging characteristics
- The post-acceptance evaluation of grain integrity, inert materials aging, chemical attack and migration, corrosion, and environmental storage effects
- Use of NDE technologies in strategic sustainment
- Advanced NDE systems and technologies, including but not limited to, real-time radiography, digital ultrasonics, holography, shearography, computed tomography, acoustic emission, electro-optic fiber embedments, thermography, lasers, and advanced digital image analysis techniques
- Emerging NDE technologies and their potential application to the propulsion community

**Mission Area VI: Damage Tolerance / Fracture / Failure [Joint Mission Area with RNTS]**

**Chair:** Mr. David M. McCutcheon, NASA MSFC / Huntsville, AL

**Telephone:** (256) 544-8835

**Email:** david.m.mccutcheon@nasa.gov

This mission area will focus on experimental and modeling studies into damage tolerance and/or fracture pertaining to non-metallic materials which can be used on space systems such as rocket motors or re-entry vehicles. Examples of areas of research could include investigation into fracture behavior of propellants, liners, insulation, adhesives, nozzle ablative liners, re-entry insulators, etc. Emphasis will be placed on material characterization of flaw behavior and analytical methods used to simulate these behaviors. Areas of study would include propagation, arrest, and fatigue and related topics. Current and historical investigations into anomalies and failures as related to damage tolerance and fracture will also be addressed.
Structures and Mechanical Behavior Subcommittee
Chair
Dr. Jeremy R. Rice, CCDC Aviation & Missile Center / Redstone Arsenal, AL
Telephone: (256) 876-6077
Email: jeremy.r.rice4.civ@mail.mil

Structures and Mechanical Behavior Subcommittee
Deputy Chair
Mr. Robert W. Pritchard, NAWCWD / China Lake, CA
Telephone: (760) 939-7504
Email: robert.w.pritchard@navy.mil

JHU WSE ERG Technical Representative
Mr. Bryan DeHoff, Aerospace Technical Services / West Chester, OH
Telephone: (513) 378-7071
Email: bryan.dehoff@aerospacetechnic.com

PEDCS MISSION AREAS
The 42nd Propellant and Explosives Development and Characterization Subcommittee sessions will be organized into the topic areas described below. Please submit your abstract according to the interest area.

Mission Area I: Liquid Propellants
Chair: Dr. Benjamin Greene, Jacobs Technology, Incorporated / Las Cruces, NM
Telephone: (575) 524-5761
Email: benjamin.greene-1@nasa.gov

Papers are sought on research, development, and improvement of methods of analysis of liquid propellants; development and characterization of new and existing liquid engine and gun propellants; assessment of materials compatibility and reactivity with various propellants including hydrazine fuels, dinitrogen tetroxide oxidizers, gels, ionic and other monopropellants, and liquid gun propellants. Also of interest is the evaluation of liquid propellant supply status and qualification of new or alternate suppliers.

Mission Area II: Explosive Development and Characterization
Chair: Dr. Mark H. Mason, Jr., NAWCWD / China Lake, CA
Telephone: (760) 939-4300
Email: mark.h.mason@navy.mil

Areas of interest include chemical and combustion test methods to analyze and characterize energetic materials and their formulations including solid and liquid propellants, warheads, pyrotechnics, fuses, and initiators, especially those pertaining to tactical and strategic propellants and associated energetics that contain novel ingredients; modifications of current test methods or alternate procedures that minimize/eliminate the use of ozone depleting solvents or other adverse organic chemicals; statistics of sample selection; techniques of sample preparation; methods development for microcalorimeter instruments, gun propellant, and rocket propellant; and related subjects. A newly added focus will be an emphasis to document and track on-going propellant and warhead raw material obsolescence and related testing of new replacement materials.

Mission Area III: Propellant and Explosives Process Engineering
Co-Chairs: Dr. Jamie B. Neidert, CCDC Aviation & Missile Center / Redstone Arsenal, AL
Telephone: (256) 876-5455
Email: jamie.b.neidert.civ@mail.mil
Mr. Charles R. Painter, NSWC IHEODTD / Indian Head, MD
Telephone: (301) 744-6772
Email: charles.r.painter@navy.mil

Papers are sought in the areas of propellant and energetic formulation development and processing technology. Additional areas of interest include the measurement and characterization of rheological properties such as viscosity, yield stress, pot life/gelation time, cure rate, and viscoelasticity and their effect on properties such as processability, ballistics, and mechanical behavior. Of particular interest are the continuous processing of energetic materials and lessons-learned in propellants and explosives manufacture. Novel propellant processing topics are also solicited.

Mission Area IV: Energetic Materials Characterization and Raw Material Obsolescence
Chair: Mr. Christopher A. Marshall, CCDC Aviation & Missile Center / Redstone Arsenal, AL
Telephone: (256) 842-0094
Email: christopher.a.marshall4.civ@mail.mil

Areas of interest include chemical and combustion test methods to analyze and characterize energetic materials and their formulations including solid and liquid propellants, warheads, pyrotechnics, fuses, and initiators, especially those pertaining to tactical and strategic propellants and associated energetics that contain novel ingredients; modifications of current test methods or alternate procedures that minimize/eliminate the use of ozone depleting solvents or other adverse organic chemicals; statistics of sample selection; techniques of sample preparation; methods development for microcalorimeter instruments, gun propellant, and rocket propellant; and related subjects. A newly added focus will be an emphasis to document and track on-going propellant and warhead raw material obsolescence and related testing of new replacement materials.
Mission Area V: Solid Propellant Ingredients and Formulations

Co-Chairs: Dr. Gregory W. Drake, CCDC Aviation & Missile Center / Redstone Arsenal, AL
Telephone: (256) 842-0647
Email: gregory.w.drake.civ@mail.mil
Dr. Nirupam J. Trivedi, CCDC Army Research Laboratory / Aberdeen Proving Ground, MD
Telephone: (410) 306-3108
Email: nirupam.j.trivedi.civ@mail.mil

Identification of advances and challenges in the area of solid propellant ingredients and formulations with emphasis on ingredient synthesis and production, industrial base and supplier status, chemical, structural and physical characteristics (including reactivity), and recovery, reuse, and disposal of ingredients as well as the qualification and use of new and novel ingredients in propellant formulations.

Mission Area VI: Propellant and Explosive Surveillance and Aging

Chair: Dr. Kerry A. Clark, NSWC IHEODTD / Indian Head, MD
Telephone: (301) 744-4273
Email: kerry.a.clark@navy.mil

Papers are sought on analysis techniques for the determination of the chemical aging behavior and safe storage of solid propellants. Of particular interest are the decomposition of solid propellants that contain nitrate esters and the autoignition risk that may result from their degradation.

Mission Area VII: Gun Propulsion

Co-Chairs: Dr. Kirstin F. Warner, DoD Explosives Safety Board / Alexandria, VA
Telephone: (571) 375-6774
Email: kirstin.f.warner.civ@mail.mil
Ms. Christine D. Knott, NSWC IHEODTD / Indian Head, MD
Telephone: (301) 744-2555
Email: christine.knott@navy.mil

Research in the areas of formulation and processing of propellants and associated components (igniters, case and packaging materials, etc.) for use in gun propulsion. This can include new compositions, new ingredient development, novel geometries and structures, propellant development protocols, performance diagnostics, aging and shelf life, increased performance, reduced wear and erosion, as well as insensitive munitions response.

Mission Area VIII: Green Energetic Materials (GEM)

Joint PEDCS - SEPS Mission Area

Co-Chairs: Mr. Noah Lieb, Jensen Hughes / Baltimore, MD
Telephone: (410) 737-8677
Email: nlieb@jensenhughes.com
Dr. Jesse J. Sabatini, CCDC Army Research Laboratory / Aberdeen Proving Ground, MD
Telephone: (410) 278-0235
Email: jesse.j.sabatini.civ@mail.mil
Dr. Sara K. Pliskin, NSWC / Crane, IN
Telephone: (812) 854-3190
Email: sara.pliskin@navy.mil

Papers are sought on the development of environmentally sustainable energetic ingredients, formulations, and processing technologies with an emphasis on the following: reduction of impacts from energetic materials and unexploded ordnance on military ranges, manufacturing and demilitarization facilities; enhancement of recycling, recovery, reuse and reduction of waste; and response to specific impacts that environmental regulations have had on military readiness, such as limiting training with live ordnance, outsourcing of manufacturing overseas or explicit banning of the use of specific materials.

Propellant and Explosives Development and Characterization Subcommittee Chair
Mr. Chuck Davis, NASA / Kennedy Space Center, FL
Telephone: (321) 867-4748
Email: chuck.davis@nasa.gov

JHU WSE ERG Technical Representative
Mr. William A. Bagley, JHU WSE ERG / Columbia, MD
Telephone: (443) 718-5009
Email: wbagley@erg.jhu.edu

RNTS MISSION AREAS
The 33rd Rocket Nozzle Technology Subcommittee sessions will focus on materials, processing, testing, evaluation, design, analysis, and other topics of interest in the rocket nozzle technology area. Additional information concerning these areas or the topics being solicited should be directed to the appropriate Area Chair. Papers are sought in the specific areas listed below.

Mission Area I: Nozzle Thermal, Structural, Fluids Analysis and Modeling
Chair: Dr. Heath T. Martin, NASA MSFC / Huntsville, AL
Telephone: (256) 544-5993
Email: heath.t.martin@nasa.gov

Suggested topics for papers in this session:
- Advances in modeling of ablation and erosion of nozzle composite materials
- Advances in CFD modeling of heat and mass transfer processes in rocket nozzles
• Advances in structural composite materials modeling and failure criteria
• Coupled thermo-structural modeling of heated composites using explicit methods
• Coupled fluid-thermal surface ablation modeling with two-phase surface interaction
• Porous media, pyrolysis gas, and pore pressure modeling
• Semi-empirical laboratory methods used for gathering of heated composite property data

Mission Area II: Nozzle Design, Test and Evaluation

Chair: Mr. Clyde E. Carr, Jr., Northrop Grumman Innovation Systems / Elkton, MD
Telephone: (410) 392-1877
Email: clyde.carr@ngc.com

Nozzle design, test, and evaluation areas of interest include:

• Evaluation - Health monitoring for material aging and material characterization
• Nozzle Design 'lessons learned'
• Test - performance based acceptance testing and new or improved test methods
• Post-Test Evaluation - comparison of test results to predictive methodologies and tools (e.g. SPP)
• New materials characterization and fabrication, including constituent/composite material behavior throughout all phases of processing
• In-process characterization techniques and instrumentation
• Assessment of the state-of-the-art, vision of the future, and research/development paths is requested

Papers addressing qualitative and quantitative goals relevant to technical and system level challenges are specifically sought. Discussion of new technologies/materials and future expectations is also invited.

Mission Area III: Thrust Control

Chair: Mr. J. Robert Esslinger, Jr., CCDC Aviation & Missile Center / Redstone Arsenal, AL
Telephone: (256) 842-1358
Email: john.r.esslinger.civ@mail.mil

Specific topics of interest include nozzle designs that use active or passive control to achieve thrust control; weight, volume, size, and cost reduction techniques; component and system modeling and analysis, to include system performance benefits of thrust management control or thrust vector control; control techniques, to include control systems, control algorithms, actuation methods or mechanisms; thrust management control via pulsing, and motor extinguishment and re-ignition; pintle controlled nozzles; VAN (variable area nozzle) designs; nozzle designs that incorporate thrust vector control (exclusive of jet vane systems) as well as thrust level control; developments in jet vane/tab, moveable nozzle, hot gas valve, probe, fluid injection, or any other standard or novel TVC technologies; TVC applications of micro-electromechanical systems (MEMS); and component and system test results.
**Mission Area I: Toxicology**

**Co-Chairs:** Dr. David R. Mattie, AFRL, 711HPW / Wright-Patterson AFB, OH

**Telephone:** (937) 904-9569

**Email:** david.mattie@us.af.mil

Dr. Mark S. Johnson, Army Public Health Center / Aberdeen Proving Ground, MD

**Telephone:** (410) 436-5081

**Email:** mark.s.johnson@us.army.mil

Toxicity of energetic materials such as propellants, pyrotechnics, and munitions, their ingredients, combustion products, and related chemicals and subjects. Also of interest are the use of risk assessment methodologies in the management of toxic hazards and the rationale for the establishment of toxic material exposure criteria for the workplace and the environment.

**Mission Area II: Atmospheric Dispersion Modeling and Hazards Assessment**

**Co-Chairs:** Mr. Daniel E. Strub, 30th Space Wing / Vandenberg AFB, CA

**Telephone:** (805) 605-2407

**Email:** daniel.strub@us.af.mil

Dr. Josephine Covino, DoD Explosives Safety Board / Alexandria, VA

**Telephone:** (571) 372-6685

**Email:** josephine.covino.civ@mail.mil

Mission Area II is focused on atmospheric dispersion modeling and hazards assessment applied to propulsion activities. Subjects of interest include modeling transport and diffusion of propellant spills including both dense and trace gases, chemically reactive species, and aerosols; wind flow and dispersion modeling in complex terrain; model validation; source modeling; ozone depletion, ground cloud dispersal, and acid rain from launch vehicles; and models for emergency response systems. Experimental or theoretical work on other atmospheric hazards such as thunderstorms, lightning, wind shear, and precipitation are also welcome.

**Mission Area III: Instrumentation**

**Chair:** Dr. Karen L. Mumy, Naval Medical Research Unit - Dayton / Wright-Patterson AFB, OH

**Telephone:** (937) 904-9474

**Email:** karen.mumy@us.army.mil

Interests include instrumentation requirements, basic research, and hardware development of equipment used to measure hazardous environments. Presentations regarding work done in the measurement of hypergolic or other hazardous propellant vapors, oxygen/hydrogen propellant vapors, hydrochloric acid and other propellant combustion products, and other chemical hazards of interest to the propulsion community are sought.

**Mission Area IV: Environmental**

**Co-Chairs:** Dr. William S. Eck, Army Public Health Center / Aberdeen Proving Ground, MD

**Telephone:** (410) 436-7169

**Email:** william.s.eck.civ@mail.mil

Dr. Jeanne Hartzell, Naval Ordnance Safety & Security Activity / Indian Head, MD

**Telephone:** (301) 744-5629

**Email:** jeanne.hartzell1@navy.mil

For the May 2020 meeting, the Environmental Mission Area is interested in papers that address environmental fate and transport of insensitive munitions or proposed propellant replacements. This includes computational approaches for predicting combustion products and their transport in the environment. Presentations that address any of the following: emerging environmental regulations and their impact on energetic materials operations, environmental effects on flora and fauna resulting from propulsion-related activities, permitting requirements; hazardous waste treatment; water and air pollution prevention and control technologies involving energetic material production and use; waste minimization, operational ingredient reclamation or recycling in the production of energetic materials.

**Mission Area V: Industrial Hygiene**

**Co-Chairs:** Ms. Lindsey Kneten, Army Public Health Center / Aberdeen Proving Ground, MD

**Telephone:** (410) 436-5485

**Email:** lindsey.b.kneten.civ@mail.mil

Dr. N. Cody Schaal, Naval Medical Research Unit - Dayton / Wright-Patterson AFB, OH

**Telephone:** (937) 904-9436

**Email:** nicholas.schaal@us.af.mil

Industrial hygiene aspects of energetic material production, transportation, use, and disposal. Areas of interest include personal protective strategies and equipment used in manufacturing and handling operations; ingredient and product monitoring methods and experience; operational ventilation strategies and experience; hazardous materials control; hazardous waste management; substitution of less hazardous materials in industrial processes and maintenance; and hazardous materials information, including labeling and material safety data sheets.

**Mission Area VI: Range Safety and Explosives Safety**

**Co-Chairs:** Mr. Daniel E. Strub, 30th Space Wing / Vandenberg AFB, CA

**Telephone:** (805) 605-2407

**Email:** daniel.strub@us.af.mil

Dr. Josephine Covino, DoD Explosives Safety Board / Alexandria, VA

**Telephone:** (571) 372-6685

**Email:** josephine.covino.civ@mail.mil

Range safety and explosives safety issues relevant to launch range safety risk assessments and other energetic material safety
problems. Papers are sought that address hazards inherent in solid and liquid propellant/explosive/pyrotechnic (PEP) materials manufacturing, processing, handling, storage, use and disposal; liquid and solid propellant explosive hazards; air blast effects; quantity-distance criteria; shielding; and the hazards of damaged or aged propellants.

Mission Area VII: Green Energetic Materials (GEM) Joint PEDCS - SEPS Mission Area
Co-Chairs: Mr. Noah Lieb, Jensen Hughes / Baltimore, MD
Telephone: (410) 737-8677
Email: nlieb@jensenhughes.com
Dr. Jesse J. Sabatini, CCDC Army Research Laboratory / Aberdeen Proving Ground, MD
Telephone: (410) 278-0235
Email: jesse.j.sabatini.civ@mail.mil
Dr. Sara K. Pliskin, NSWC / Crane, IN
Telephone: (812) 854-3190
Email: sara.pliskin@navy.mil

Papers are sought on the development of environmentally sustainable energetic ingredients, formulations, and processing technologies with an emphasis on the following: reduction of impacts from energetic materials and unexploded ordnance on military ranges, manufacturing and demilitarization facilities; enhancement of recycling, recovery, reuse and reduction of waste; and response to specific impacts that environmental regulations have had on military readiness, such as limiting training with live ordnance, outsourcing of manufacturing overseas or explicit banning of the use of specific materials.

Mission Area VIII: Demilitarization, Reclamation, and Reuse Technologies
Co-Chairs: Dr. Jeffrey L. Lee, CCDC Aviation & Missile Center / Redstone Arsenal, AL
Telephone: (256) 842-6514
Email: jeffrey.l.lee.civ@mail.mil
Mr. Gary Mescavage, CCDC Armaments Center / Picatinny Arsenal, NJ
Telephone: (973) 724-3349
Email: gary.s.mescavage.civ@mail.mil

Demilitarization, reclamation, and reuse technologies for propellant, explosive, and pyrotechnic (PEP) materials. Interest areas include: thermal degradation/treatment and incineration of PEP materials; chemical or mechanical separation, reclamation, and neutralization technologies; technologies that utilize sub-or super-critical fluids for reclamation or oxidation of PEP materials; biodegradation technology; reuse of energetic materials or ingredients for military and commercial applications; and regulations that address traditional disposal options, such as open burning/open detonation and static firing.

Mission Area IX: Review of Accidents and Incidents
Chair: Mr. Daniel E. Strub, 30th Space Wing / Vandenberg AFB, CA
Telephone: (805) 605-2407
Email: daniel.strub@us.af.mil

Review of accidents and incidents involving propellant manufacturing, storage, transportation, use, hazardous material spills, and transportation accident response. Topics of interest include lessons learned, post-accident procedures for liquid propellant spills, propellant spill response systems, spill mitigation activities, and transportation accident response computer systems.

Safety and Environmental Protection Subcommittee Chair
Dr. Sara K. Pliskin, NSWC / Crane, IN
Telephone: (812) 854-3190
Email: sara.pliskin@navy.mil

Safety and Environmental Protection Subcommittee Deputy Chair
Dr. David R. Mattie, AFRL, 711HPW / Wright-Patterson AFB, OH
Telephone: (937) 904-9569
Email: david.mattie@us.af.mil

JHU WSE ERG Technical Representative
Mr. William A. Bagley, JHU WSE ERG / Columbia, MD
Telephone: (443) 718-5009
Email: wbagley@erg.jhu.edu

MSS MISSION AREAS
The 14th Modeling and Simulation Subcommittee (MSS) provides an overarching focus on M&S across all disciplines related to JANNAF Interagency simulation-based acquisition of propulsion systems for aerospace plane, hypersonic aircraft, rocket-based space-access systems, high-speed missiles, and in-space propulsion systems, and gun propulsion systems. The MSS pursues this focus through Model-Based Engineering, Integrated Health Management, Simulation Credibility: Verification, Validation, and Uncertainty Quantification, and Modeling and Simulation of System Autonomy. At the 14th MSS Meeting, papers are sought to address specifics of these mission areas as described below.

Mission Area I: Model-Based Engineering
Chair: Dr. Eric Sholes, CCDC Aviation & Missile Center / Redstone Arsenal, AL
Telephone: (256) 955-0197
Email: eric.c.sholes.civ@mail.mil

Model-Based Engineering (MBE) encompasses the development of methodologies, codes, and model simulations to quantitatively evaluate and optimize propulsion technologies across propulsion component, propulsion system, and vehicle system levels. The MBE mission area includes the specific discipline of Model-Based System Engineering (MBSE). MBSE is the formalized application of modeling to support system requirements, design, analysis, and
verification/validation activities from conceptual design through later life cycle phases. The use of models complements traditional experimentation during technology development with a goal of reducing the development time and schedule. Development and usage of physics-based models allows exploration of domains and behaviors that may be particularly difficult or impossible to examine experimentally. Statistical models provide an estimation of system sensitivities and uncertainties. Publications in the MBE area fall under two topic headings: Modeling Methodologies/Approaches/Tools and System Analysis Results.

Examples of topics of interest for the MBE mission area include the following:

- **Modeling Methods/Approaches**
  - Proposed performance/loss models for rotating detonation rocket engines
  - Accommodating multidisciplinary modeling at multiple heterogeneous levels of fidelity
  - Engineering decision support, including facilitating optimization, scheduling, and knowledge-based tool integration into the engineering process
  - Advances in the development of models and methods for component modeling and simulations to aid propulsion design
  - Improvements in commercial software which enable advanced MBE
  - Challenges/Boosts to using MBE under a more commercial/less centralized propulsion technology development paradigm and shifts from horizontal to vertical integration in the launch industry

- **System Analysis Results**
  - M&S of vehicle system technology trades for space launch systems, prompt strike platforms, long-range ballistic missiles, cruise missiles, and hypersonic cruise vehicles
  - Simulations, methods, and models to evaluate performance capabilities, cost, and reliability of systems
  - Vehicle and launch facility, weapon and weapons platform, propulsion system and test facility simulations, interactions, and integration

**Mission Area II: Integrated Health Management**

**Chair:** Mr. James T. Singleton, AFRL / Edwards AFB, CA

**Telephone:** (661) 275-5907

**Email:** james.singleton.7@us.af.mil

Integrated Health Management (IHM) promotes advancement and development of best practices for IHM of propulsion systems within a “system of systems” environment. IHM technologies are focused on reducing maintenance and logistics costs, and increasing reliability of propulsion systems. IHM includes methods and tools for: data management and mining; integrated communications, command and control; diagnostics; prognostics, and integrated sensors and sensing systems. These tools enable making redline and contingency decisions using knowledge-based expert systems, model-based diagnostic and reasoning, fault models, neural networks, fuzzy logic, genetic and evolutionary algorithms, and life-cycle analysis. The advancement of the internet of things (IoT), digital twin and augmented reality (AR) technologies are key enablers for implementing IHM systems in propulsion systems.

Seeking papers on the following, with the intent to establish a valuable interchange of technical solutions:

- **Propulsion System relevant IoT, Digital Twin and AR implementation challenges, successes, lessons learned and business case impact**
- **Data Management and Mining: Advances in data mining, data fusion, machine learning, and statistics with applications to verification and validation of data, prognosis and diagnosis of system health**
- **Integrated Communications, Command and Control: architecture, theory, test beds, and demonstrations**
- **Diagnostic Systems: architecture, theory, simulations, and demonstrations of diagnosis of current state of health of propulsion and vehicle system, including in-place and depot-level non-destructive inspection methodologies**
- **Prognostic Systems: architecture, theory, simulations, and demonstrations of prognosis of future state of health of propulsion and vehicle systems; mitigation of, and recovery from, degraded system health to enable condition based repairs and successful missions**
- **Integrated Sensors and Sensing Systems: diverse sensors and integrated sensing systems with broad applications to health and status monitoring of all vehicle types and methods for integrated sensing systems across multiple disciplines and end-use applications with an emphasis on measurement technology, smart sensors, test beds, application considerations, lessons learned, and sensor fidelity for condition-base maintenance (CBM+) of propulsion systems**

**Mission Area III: Simulation Credibility: Verification, Validation, and Uncertainty Quantification**

**Co-Chairs:** Dr. Robert Baurle, NASA LaRC / Hampton, VA

**Telephone:** (757) 864-9016

**Email:** robert.a.baurle@nasa.gov

Dr. Dean R. Eklund, AFRL / Wright-Patterson AFB, OH

**Telephone:** (937) 255-0632

**Email:** dean.eklund@us.af.mil

The credibility of digital simulations is a major issue for incorporating simulation tools and data into a technology-development program, for conducting simulation-based acquisition, for assessing system reliability to assure human safety and/or mission success, and for identifying and assessing risks in complex, technological systems. Simulation credibility includes assessment and quantification of simulation uncertainty, sensitivity analysis, experimental uncertainty, physical model validation, simulation verification and validation, and risk assessment. Papers are solicited on efforts and guidance on simulation credibility for unit, benchmark, subsystem, and system problems related to the following topics:

- Uncertainty sources and sensitivity analysis
- Propagation, quantification, and management of uncertainty
Mission Area IV: Modeling and Simulation of System Autonomy

Co-Chairs: Dr. Michael D. Watson, NASA MSFC / Huntsville, AL
Telephone: (256) 544-3186
Email: michael.d.watson@nasa.gov

Dr. David R. Gonzalez, NSWC IHEODTD / Indian Head, MD
Telephone: (301) 744-1513
Email: david.r.gonzalez@navy.mil

Modeling and Simulation of System Autonomy encompasses the development of methodologies, codes, and models, and simulations to evaluate, analyze, and optimize autonomous system capabilities. System autonomy addresses the modeling and simulation of artificial intelligence (AI) algorithms, the integration of AI algorithms, simulation environments including the interaction of algorithms with system hardware, verification and validation of non-deterministic algorithms, and determination of operational bounds. The use of modeling and simulations of autonomous systems to determine their responses and operational bounds is also a crucial technology area. Various autonomous systems are included in this mission area including aircraft, ground vehicles, hypersonic vehicles, launch vehicles, spacecraft, and water craft.

Modeling and Simulation Subcommittee Chair
Dr. Michael D. Watson, NASA MSFC / Huntsville, AL
Telephone: (256) 544-3186
Email: michael.d.watson@nasa.gov

JHU-WSE ERG Technical Representative
Mr. Alex Bishop, JHU WSE Energetics Research Group / Columbia, MD
Telephone: (443) 718-5008
Email: abishop@erg.jhu.edu

WORKSHOPS/SPECIALIST SESSIONS

Recommendations for workshops or specialist sessions are solicited at this time. Individuals interested in organizing and chairing a workshop or specialist session should contact the JHU WSE ERG Technical Staff member in their respective subcommittee by the Deadline of 9 December 2019.

Workshops

The JANNAF Workshop is reserved for bringing the community together to address a specific task or problem, the outcome of which is important and substantial enough to warrant the publication of a final report detailing the discussions, conclusions, and recommendations that resulted from the workshop.

Requirements for JANNAF workshops and established best practices can be found in the JANNAF Workshop Guide for Chairs; this document will guide you through the planning and approval process for workshops held at a JANNAF meeting.

To request a workshop you must submit a Workshop Request Form to your JHU WSE ERG Technical Representative (see pages 6 - 17 for contact information) or the JANNAF Meeting Planning Team at meetings@erg.jhu.edu. This form must be submitted to ERG by Monday, 9 December 2019. The agenda and invitation list is due Monday, 10 February 2020 for inclusion in the Preliminary Program, and must be approved no later than Monday, 6 April 2020 for inclusion in the Final Program.

Specialist Sessions

A JANNAF specialist session is an opportunity for experts in a specific technical area to meet to stimulate ideas and contributions from the audience. These sessions are dedicated to a single topic and often include invited presentations. The organization of these sessions is similar to a regular JANNAF paper session with time allocated to individual presentations; however, specialist sessions often include moderator led discussion periods or a question and answer session with expert panelists. Unlike a regular JANNAF paper session, the presentations from specialist sessions may or may not be published as part of the meeting proceedings. Publication can include an executive summary authored by the session chair if desired.

To request a Specialist Session for this JANNAF meeting, a Specialist Session Request Form must be submitted to JHU WSE ERG. This form requires a statement of justification for the Specialist Session along with a well thought out agenda. Requests will be reviewed by the designated JANNAF subcommittee TSG chair and ERG for approval; this approval is necessary for any Specialist Sessions to be included in the Final Program.

The deadline for submission of a Specialist Session request is 9 December 2019, and forms must include a draft agenda. If you have any questions about planning a Specialist Session please contact your ERG Technical Liaison or the JANNAF Meeting Planning Team at meetings@erg.jhu.edu.

JANNAF AWARDS PROGRAM

In the tradition of recognizing the outstanding achievements by members of the propulsion community, the JANNAF Technical Executive Committee (TEC) and Programmatic and Industrial Base Committee (PEC), as well as the Structures and Mechanical Behavior (SMBS), Propellant and Explosives Development and Characterization (PEDCS), Rocket Nozzle Technology (RNTS), Safety and Environmental Protection (SEPS), and Modeling and Simulation (MSS) subcommittees, are soliciting nominations for awards to be presented at the meeting. A TEC or PEC Award is justified if the achievement or service is in a technical or programmatic area that is not covered by an existing subcommittee, or is of such scope or magnitude that merits this recognition.
JPM / PIB / SMBS / PEDCS / RNTS / SEPS / MSS Announcement and Call for Papers

Special Recognition Awards
The Special Recognition awards for Sustained Contribution and Lifetime Achievement honor individual achievements, either in the last 18 months or for a lifetime of dedicated service. These awards are the most prestigious subcommittee awards and reflect on the awardees’ contributions to JANNAF.

Special recognition award winners will be selected by respective subcommittee Awards Committees based on review of the nomination in consideration of the following:

- Technical value of the achievement(s) including level of technical complexity and challenge, quality of results, degree of innovation and timeliness of research.
- Impact of the achievement on the broader propulsion community.
- For individuals nominated for lifetime achievement, demonstrated participation in technical societies as evidenced by positions held and papers published will be considered favorably.

Outstanding Achievement Award
The Outstanding Achievement Award is given for the most outstanding technical achievement in the subcommittee’s area by an individual, by a team within an organization, or by a team of organizations. To recognize the varied nature of the JANNAF subcommittees and the accomplishments of their communities, nominations may be solicited and given in the two focus areas of R&D Technology and Operational Systems.

- The achievement shall have been accomplished in the previous 18 months.
- The nominees must have worked for the organization during the same 18-month period of performance.

Certificate of Commendation
The Certificate of Commendation is given to recognize an individual whose contributions within the last 18 months have been pivotal in ensuring the success of a JANNAF activity.

Certificate of Appreciation
The Certificate of Appreciation is given to recognize individuals for outstanding contributions and dedicated service to JANNAF.

Nominations
To nominate an individual for one of the above awards please use the JANNAF TEC/PEC and Subcommittee Award Nomination Form. Nomination submissions should include the following:

- A description of the achievement or distinguished service, of no less than 200 and no more than 1000 words. The description must be typed or provided in electronic format (Adobe Acrobat PDF or MS Word) via email.
- Supporting data (if desired) of no more than 10 pages.
- Supporting curriculum vitae, list of publications, and/or professional activities as required to support the nomination.
- Contact information for the nominee(s) and the nominator, including organization affiliation, phone number, and email address.

Nominations should be submitted to the appropriate JHU WSE ERG technical representative no later than Monday, 16 March 2020.

Best Paper Awards
In addition to the nomination awards listed above JANNAF recognizes authors of papers that exhibit excellence and significant merit with the Best Paper Awards. Best Paper Awards from this meeting will be acknowledged in JANNAF News and announced at the next JANNAF Subcommittee meeting.

Best Student Paper Awards
The Best Student Paper Award will be given to undergraduate or graduate students who author papers that exhibit excellence and significant merit. One paper will be selected to receive the Best Student Paper Award. If requested on the Abstract Submittal Form, student-authored works will be included in the initial round of consideration with the submission of an abstract; please be sure to indicate on the Abstract form if you wish to be considered for the Best Student Paper Award. Please note that a student must be the paper’s primary author to be considered for this award.

As a reminder: student authors must conform to the same JANNAF eligibility requirements as other authors, per the policy on non-government attendees at JANNAF meetings given on page 2. Student authors are encouraged to work with their advisors to ensure they meet these requirements, and should contact the JANNAF Security Team (Mary Gannaway at mtg@jhu.edu or Tricia Frey at tfrey@erg.jhu.edu) at their earliest convenience with questions regarding their eligibility and participation.

Student papers will be reviewed upon submission of their cleared manuscripts. In order to be considered for the student best paper selection, the completed paper must be provided to JHU WSE ERG by Monday, 16 March 2020. The Best Student Paper Award will be presented at the JANNAF meeting at which the paper is given.

Some top reasons given for attending JANNAF meetings:

- The opportunity to present limited distribution papers to a technical audience and collaborate with colleagues from other laboratories and companies.
- Networking opportunities with other scientists.
- Lessons learned presentations.
- Keeping up with changing technology.
- Wide variety of subjects.
- Great exposure to the industry for young professionals.

JPM / PIB / SMBS / PEDCS / RNTS / SEPS / MSS Announcement and Call for Papers
UPCOMING JANNAF MEETINGS

13th Modeling and Simulation
11th Liquid Propulsion
10th Spacecraft Propulsion
Joint Subcommittee Meeting
Programmatic and Industrial Base Meeting

9-13 December 2019
Tampa, Florida
Visit December 2019 meeting website

67th JANNAF Propulsion Meeting
Programmatic and Industrial Base Meeting
46th Structures and Mechanical Behavior
42nd Propellant and Explosives Development and Characterization
33rd Rocket Nozzle Technology
31st Safety and Environmental Protection
14th Modeling and Simulation
Joint Subcommittee Meeting
18-22 May 2020
Pittsburgh, Pennsylvania
Visit May 2020 meeting website

50th Combustion
38th Airbreathing Propulsion
38th Exhaust Plume and Signatures
32nd Propulsion Systems Hazards
Joint Subcommittee Meeting
Programmatic and Industrial Base Meeting
7-11 December 2020
Location TBA