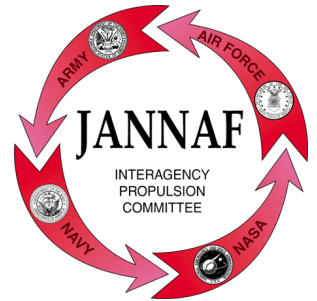


# **JANNAF** INTERAGENCY PROPULSION COMMITTEE

## JOINT ARMY-NAVY-NASA-AIR FORCE

64th JANNAF Propulsion Meeting  
Programmatic and Industrial Base Meeting  
44th Structures and Mechanical Behavior (SMBS)  
40th Propellant and Explosives Development and  
Characterization (PEDCS)  
31st Rocket Nozzle Technology (RNTS)  
29th Safety and Environmental Protection (SEPS)  
JOINT SUBCOMMITTEE MEETING  
**May 22 - 25, 2017**



## **Announcement and Call For Papers**

**Extended Abstract Deadline  
January 13, 2017**

**Kansas City, Missouri**

Last updated 1/9/2017

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The May 2017 meeting of the Joint Army-Navy-NASA-Air Force (JANNAF) will consist of the **64th JANNAF Propulsion meeting (JPM)**; the **Programmatic and Industrial Base (PIB) meeting**; and the Joint Meeting of the **Structures and Mechanical Behavior, Propellant and Explosives Development and Characterization, Rocket Nozzle Technology, and Safety and Environmental Protection Subcommittees**. Dr. Charles J. Trefny with NASA Glenn Research Center, Cleveland, Ohio, is the Meeting Chair. **This meeting will be held May 22 - 25, 2017, at the Westin Kansas City at Crown Center in Kansas City, Missouri.**

## ATTENDANCE

The overall security level of the meeting is Unclassified. All sessions will be held at a hotel located in the selected city, to be announced. Attendance, applicable to presenters as well, is restricted to qualified U.S. citizens. *No foreign nationals will be 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 [www.dlis.dla.mil/jcp/](http://www.dlis.dla.mil/jcp/).

Questions concerning attendance eligibility should be directed to the JHU WSE ERG Facility Security Officer, Mary Gannaway, at (410) 992-7304, ext. 211 or [mtg@jhu.edu](mailto:mtg@jhu.edu).

## PURPOSE

The JANNAF Interagency Propulsion Committee focuses on the technology, development, and production capabilities for all types of propulsion systems and energetics for tactical, strategic and missile defense rockets and missiles, for space boost and orbit transfer, for in-space propulsion, and for gun systems. JANNAF provides a forum for discussion of propulsion issues, challenges, and opportunities across the Military Departments, Defense Agencies and NASA. JANNAF subcommittees focus their resources on technical issues of interest to the JANNAF agencies.

Work in all areas of DoD and NASA are solicited as defined below:

### 6.1 Basic Research:

Systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products.

### 6.2 Applied Research:

Systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

### 6.3 Development:

Systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

JANNAF accepts papers that are unclassified/unlimited and unclassified/limited for all meetings; and up to classified Secret as announced in the specific meeting's announcement and call for papers.

## SCOPE

### JANNAF Propulsion Meeting

The JANNAF Propulsion Meeting (JPM) encompasses research and applications at the systems level. The JPM is held each year in conjunction with standing JANNAF subcommittee meetings on a rotating basis. The scope of the 64th JPM in 2017 spans seven mission areas, which are listed and described on pages 6-9.

In conjunction with the JPM, the standing JANNAF subcommittees for Structures and Mechanical Behavior, Propellant and Explosives Development and Characterization, Rocket Nozzle Technology, and Safety and Environmental Protection will also hold their biennial meeting (held every 18 months). To learn more about the scope of the standing JANNAF subcommittee meetings, please review the information provided below and on pages 9-16.

### Programmatic and Industrial Base

The JANNAF Programmatic and Industrial Base (PIB) Committee was created with the approval of the [updated JANNAF Charter](#) by the Department of Defense and the National Aeronautics and Space Administration in 2014. As stated in the [Charter](#), the "Programmatic and industrial base areas of interest include integrated program plans and key decision points; industrial base assessments; risks and opportunities with respect to skills, knowledge, and experience; identification of commonality, innovative acquisition, and partnership opportunities; integrated assessments to identify rocket propulsion industrial base (RPIB) rationalization opportunities; special actions from senior agency, department, or Executive 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 JANNAF 29th Safety and Environmental Protection Subcommittee 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.

## 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 6-16.
- The submission of an abstract represents an agreement to **submit a final paper for publication by 24 April 2017**, 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.
- **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 a qualified U.S. Citizen to attend and present at this meeting.*** No foreign nationals are permitted to attend.
- The **deadline** date for submission of [Abstract Submittal Forms](#) to JHU WSE ERG has been extended till **13 January 2017**.

JHU WSE ERG accepts only **electronic submission** of abstracts and papers. **Abstracts must be submitted on the [Abstract Submittal Form](#):**

- Via email to: [scohen@erg.jhu.edu](mailto:scohen@erg.jhu.edu); (*Distribution A only*); **OR**
- Uploaded to the ERG secure server as follows:
  1. Go to <https://webdatabase.cpia.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].
  5. Click the “Login” button.
  6. Click on “May 2017 JANNAF Meeting”; choose “Add Document” (to the left of the page)
  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”.
  8. Email [scohen@erg.jhu.edu](mailto:scohen@erg.jhu.edu) to notify that the file has been successfully uploaded.

**Remember, the deadline to submit a completed [Abstract Submittal Form](#) has been extended till 13 January 2017.**

## JPM / PIB / SMBS / PEDCS / RNTS / SEPS AUTHOR TIMELINE

Date	Weeks before Meeting	Action
13 January 2017	21	Extended Deadline for receipt of <a href="#">Abstract Submittal Form</a> . Deadline for receipt of <a href="#">Workshop and Specialist Session Request Forms</a> .
13 February 2017	14	Acceptance/rejection letters sent to authors.
27 February 2017	12	Deadline for changes to Meeting Invitation and Preliminary Program
6 March 2017	11	Invitation, Preliminary Program, and registration materials forwarded to propulsion community.
20 March 2017	9	Deadline for <a href="#">award nominations</a> .
10 April 2017	6	Deadline for submission of changes to the Final Program.
24 April 2017	4	Deadline for receipt of manuscripts and paper/presentation clearance forms. <b>Papers not received by this date may be removed from the program.</b>
1 May 2017	3	Anticipated deadline for reservations at host hotel.
8 May 2017	2	Deadline for reduced registration fee. Deadline for completion of Registration Questionnaire.
8 May 2017	2	Deadline for receipt of presentations.
22 May 2017	0	Start date for JPM/PIB/SMBS/PEDCS/RNTS/SEPS Joint Subcommittee Meeting

## AWARDS

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

## 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 **19 December 2016**. See page 17 for additional information and requirements.

## HOTEL INFORMATION

Discounted room rates have been arranged for JANNAF attendees at the Westin Kansas City at Crown Center in Kansas City, Missouri. Many options for dining and entertainment are located within a short walk or free trolley ride from the hotel. JANNAF attendees with a valid Government-employee I.D. will be eligible to reserve their room in the JANNAF per diem rate room block at \$117 per night plus tax. The discounted rate for non-Government attendees is \$159 per night. All room rates are subject to applicable state and local taxes, currently 16.85%, plus a Kansas City Development Fee of \$1.50 plus tax per night (\$1.75 including tax). Please visit the [Hotel](#) page of the website for more information.

## REGISTRATION INFORMATION

Registration will open in early March. To take advantage of the lowest registration fee, please plan to complete the two-step registration process (registration questionnaire and payment of the registration fee) on or before 8 May 2017.

Please be aware that there is a pre-requisite to registering for JANNAF meetings. You must have an active JANNAF Secure Portal Account. **If you do not currently have a Portal Account, or your account has expired, or you don't remember your password, we highly recommend addressing these issues now to simplify and speed up the registration process later.**

To apply for a JANNAF Secure Portal Account, go to <https://www.jannaf.org> and click on "Create new account" in the top right corner of the screen. Follow the instructions posted there to begin the application process. More information can be found on the JANNAF website by viewing the Portal Account Tutorial, found under "Resources".

If your account has expired or you don't remember your password, please contact [info@erg.jhu.edu](mailto:info@erg.jhu.edu) or call (410) 992-7300 for guidance.

## 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.

Mission Area	JPM	SMBS	PEDCS	RNTS	SEPS
I	Tactical Propulsion	Service Life / Missile Sustainment	Liquid Propellants	Nozzle Thermal, Structural, Fluids Analysis and Modeling	Toxicology
II	Missile Defense / Strategic Propulsion	Materials Properties and Characterization	Explosive Development and Characterization	Nozzle Design, Test and Evaluation	Atmospheric Dispersion Modeling and Hazards Assessment
III	Propulsion Systems for Space Access	Structural Analysis and Design	Propellant and Explosives Process Engineering	Thrust Control	Instrumentation
IV	Gun and Gun-Launched Propulsion	Experimental Structural and Mechanical Analysis and Test Methods	Solid Propellant Chemistry Test Methods	Innovative Nozzle Materials and Manufacturing	Environmental
V	Propulsion and Energetics Test Facilities	Nondestructive Evaluation	Solid Propellant Ingredients and Formulations	Damage Tolerance / Fracture / Failure [Joint Mission Area with SMBS]	Industrial Hygiene
VI	Sensors for Propulsion Measurement Applications	Damage Tolerance / Fracture / Failure [Joint Mission Area with RNTS]	Propellant and Explosive Surveillance and Aging		Range Safety and Explosives Safety
VII	System-wide Application of Additive Manufacturing for Propulsion Applications		Gun Propulsion Component Formulation and Development		<del>Environmental, Safety and Occupational Health of Insensitive Munitions</del>
VIII			Green Energetic Materials (GEM) Joint PEDCS - SEPS Mission Area		Green Energetic Materials (GEM) Joint PEDCS - SEPS Mission Area
IX					Demilitarization, Reclamation, and Reuse Technologies
X					Review of Accidents and Incidents

## JPM MISSION AREAS

The 64th JPM 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, AMRDEC/Redstone Arsenal, AL

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Dr. David R. Gonzalez, NSWC/Indian Head, MD

Telephone: (301) 744-1513

Email: [david.r.gonzalez@navy.mil](mailto: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 on structures and materials that have recently flown, or are planned for flight, on flight vehicles are encouraged.

### Mission Area II: Missile Defense / Strategic Propulsion

**Chair:** Dr. Robert J. Jensen, Sierra Lobo, Incorporated/Edwards AFB, CA

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Email: [robert.jensen.12.ctr@us.af.mil](mailto:robert.jensen.12.ctr@us.af.mil)

This area includes technology applicable to ballistic missiles, trans-atmospheric operational vehicles, and ground- and sea-based 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. 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 areas of:

- Strategic systems
- Ground-based missile defense
- Sea-based missile defense
- Advanced (including low or non-toxic) propellants
- Advanced (including light weight) 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
- Tolerance of long term storage environmental conditions
- Manufacturing technologies and fabrication techniques including the use of 3D printing for propulsion system components

### 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](mailto: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. 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
- 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

### Mission Area IV: Gun and Gun-Launched Propulsion

**Chair:** Mr. Lucas R. Lopez, ARDEC/Picatinny Arsenal, NJ

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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

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Ms. Julie A. Carlile, AFRL/Edwards AFB, CA

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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

**Co-Chairs:** Dr. Gary W. Hunter, NASA GRC/Cleveland, OH

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Mr. Robert F. Peterson, Aerojet Rocketdyne/  
Culpeper, VA

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Email: [bob.peterson@rocket.com](mailto:bob.peterson@rocket.com)

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 propellant 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

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This area focuses on the use of additive manufacturing 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

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## SMBS MISSION AREAS

The 44th 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:** Dr. Donald G. Messitt, Aerojet Rocketdyne/  
Sacramento, CA

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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](mailto:soe.bhe@rocket.com)

Mr. David J. Braithwaite, Orbital ATK/Brigham  
City, UT

Telephone: (435) 863-6904

Email: [david.braithwaite@orbitalatk.com](mailto:david.braithwaite@orbitalatk.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

**Chair:** Dr. Brian C. Liechty, Orbital ATK/Brigham City, UT

Telephone: (435) 863-4359

Email: [brian.liechty@orbitalatk.com](mailto:brian.liechty@orbitalatk.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
- A priori predictive modeling methods for gun tube wear and erosion
- 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. Gary L. Biggs, NSWC/Indian Head, MD

Telephone: (301) 744-1449

Email: [gary.biggs@navy.mil](mailto:gary.biggs@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: Nondestructive Evaluation

**Chair:** Mr. Scott H. McClain, ARDEC/Picatinny Arsenal, NJ

Telephone: (973) 724-8428

Email: [scott.mcclain3.civ@mail.mil](mailto: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:** Dr. David E. Richardson, Orbital ATK/Brigham City, UT

Telephone: (435) 863-6995

Email: [david.richardson@orbitalatk.com](mailto:david.richardson@orbitalatk.com)

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 into 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. Timothy C. Miller, AFRL/Edwards AFB, CA

Telephone: (661) 275-5323

Email: [timothy.miller.26@us.af.mil](mailto:timothy.miller.26@us.af.mil)

## Structures and Mechanical Behavior Subcommittee Deputy Chair

Dr. Jeremy R. Rice, AMRDEC/Redstone Arsenal, AL

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## JHU WSE ERG Technical Representative

Mr. David B. Owen, JHU WSE ERG/Columbia, MD

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Email: [dowen@erg.jhu.edu](mailto:dowen@erg.jhu.edu)

## PEDCS MISSION AREAS

The 40th 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](mailto:benjamin.greene-1@nasa.gov)

Papers are sought on liquid monopropellants and bipropellants in areas including:

- Research and improve existing analytical test methods, and support developing new propellant specifications and their associated test methods
- 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
- 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) 939-4330

Email: [mark.h.mason@navy.mil](mailto:mark.h.mason@navy.mil)

Development, characterization and testing of explosive and reactive material formulations; relationship of composition to sensitivity, metal acceleration, air-blast performance,

mechanical properties, and initiation; phenomenology of non-ideal explosives, influence of ingredients, non-energetic components and additives, on composite explosive materials. Abstracts are especially sought in the following areas:

- The use of resonance mixing to produce plastic bonded explosives
- The characterization of large critical diameter explosives
- Initiation and growth in non-ideal explosives
- Advances with CL-20
- Formulation and Characterization of Thermally Robust Explosives
- Advances in explosive synthetic chemistry and scale up

### Mission Area III: Propellant and Explosives Process Engineering

**Co-Chairs:** Dr. Jamie B. Neidert, AMRDEC/Redstone Arsenal, AL

Telephone: (256) 876-5455

Email: [jamie.b.neidert.civ@mail.mil](mailto:jamie.b.neidert.civ@mail.mil)

Mr. Richard S. Muscato, NSWC/Indian Head, MD

Telephone: (301) 744-2585

Email: [richard.muscato@navy.mil](mailto:richard.muscato@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.

### Mission Area IV: Solid Propellant Chemistry Test Methods

**Chair:** Mr. Christopher A. Marshall, AMRDEC/Redstone Arsenal, AL

Telephone: (256) 842-0094

Email: [christopher.a.marshall4.civ@mail.mil](mailto:christopher.a.marshall4.civ@mail.mil)

Methods to analyze and characterize solid propellants: especially propellants that contain new ingredients; modifications of current test methods or alternate procedures that minimize/eliminate the use of ozone depleting solvents or other organic chemicals; statistics of sample selection; techniques of sample preparation; methods development on a Microcal instrument for explosives, gun propellant, and rocket propellant; and related subjects.

### Mission Area V: Solid Propellant Ingredients and Formulations

**Co-Chairs:** Dr. Gregory W. Drake, AMRDEC/Redstone Arsenal, AL

Telephone: (256) 842-0647

Email: [gregory.w.drake.civ@mail.mil](mailto:gregory.w.drake.civ@mail.mil)

Dr. Nirupam J. Trivedi, ARL/Aberdeen Proving Ground, MD

Telephone: (410) 306-3108

Email: [nirupam.j.trivedi.civ@mail.mil](mailto: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 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

**Co-Chairs:** Dr. Kerry A. Clark, NSWC IHEODTD/Indian Head, MD

Telephone: (301) 744-4273

Email: [kerry.a.clark@navy.mil](mailto:kerry.a.clark@navy.mil)

Dr. Heather F. Hayden, NOSSA/Indian Head, MD

Telephone: (301) 744-4102

Email: [heather.f.hayden@navy.mil](mailto:heather.f.hayden@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 Component Formulation and Development

**Co-Chairs:** Dr. Pamela J. Kaste, ARL/Aberdeen Proving Ground, MD

Telephone: (410) 306-0749

Email: [pamela.j.kaste.civ@mail.mil](mailto:pamela.j.kaste.civ@mail.mil)

Ms. Christine D. Knott, NSWC/Indian Head, MD

Telephone: (301) 744-2555

Email: [christine.knott@navy.mil](mailto: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](mailto:nlieb@jensenhughes.com)

Dr. Jesse J. Sabatini, ARL/Aberdeen Proving Ground, MD

Telephone: (410) 278-0235

Email: [jesse.j.sabatini.civ@mail.mil](mailto:jesse.j.sabatini.civ@mail.mil)

Dr. Sara K. Pliskin, NSWC/Crane, IN

Telephone: (812) 854-3190

Email: [sara.pliskin@navy.mil](mailto: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

Dr. Mark H. Mason, Jr., NAWCWD/China Lake, CA

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## Propellant and Explosives Development and Characterization Subcommittee Deputy Chair

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Telephone: (321) 867-4748

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## JHU WSE ERG Technical Representative

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Email: [ataylor@erg.jhu.edu](mailto:ataylor@erg.jhu.edu)

## RNTS MISSION AREAS

The 31st 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:** Mr. J. Louie Clayton, NASA MSFC/Huntsville, AL

Telephone: (256) 544-2322

Email: [jeppy.L.clayton@nasa.gov](mailto:jeppy.L.clayton@nasa.gov)

Suggested topics for papers in this session:

- Advances in Charring Material Ablator (CMA) style modeling of nozzle composite materials
- Advances in CFD modeling of nozzle heat and mass transfer processes
- 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., Orbital ATK/Elkton, MD

Telephone: (410) 392-1877

Email: [clyde.carr@orbitalatk.com](mailto:clyde.carr@orbitalatk.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 test/post-test evaluation and new, improved test methods
- 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., AMRDEC/Redstone Arsenal, AL

Telephone: (256) 842-1358

Email: [john.r.esslinger.civ@mail.mil](mailto: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 IV: Innovative Nozzle Materials and Manufacturing

**Co-Chairs:** Ms. Amanda B. Napier, AMRDEC/Redstone Arsenal, AL

Telephone: (256) 876-1641

Email: [amanda.b.napier.civ@mail.mil](mailto:amanda.b.napier.civ@mail.mil)

Mr. Timothy W. Lawrence, NASA MSFC/  
Huntsville, AL

Telephone: (256) 684-5221

Email: [tim.lawrence@nasa.gov](mailto:tim.lawrence@nasa.gov)

Specific topics of interest include new/innovative materials addressing the following area(s) for aluminized, reduced-smoke or minimum-smoke solid rocket motors:

- Lightweight and high temperature capability components
- Low erosion materials for use as liners or monolithic components
- Structural insulators
- Manufacturing techniques
- Reduced cost for advanced/high temperature materials

### Mission Area V: Damage Tolerance / Fracture / Failure [Joint Mission Area with SMBS]

**Co-Chairs:** Dr. David E. Richardson, Orbital ATK/Brigham City, UT

Telephone: (435) 863-6995

Email: [david.richardson@orbitalatk.com](mailto:david.richardson@orbitalatk.com)

Mr. David M. McCutcheon, NASA MSFC/  
Huntsville, AL

Telephone: (256) 544-8835

Email: [david.m.mccutcheon@nasa.gov](mailto:david.m.mccutcheon@nasa.gov)

This mission area will focus on experimental and modeling studies into damage tolerance, fracture, and/or failure 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 or failure behavior of propellants, liners, insulation, adhesives, nozzle ablative liners, re-entry insulators, etc. Emphasis will be placed on material characterization of flaw behavior and failure initiation and analytical methods used to simulate these behaviors. Areas of study would include propagation, arrest, failure, and fatigue and related topics. Current and historical investigations into anomalies and failures as related to damage tolerance and fracture will also be addressed.

### Rocket Nozzle Technology Subcommittee Chair

Mr. J. Robert Esslinger, Jr., AMRDEC/Redstone Arsenal, AL

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Email: [john.r.esslinger.civ@mail.mil](mailto:john.r.esslinger.civ@mail.mil)

### Rocket Nozzle Technology Subcommittee Deputy Chair

Mr. J. Louie Clayton, NASA MSFC/Huntsville, AL

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### JHU WSE ERG Technical Representative

Mr. David B. Owen, JHU WSE ERG/Columbia, MD

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## SEPS MISSION AREAS

The 29th Safety and Environmental Protection Subcommittee sessions will be organized into the topic areas described below. Please submit your abstract according to the interest area. Topics to highlight:

### 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](mailto: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](mailto:mark.s.johnson@us.army.mil)

Toxicology of propellants, propellant ingredients, propellant combustion products, and related 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

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

Telephone: (805) 605-2407

Email: [daniel.strub@us.af.mil](mailto:daniel.strub@us.af.mil)

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.af.mil](mailto:karen.mumy@us.af.mil)

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](mailto:william.s.eck.civ@mail.mil)

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

Telephone: (937) 904-9474

Email: [karen.mumy@us.af.mil](mailto:karen.mumy@us.af.mil)

For the Spring 2017 meeting, the Environmental Mission Area is particularly interested in papers that address environmental fate and transport of insensitive munitions or proposed propellant replacements. Environmental issues that address any of the following: 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; environmental effects on flora and fauna resulting from propulsion-related activities; and impact of emerging environmental regulations on energetic materials operations.

### 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](mailto:lindsey.b.kneten.civ@mail.mil)

CPT Kenneth Kirk, AFRL, 711HPW/Wright-Patterson AFB, OH

Telephone: (937) 904-9555

Email: [kenneth.kirk.1@us.af.mil](mailto:kenneth.kirk.1@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

**Chair:** Mr. Daniel E. Strub, 30th Space Wing/  
Vandenberg AFB, CA  
**Telephone:** (805) 605-2407  
**Email:** [daniel.strub@us.af.mil](mailto:daniel.strub@us.af.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: Environmental, Safety and Occupational Health of Insensitive Munitions~~

## 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](mailto:nlieb@jensenhughes.com)

Dr. Jesse J. Sabatini, ARL/Aberdeen Proving Ground, MD

**Telephone:** (410) 278-0235  
**Email:** [jesse.j.sabatini.civ@mail.mil](mailto:jesse.j.sabatini.civ@mail.mil)

Dr. Sara K. Pliskin, NSWC/Crane, IN  
**Telephone:** (812) 854-3190  
**Email:** [sara.pliskin@navy.mil](mailto: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 IX: Demilitarization, Reclamation, and Reuse Technologies

**Co-Chairs:** Dr. Randall J. Cramer, Navy Ordnance  
Environmental Support Office/Indian Head, MD  
**Telephone:** (301) 744-5641  
**Email:** [randall.cramer@navy.mil](mailto:randall.cramer@navy.mil)

Dr. Sara K. Pliskin, NSWC/Crane, IN  
**Telephone:** (812) 854-3190  
**Email:** [sara.pliskin@navy.mil](mailto:sara.pliskin@navy.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 X: 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](mailto: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. Mark S. Johnson, Army Public Health Center/Aberdeen Proving Ground, MD  
**Telephone:** (410) 436-5081  
**Email:** [mark.s.johnson@us.army.mil](mailto:mark.s.johnson@us.army.mil)

## Safety and Environmental Protection Subcommittee Chair

Dr. David R. Mattie, AFRL, 711HPW/Wright-Patterson AFB, OH  
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## JHU WSE ERG Technical Representative

Mr. William A. Bagley, JHU WSE ERG/Columbia, MD  
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## 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 with suggestions for topics by 19 December 2016.**

### 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 [Guide for JANNAF Workshop 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 Liaison or Shelley Cohen at [scohen@erg.jhu.edu](mailto:scohen@erg.jhu.edu). This form must be submitted to ERG by **Friday, 13 January 2017**. The agenda and invitation list is due **Monday, 27 February 2017** for inclusion in the Preliminary Program, and must be approved no later than **Monday, 10 April 2017** 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.

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 as well as 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 13 January 2017.** If you have any questions about planning a Specialist Session please contact your ERG Technical Liaison or Shelley Cohen at [scohen@erg.jhu.edu](mailto:scohen@erg.jhu.edu).

## JANNAF AWARDS PROGRAM

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

### 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 Executive Committee 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 (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, 20 March 2017**.

## 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 given 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. All student-authored works will automatically be included in the initial round of consideration with the submission of an abstract; in order to facilitate identification of student-authored works please be sure to clearly state on your abstract that you wish to be considered for the Best Student Paper Award or contact the appropriate JHU WSE ERG technical representative.

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 JHU WSE ERG 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 **13 March 2017**. The Best Student Paper Award will be presented at the JANNAF meeting at which the paper is given.

## UPCOMING JANNAF MEETINGS

Programmatic and Industrial Base Meeting

11th Modeling and Simulation

9th Liquid Propulsion

8th Spacecraft Propulsion

Joint Subcommittee Meeting

*5-9 December 2016*

*Hyatt Regency Phoenix*

*Phoenix, Arizona*

64th JANNAF Propulsion Meeting

Programmatic and Industrial Base Meeting

44th Structures and Mechanical Behavior

40th Propellant and Explosives Development and Characterization

31st Rocket Nozzle Technology

29th Safety and Environmental Protection

Joint Subcommittee Meeting

*May 22 - 25, 2017*

*Westin Kansas City at Crown Center*

*Kansas City, Missouri*

Programmatic and Industrial Base Meeting

48th Combustion

36th Airbreathing Propulsion

36th Exhaust Plume and Signatures

30th Propulsion Systems Hazards

Joint Subcommittee Meeting

*4-8 December 2017*

*Location TBA*