



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

48th Combustion (CS)
36th Airbreathing Propulsion (APS)
36th Exhaust Plume and Signatures (EPSS)
30th Propulsion Systems Hazards (PSHS)
JOINT SUBCOMMITTEE MEETING
Programmatic and Industrial Base Meeting
4 - 8 December 2017

Newport News, Virginia

Abstract Deadline

22 May
2017

Announcement and Call For Papers

last updated 7/11/2017



The December 2017 meeting of the Joint Army-Navy-NASA-Air Force (JANNAF) will consist of the Joint Meeting of the 48th Combustion / 36th Airbreathing Propulsion / 36th Exhaust Plume and Signatures / 30th Propulsion Systems Hazards Subcommittees; and the Programmatic and Industrial Base (PIB) meeting. Mr. Kevin P. Ford with Naval Air Warfare Center Weapons Division, China Lake, CA, is the meeting chair. This meeting will be held **Monday through Friday, 4 - 8 December 2017**, at the **Newport News Marriott at City Center in Newport News, Virginia**. Please refer to page 4 for hotel and area information.

ATTENDANCE REQUIREMENTS

The overall security level of the meeting is **Secret**. Unclassified sessions will be held at the Newport News Marriott at City Center in Newport News, VA; classified sessions will be held at NASA Langley Research Center, located in Hampton, Virginia, approximately a fifteen minute drive from the hotel. 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://public.logisticsinformationservice.dla.mil/jcp/>.

To attend the classified sessions, attendees must also possess a personal security clearance of at least Secret with a need-to-know in the areas of rocket, missile, space, aircraft, or gun propulsion.

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

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.

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

The standing JANNAF subcommittees for Combustion, Airbreathing Propulsion, Exhaust Plume and Signatures, and Propulsion Systems Hazards 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 on page 3 and on pages 6-14.

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Combustion Subcommittee

The Combustion Subcommittee (CS) covers analytical modeling and experimental research on chemical combustion phenomena for solid, liquid, hybrid, and airbreathing missile, space, underwater, and gun propulsion systems.

Airbreathing Propulsion Subcommittee

The Airbreathing Propulsion Subcommittee (APS) addresses technical problems and issues associated with turbojet, ramjet, scramjet, and combined- or mixed-cycle engines.

Exhaust Plume and Signatures Subcommittee

The Exhaust Plume and Signatures Subcommittee (EPSS) addresses the phenomena associated with the exhaust from rockets, ramjets, space, gun propulsion systems, and Electro-Optical/Infrared (EO/IR) signature community.

Propulsion Systems Hazards Subcommittee

The Propulsion Systems Hazards Subcommittee (PSHS) examines potential hazards associated with missile, space, and gun propulsion systems.

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.”

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 6-14.
- 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 [December 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 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 ERG is **22 May 2017.**

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 (*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, changed daily].
 5. Click the “Login” button.
 6. Click on “December 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 to notify that the file has been successfully uploaded.

AUTHOR TIMELINE

Date	Weeks before Meeting	Action
22 May 2017	28	Deadline for receipt of Abstract Submittal Forms .
17 July 2017	20	Acceptance/rejection letters sent to authors.
28 August 2017	14	Deadline for changes to meeting invitation and preliminary program
11 Sept 2017	12	Invitation, preliminary program, and registration materials forwarded to propulsion community.
2 October 2017	9	Deadline for award nominations.
23 October 2017	6	Deadline for submission of changes to the final program.
6 Nov 2017	4	Deadline for receipt of papers and paper clearance forms. Papers not received by this date may be removed from the program.
13 Nov 2017	3	Deadline for reservations at the Newport News Marriott at City Center.
20 Nov 2017	2	Deadline for reduced registration fee. Deadline for completion of Registration Questionnaire.
20 Nov 2017	2	Deadline for receipt of presentations.
4 Dec 2017	0	CS/APS/EPSS/PSHS/PIB Joint Subcommittee Meeting

AWARDS

Nominations for JANNAF Technical Executive Committee (TEC), PIB Executive Committee (PEC), CSS, APS, EPSS and PSHS recognition awards are being solicited. Individuals interested in nominating an award recipient should follow the guidelines and instructions on pages 15-16.

RECOMMENDATIONS FOR WORKSHOPS OR SPECIALIST SESSIONS

Recommendations for workshops or specialist sessions are solicited at this time. Individuals interested in organizing and chairing a specialist session should contact the ERG Technical Staff member in their respective subcommittee by **22 May 2017**. See page 15 for additional information and requirements.

HOTEL AND AREA INFORMATION

Sleeping rooms have been reserved with the Newport News Marriott at City Center in Newport News, Virginia, where all unclassified sessions will be held. Newport News City Center is a mixed-use development with restaurants, shops and entertainment establishments all within walking distance of the hotel, and just a short 15 minute ride from the Newport News/Williamsburg International Airport. The hotel is also just 15 minutes from NASA-Langley Research Center where classified sessions will be held.

Hotel

The JANNAF room block is not yet open for reservations. When reservations open in September, the room rate per night for government attendees with a valid government employee i.d. will be at the GSA FY 2017 per diem rate, currently \$91 plus tax (currently 14%) and a \$1 lodging fee per day, for single or double occupancy. The discounted rate for all other attendees will be \$107 plus tax and lodging fee. More details will be posted on the December meeting website when the Meeting Invitation and Preliminary Program have been posted online, and registration has been opened.

Transportation

Three airports serve the area: Newport News/Williamsburg International Airport (15 minute drive); Norfolk International Airport (30-60 minute drive, depending on traffic); Richmond International Airport (one hour drive). Ground transportation costs range from approximately \$17 for a taxi from the Newport News/Williamsburg airport to over \$100 for a taxi or shuttle from the Richmond airport. More information can be found on the airports' websites. Rental cars are available at each area airport. If planning to attend classified sessions at NASA Langley Research Center, a rental car will be needed for your transportation to that facility. Carpooling is encouraged.

Amtrak has a station in Newport News, just five miles / 15 minutes from the hotel. A taxi between the train station and the hotel will cost approximately \$16.

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	CS	APS	EPSS	PSHS
I	Ignition and Combustion of Gun Propellants	Conventional Ramjet Propulsion	Exhaust Plume Flow Field Analysis	Thermal Decomposition and Cookoff
II	Solid Propellants and Combustion	Scramjet Propulsion	Exhaust Plume Radiation	Impact / Shock-Induced Reactions
III	Explosive Performance / Enhanced Blast	Scramjet Propulsion / Structures	Exhaust Plume Effects	Insensitive Munitions Technology
IV	Airbreathing Combustion	Scramjet Component / Engine Testing	Other Exhaust Plume Related Problems	Gun Propellant Vulnerability
V	Combustion Diagnostics	Combined / Advanced Cycle Propulsion	Signatures and Spectral and In-band Radiometric Imaging of Targets and Scenes (SPIRITS)	Propulsion Systems Safety and Hazard Classification
VI	Liquid, Hybrid, and Novel Propellants Combustion	Small / Expendable Turbopropulsion		Energetic Liquid Hazards
VII		Fuel Technology		
VIII		Component Modeling Simulation		
IX		Advanced Combustion Control		

CS MISSION AREAS

The JANNAF 48th Combustion Subcommittee meeting will include sessions on chemical combustion phenomena occurring within the interior of guns and combustors of solid, liquid, and airbreathing (including small or expendable turbojets) missile and space propulsion systems. Papers are solicited that will aid in developing design criteria to build efficient and stable combustion systems. Papers are also invited that will aid in synthesizing, interpreting, and validating current knowledge to make research and development results more useful to design engineers. Specific areas of interest are listed below:

Mission Area I: Ignition and Combustion of Gun Propellants

Co-Chairs: Dr. Michael J. Nusca, ARL / Aberdeen Proving Ground, MD

Telephone: (410) 278-6108

Email: michael.j.nusca.civ@mail.mil

Dr. Eugene Rozumov, Army ARDEC / Picatinny Arsenal, NJ

Telephone: (973) 724-4535

Email: eugene.rozumov.civ@mail.mil

Mr. Michael A. Bonanno, NSWC / Indian Head, MD

Telephone: (301) 744-1440

Email: michael.bonanno@navy.mil

Experimental and modeling studies of ignition, flame spreading, and combustion of solid propellants in guns, mortars and novel gas generators are considered. These studies include the investigation of combustion temperature sensitivity, transient combustion, and gun barrel erosion under gun chamber conditions. Burn rate measurements and techniques, novel gun propelling charge concepts, interior ballistics of grain/stick/disk/consolidated and traveling charges are also considered. Innovative ignition systems, novel chemical igniter and propellant formulations, experimental and analytical techniques to support the production of gun propellants and igniter materials, muzzle flash and blast, mechanical behavior and integrity of propellants in dynamic pressure wave environments, combustion behavior of thermally and mechanically damaged propellant, modeling and studies of deterred propellants, improved gun erosion and ballistic efficiencies through propellant formulations are among the many topics included in this mission area. Papers on gun propellant ignition and combustion and propellant vulnerability will be considered for joint CS/PSHS sessions.

Workshop

CHEETAH Modeling for Gun Propellant Applications: A workshop on the thermodynamic modeling of gun propellants employing the CHEETAH code will feature presentations by Dr. Sorin Bastea (Lawrence Livermore National Laboratory), the

curator of the code. Dr. Eugene Rozumov (ARDEC) will present his work modeling Army igniters and propellants. Dr. John Schmidt (ARL) will present his work on adding new product species to CHEETAH. Christine Knott (NSWCIH) will present the Navy's use of CHEETAH in formulations development. Carlton Adam (ARDEC) will present his work on integrating CHEETAH with Interior Ballistic codes. Discussions will follow each presentation to address the gun community's needs for specific inclusions and modifications to the CHEETAH code. Please indicate your interest in being included in this workshop when completing the [Abstract Submittal Form](#).

Mission Area II: Solid Propellants and Combustion

Co-Chairs: Dr. Matthew L. Gross, NAWCWD / China Lake, CA

Telephone: (760) 939-8087

Email: matthew.gross1@navy.mil

Dr. Scott A. Felt, Aerojet Rocketdyne / Rancho Cordova, CA

Telephone: (916) 355-2358

Email: scott.felt@rocket.com

- *Decomposition, Ignition, Kinetics, Combustion, and Extinguishment of Ingredients and Solid Rocket Propellants:* Decomposition of ingredients and propellants (including kinetics, mechanisms, microstructure, and thermochemistry of thermal decomposition); ignition of ingredients and propellants (including ignition mechanisms, ignition transients, igniter designs, especially smokeless igniters, and new problems associated with ignition); combustion of ingredients and propellants (including burn rate, pressure exponent and temperature sensitivity, understanding the microstructural combustion zone structure, chemistry, and heat release, effect of motor environment, including spin on combustion, transient burning, combustion of fuel rich propellants, analytical modeling including detailed kinetics studies); hazard initiation of propellants (including inadvertent ignition and effects of high burn rate); methods of extinguishing propellants and implementing thrust termination are considered. Of special interest is how these processes are related to new energetic ingredients and how this knowledge may be used to design new propellants that meet more demanding performance, insensitive munitions, and life cycle requirements. (Papers on thermal decomposition ignition and combustion will be considered for joint CS/PSHS sessions.)
- *Failure Analysis of Solid Rocket Motors:* Combustion analyses including ignition, flame propagation, burning in cracks and defects, burnback, and flow behavior in support of accident investigations and failure analyses of solid rocket motors are considered. (Papers in this area will be considered for joint CS/PSHS sessions.)

- *Solid Rocket Propellant Combustion Instability:* Development, laboratory, and analytical advancements are considered. Specific topics of interest include: combustion response of low smoke propellants; velocity coupled instability; nonlinear instability; instability at high pressures; motor pulsing; mean flow and acoustics interactions; L^* instability; high frequency instability in low smoke motors; combustion response function measurement techniques; and analytical methods for predicting propellant response functions and motor stability.
- *Metal Combustion:* Behavior of metallic ingredients with special emphasis on nano-particle metals in solid rocket motors is sought. Individual areas of interest include: ignition and burning rate of metal particles or droplets; metal combustion in high density propellants; effects of metal combustion on motor stability and performance; particle phase and size change phenomena; surface melt, agglomeration, and filigree formation; metal combustion in fuel-rich propellants and metal combustion in propellants without ammonium perchlorate; and methods for obtaining in situ particle size measurements.
- *Combustion, Prediction, Performance, and Other Topics in Solid Rocket Motor Behavior:* Combustion related motor behavior and the application of analytical models, experimental research, and subscale testing to their solution are considered. Areas of interest include: methodology for standardizing experimental measurements, measurement uncertainties, analytical prediction, computer code verification, correlation, extrapolation, and flight confirmation of performance of solid and liquid rocket, missile and space propulsion systems. Papers on grain design and ballistic modeling are also sought. Behavior in conventional ballistic, tactical, low smoke, controllable, spin-stabilized, ducted, nozzleless motors and gas generators are appropriate subjects for presentation, as are methods for calculating combustion chamber flowfields and their interaction with the motor structural components.
- *Solid Rocket RP-21 Combustion Technologies:* Advancements in the understanding of state-of-the-art in combustion technology in solid rocket motors, modeling, and analysis techniques, funded by RP-21 and/or IR&D programs are sought. Advancements in solid propellant combustion are of interest and its impact on selection of case, nozzle, and insulation materials or propellant ingredients. Papers on new or improved methods of thermal, structural, and fluid analysis and improved motor performance prediction and evaluation as related to combustion technology are also solicited.

materials over a range of lifecycle conditions. This session will feature the development of new diagnostics, improved computational capabilities and solid state decomposition chemistry. Contributing presentations aside from those invited are welcome. Technical papers are not required but may be submitted in addition to the presentations. Please indicate your desire to be included in this specialist session when completing the [Abstract Submittal Form](#).

Mission Area III: Explosive Performance / Enhanced Blast

Co-Chairs: Dr. Forrest R. Svingala, NSWC / Indian Head, MD

Telephone: (301) 744-4117

Email: forrest.svingala@navy.mil

Dr. Barrie E. Homan, ARL / Aberdeen Proving Ground, MD

Telephone: (410) 306-0932

Email: barrie.e.homan.civ@mail.mil

Investigations related to detonation and blast performance are sought. Topics ranging from detonation propagation, chemical species formed from the detonation, and combustion processes following the detonation are appropriate for this area. Experimental, theoretical, and computational studies are encouraged that address diverse subjects including; detonation properties, metal driving, enhanced blast, Chem/Bio defeat, target response, underwater blast, and blast protection.

Papers elucidating how new or existing energetic materials and/or novel munitions designs can be exploited are of interest. New experimental techniques, advanced diagnostics and new modeling capabilities that are applicable to the dynamic conditions inherent in detonation events are of interest to this community. Reports of propellant technologies that are applicable to explosive performance are also encouraged.

Of particular interest to this mission area are enhanced blast technologies. Investigations of combustion of detonation products, added fuels, and reactive material dispersal for enhancing blast effects in open-air and various confined structures are sought. Targets of interest include tunnels, caves, multi-room structures, and blast chambers. Papers reporting experimental, theoretical, and computational efforts specifically geared toward understanding the non-ideal, post-detonation energy release phenomena are requested. Papers concerning enhanced blast technologies that exploit novel explosive formulations, non-detonative energetic materials, and munitions designs are of interest.

Specialist Session

Kinetics and Related Aspects of Combustion Chemistry: This session will focus on those actively involved in the issues of chemical reaction phenomenon in the areas of modeling, diagnostics and chemical kinetics as they apply to energetic

Mission Area IV: Airbreathing Combustion

Chair: Dr. Mark R. Gruber, AFRL / WPAFB, OH

Telephone: (937) 255-7350

Email: mark.gruber.1@us.af.mil

Airbreathing Combustion: Theoretical and experimental investigations of subsonic, supersonic, and hypersonic combustion phenomena for airbreathing systems (including small or expendable turbojet engines) are considered. Specific topics of interest include: analytical and experimental (including CFD) determination of combustor flowfield characteristics; connected-pipe testing, freejet testing, and scaling analyses to free-flight conditions; experiments and analyses relating to ignition, mixing and combustion in liquid-fuel, gel/slurry-fuel, and solid-fuel ramjets, gas generator (ducted rocket) combustors, scramjets, and combined cycle engines; the use of ignition and combustion enhancement techniques; studies of liquid and gel/slurry fuel injection, spray formation, vaporization, and combustion processes; the measurement and analysis of combustion instability phenomena; investigation of the formulation, properties, and combustion of high energy-density single- and multi-phase fuels, including boron and other metal-burning slurries and gels; fundamental investigations of airbreathing combustion. (Papers in this area will be considered for joint CS/APS sessions.)

Mission Area V: Combustion Diagnostics

Chair: Dr. Jeffrey S. West, NASA-MSFC / Huntsville, AL

Telephone: (256) 544-6309

Email: jeffrey.s.west@nasa.gov

This area seeks to bring together the non-intrusive flow field diagnostics and computational fluid dynamics (CFD) communities to create an interaction beneficial to both. Papers are sought from the flow field diagnostics community on the development and implementation of new or existing instrumentation relevant to any combustion problem. Emphasis is placed on methods producing data required for code verification. Similar papers are sought from the computational community emphasizing measurement needs and uncertainties required for verification of existing CFD codes. This interaction is expected to result in development of new instrumentation for combustion research, methods designed specifically for high confidence measurements of critical CFD parameters, and new approaches for creating computational models.

Mission Area VI: Liquid, Hybrid and Novel Propellants Combustion

Co-Chairs: Mr. Joel W. Robinson, NASA-MSFC / Huntsville, AL

Telephone: (256)-544-3513

Email: joel.w.robinson@nasa.gov

Dr. A. Paul Zuttarelli, AFRL / Edwards AFB, CA

Telephone: (661)-275-6786

Email: anthony.zuttarelli@us.af.mil

- *Combustion Dynamics of Liquid and Gaseous Rocket Propellants:* Theoretical and experimental studies of steady and unsteady combustion phenomena in propulsion systems using liquid or gaseous propellants are considered. Areas of interest include: transient system or process analysis; characterization of the physical and chemical processes involved in combustion (e.g., injection, mixing, atomization and vaporization, chemical kinetics, film cooling, reactive stream separation, chamber wall boundary flow, nozzle flow, and supersonic combustion); performance, heat transfer, and cooling prediction methods for subcomponents, components, and assemblies including CFD approaches; stability prediction models, (e.g., new models, critiques and/or evaluations of existing models, experimental verification, and propellant characterization); development and application of new instrumentation techniques applicable to spray characterization and measurement of species, temperature, velocity, etc.; subsystem effects on stability (e.g., acoustic cavities, slot liners, and nozzles); feedback control, or other adaptive methods of stabilizing liquid engines; stability rating techniques; and validity of subscale stability studies.
- *Combustion Dynamics of Monopropellant, Bipropellant, and Hybrid Propulsion Systems:* Theoretical and experimental studies of steady and unsteady combustion phenomena in propulsion systems using liquid monopropellants and bipropellants, liquid oxidizers and solid fuels are considered. Areas of interest include injection, mixing, analytical models of fuel regression rate, chemical kinetics of combustion, ignition system design, and simulation of combustor flows.
- *Combustion Dynamics of Hydrogen Peroxide (HP):* Theoretical and experimental studies of combustion phenomena in propulsion systems using HP are considered. Areas of interest include: effect of stabilizers and additives on longevity and reactivity of HP; development of advanced catalysts and catalytic devices for HP decomposition; chemical kinetics of catalysis; direct energy conversion including fuel cells, thermionics, and thermoelectrics; containment strategies mitigating decomposition over time using advanced materials; manufacture and chemical enrichment of HP; and historical usage of HP in propulsion applications.

- *Combustion for Underwater Propulsion*: Theoretical and experimental studies, numerical modeling, and simulation of steady and unsteady combustion phenomena in propulsion systems for underwater vehicles are considered. Topics of interest include but are not limited to: experimental determination and numerical simulation of combustor flows; underexpanded reacting jets and their mixing, entrainment, and transport characteristics; transients in combustion processes (e.g., kinetics, ignition, quenching, acoustic oscillations in jets, reverse shocks, coherent turbulent structures in fuel-product baths); experimental studies of non- or slowly-reacting similarity systems; combustion similitude, model development, and verification; radiation and other heat transfer effects; behavior of multiphase and multiple, immiscible liquid-phase constituents in combustors; shock, turbulent mixing, and chemical kinetics interactions; and diagnostic measurements, simulation, and combustion instrumentation for underwater propulsion systems.

Combustion Subcommittee Chair

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

Telephone: (301) 744-4102

Email: heather.f.hayden@navy.mil

Combustion Subcommittee Deputy Chair

Dr. Ghanshyam L. Vaghjiani, AFRL / Edwards AFB, CA

Telephone: (661) 275-5657

Email: ghanshyam.vaghjiani@us.af.mil

JHU-WSE ERG Technical Representatives

Bryan S. DeHoff, Aerospace Technical Services / West Chester, OH

Telephone: (513) 378-7071

Email: bryan.dehoff@aerospacetechnic.com

APS MISSION AREAS

The JANNAF 36th Airbreathing Propulsion Subcommittee sessions will discuss technical problems and issues associated with airbreathing propulsion systems for application to missiles, launch vehicles, aerospace planes, and remotely piloted vehicles. These include technology, components, and engines within the turbojet, ramjet, scramjet, and combined cycle families. Session topics include characterization of system performance, engine cycle analysis and testing, engine design, engine/airframe integration, thermal management, fluid and structural mechanics, advanced engine structures and materials, fuel control systems, and characterization of advanced airbreathing fuels.

Mission Area I: Conventional Ramjet Propulsion

Chair: Dr. Trevor D. Hedman, NAWCWD / China Lake, CA

Telephone: (760) 939-4026

Email: trevor.hedman@navy.mil

- *Ramjets*: Welcome are papers describing either experimental or theoretical studies related to solid, liquid, and gaseous (aka ducted rocket) fueled ramjet systems or the constituents thereof. By example, topics at the component level include techniques for mixing enhancement, active and passive control, plume signature reduction, instability and fuel development studies. Whether at the component, section, or system level the author should emphasize isolated/installed level performance benefits.
- *Mode Transition*: Papers that address mode transition either to or from that of conventional ramjet operation, e.g., boost to conventional ramjet or subsonic to supersonic combustion are welcome. Papers should emphasize the technology that assists in this transition.
- *Technologies with a Ramjet Application*: Authors are encouraged to submit papers that address technologies applicable to ramjet systems, e.g., manufacturing technologies and fabrication techniques, etcetera. Papers need not be associated with a particular system but should be applicable to materials associated with such vehicles and their corresponding flight environment.

Mission Area II: Scramjet Propulsion

Chair: Dr. Aaron H. Auslender, NASA-LaRC / Hampton, VA

Telephone: (757) 864-6545

Email: aaron.h.auslender@nasa.gov

- *Fundamental (CS) and Applied Technology*: Fundamental and applied supersonic and hypersonic airbreathing propulsion technology and systems, particularly as related to existing technology development and demonstration

programs. Development of scramjet propulsion technologies, whether or not related to a particular program or system, will also be of interest. (Papers in this area will be considered for joint APS/CS sessions.)

Specialist Session

Hypersonic R&D Overview: Abstracts are requested for an overview session reviewing current activities in hypersonic R&D. Technical papers are not required but may be submitted in addition to the presentations. Please indicate your interest in being included in this Specialist Session when completing the [Abstract Submittal Form](#).

Mission Area III: Scramjet Propulsion / Structures

Chair: Mr. Brett Hauber, AFRL / WPAFB, OH

Telephone: (937) 255-7394

Email: brett.hauber@us.af.mil

- *Propulsion Structures and Materials:* Structures and materials technologies for enhancing and enabling current and future airbreathing propulsion concepts and systems. Topics of interest include: cooled and uncooled propulsion related structures and materials such as engine and nozzle flowpaths, combustion chambers, rotating components, combustor liners, hot ducts, insulation concepts, injectors and nozzles and attachment and joining techniques. Papers on structures and materials that have recently flown, or are planned for flight, on flight vehicles are encouraged.
- *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. Papers on additive manufacturing applicable to scramjets are also encouraged.
- *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 and 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 also encouraged on structures and materials for flight vehicles, either those that have flown or are planning to fly.

Mission Area IV: Scramjet Component / Engine Testing

Chair: Dr. Thomas A. Jackson, AFRL / WPAFB, OH

Telephone: (937) 255-7083

Email: thomas.jackson.17@us.af.mil

Maturation of Fully Integrated, Prototype Propulsion Systems: Physical experiment and computational analysis approaches to scramjet engine maturation from component development through flight test experiments of fully integrated, prototype propulsion systems are the focus of this area. Current practice for developing scramjet engines blends physical ground and flight test experiments with numerical simulation, applied first to components, then to partial engine flow-paths, and concluding with tip-to-tail simulation and/or limited flight experiments on fully integrated engines. Papers are solicited in the following areas of interest: impact of test air contaminants on the development process and the prediction of in-flight performance; performance, operability, and durability assessments from ground and flight experimental data (component and full engine evaluation); instrumentation strategies for both steady and transient performance, operability, and structural response; instrumentation strategies for validating test and analysis with progressively more complex and integrated flow-paths; evaluation of engine transitions (ignition, acceleration, combustion mode transition, etc.); development of test techniques to enhance ground test capability; facility-to-facility and facility-to-flight variations and their considerations for the engine development process; uncertainty assessments and quantification of ground and flight test measured and deduced parameters and of numerical analysis (including component and engine performance, operability, and durability). Two current emphasis areas are (1) engine development and evaluation methods for large-scale systems in which full-scale jet testing is not possible, and (2) contrasting scramjet engine testing for science and technology (engine development) with that required for test and evaluation (engine maturation towards a fielded system).

Mission Area V: Combined / Advanced Cycle Propulsion

Co-Chairs: Dr. Charles J. Trefny, NASA-GRC / Cleveland, OH

Telephone: (216) 433-2162

Email: charles.j.trefny@nasa.gov

Mr. Glenn W. Liston, AFRL / Arnold AFB, TN

Telephone: (931) 454-3645

Email: glenn.liston@us.af.mil

Fundamental and Applied Technology: Combined, combination, and advanced cycle airbreathing propulsion technology and systems. Of particular interest are analytical, numerical, and experimental research regarding: 1) integration of multiple propulsive cycles and mode transitions; 2) methods

of broadening the flight Mach number range of gast turbine, ramjet and scramjet cycles; 3) exploration of airbreathing propulsive cycles other than the Brayton cycle; and 4) system-level evaluations and payoff assessments. (Papers in this area will be considered for joint APS/CS sessions.)

Mission Area VI: Small / Expendable Turbopropulsion

Chair: Mr. Greg B. Bruening, AFRL / WPAFB, OH
Telephone: (937) 255-4798
Email: gregory.bruening@us.af.mil

Basic Technology and System Applications: Small and expendable turbopropulsion technology and systems related to missiles, drones, UAVs, either subsonic or supersonic. (Papers in this area will be considered for joint APS/CS sessions.)

Mission Area VII: Fuel Technology

Chair: Mr. Richard W. Wills, AFRL / WPAFB, OH
Telephone: (937) 255-3113
Email: richard.wills.1@us.af.mil

Fundamental and Applied Technology: Fuels and propellants R&D for conventional and advanced cycle airbreathing propulsion, as applied to missiles, launch vehicles, and advanced aircraft for global reach applications. Conventional non-expendable turbine- powered aircraft are excluded from this call. (Papers in this area will be considered for joint APS/CS sessions.)

Mission Area VIII: Component Modeling Simulation

Co-Chairs: Dr. Mark A. Hagenmaier, AFRL / WPAFB, OH
Telephone: (937) 255-7325
Email: mark.hagenmaier@us.af.mil

Dr. Richard L. Gaffney, NASA-LaRC / Hampton, VA
Telephone: (757) 864-7872
Email: richard.l.gaffney@nasa.gov

- *Data for Propulsion Simulation Code Validation:* Papers summarizing data for airbreathing propulsion code validation are requested which summarize new data and/or existing collections of data. The validation data may represent fundamental physics, propulsion system component operation, propulsion system unit problems, or system data. The physical phenomena investigated may include shock boundary layer interactions, multi-phase flow, turbulent flow, combustion, electromagnetic flow interactions or thermal protection systems. Fundamental thermodynamic data on physical properties of fluids including ionized gasses to supercritical fluids are also of interest. (Papers in this area will be considered for joint APS/CS sessions.)

- *Methods for Propulsion Component Analysis:* Methods suitable for propulsion system analysis are solicited. These methods may be new methods or evaluations of existing methods. The methods may range from CFD simulation methods to integral cycle codes. Methods for efficient and/or accurate modeling of turbulent flow, combustion systems, ionized flow interactions, or multi-phase flow in the subsonic to hypersonic speed range are desired. Another issue of importance is methods for the integration of component models into a larger system simulation. (Papers in this area will be considered for joint APS/CS sessions.)

Mission Area IX: Advanced Combustion Control

Co-Chairs: Dr. Aaron H. Auslender, NASA-LaRC / Hampton, VA
Telephone: (757) 864-6545
Email: aaron.h.auslender@nasa.gov

Mr. George Kopasakis, NASA-GRC / Cleveland, OH
Telephone: (216) 433-5327
Email: gkopasakis@nasa.gov

Fundamental and Applied Technology: Papers are requested to advance active combustion control technology for airbreathing propulsion engines. Combustion control includes issues such as NO_x control, pattern factor control, blowoff control, combustion dynamics control, and mode transition in combined-cycle, launch-vehicle propulsion systems, and combustion control on flight systems. Three main areas of particular interest are: the need for CFD codes to incorporate time accurate transient solutions to model actively controlling combustion; the need for sensors and actuators that are robust, responsive, inexpensive, and light enough to be used in flight for active combustion control; and the need to catalogue sources of suitably characterized sensors and actuators to actively control combustion in air breathing propulsion applications.

Airbreathing Propulsion Subcommittee Chair

Mr. Lawrence D. Huebner, NASA-MSFC / Huntsville, AL
Telephone: (256) 544-5246
Email: lawrence.d.huebner@nasa.gov

Airbreathing Propulsion Subcommittee Deputy Chair

Dr. James W. Weber, AFRL / Eglin AFB, FL
Telephone: (850) 883-2502
Email: james.weber.13@us.af.mil

JHU-WSE ERG Technical Representative

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

EPSS MISSION AREAS

The 36th JANNAF Exhaust Plume and Signatures Subcommittee meeting will include sessions on the phenomena associated with the exhaust from rockets, ramjets, space, and gun propulsion systems. These phenomena can be divided into three technical areas: plume flowfields, plume radiation, and a broad area incorporating other plume effects.

In addition, the EPSS Signatures panel (formerly the Spectral and In-band Radiometric Imaging of Targets and Scenes (SPIRITS) Users Group) promotes technical interchange among members of the Electro-Optical/Infrared (EO/IR) aircraft signature community from both government and industry.

Mission Area I: Exhaust Plume Flow Field Analysis

Chair: Dr. Kevin D. Kennedy, AMRDEC / Redstone Arsenal, AL

Telephone: (256) 876-7278

Email: kevin.d.kennedy14.civ@mail.mil

Papers submitted should be concerned with basic definitions of nozzle and exhaust plume flow fields. Solid and liquid rocket and ramjet plumes will be considered. Plume flow fields at all altitudes are important. Some typical problem areas relating to low/mid-altitude exhaust plumes include external aerodynamic-plume interaction, combustion, turbulent mixing and afterburning, two-phase flow, multi-engine base flow, radiant heating, and oxidizer/fuel gradients. High altitude vacuum plume problems include noncontinuum flow, nozzle boundary layer expansion, and condensation.

Mission Area II: Exhaust Plume Radiation

Chair: Mr. Jonathan Mautz, NASIC / WPAFB, OH

Telephone: (937) 522-6238

Email: jonathan.mautz@us.af.mil

Papers are solicited which describe or highlight the following: recent achievements in the exhaust plume radiation area; plume radiation related to the generation of vehicle design environments; detection, surveillance, and identification; advancement of theoretical prediction methods; experimental techniques; results of ground and flight measurements; interpretation and correlation of data; any portion of the radiation spectrum from ultraviolet through longwave infrared; propulsion systems of all types in terms of thrust level, propellant used, and application, as well as operating altitude; the effects of atmospheric species reacting with the exhaust species or absorbed and emitted energy from exhaust plumes; and plumes in vacuum.

Mission Area III: Exhaust Plume Effects

Chair: Dr. Forrest E. Lumpkin, NASA-JSC / Houston, TX

Telephone: (281) 483-2955

Email: forrest.e.lumpkin@nasa.gov

Theoretical and experimental papers concerning the prediction of plume impingement pressures and heating for low altitude and/or high altitude spacecraft vehicle applications are solicited. Papers treating the generation of plume contaminants and the effects of such contamination on vehicle surface are of interest. Also of interest are papers concerned with high altitude base convective heating resulting from multi-engine plume interactions.

Mission Area IV: Other Exhaust Plume Related Problems

Chair: Dr. Milton E. Vaughn, AMRDEC / Redstone Arsenal, AL

Telephone: (256) 876-3726

Email: milton.e.vaughn.civ@mail.mil

Other papers dealing with exhaust plume technology not covered by the above areas are invited.

Mission Area V: Signatures and Spectral and In-band Radiometric Imaging of Targets and Scenes (SPIRITS)

Chair: Ms. Robin L. Miller, NAWCWD / Point Mugu, CA

Telephone: (805) 989-4894

Email: robin.miller@navy.mil

Papers are solicited for the following topics related to Signatures: EO/IR target signature phenomenology; EO/IR atmospheric transmission/radiation phenomenology and modeling; EO/IR signature target measurements; SPIRITS and other signature codes development and improvement; validation and calibration of SPIRITS and other signature codes target modules; computational fluid dynamic analysis and modeling for exhaust and related flowfields; exhaust plume radiation; applications of SPIRITS and other signature codes data for acquisition programs, signature reduction, and operational warfighting.

Instructional Tutorial(s) are solicited. Back by popular demand, these instructional tutorials provide the opportunity for each community member to obtain an advanced technical understanding of the inner mechanics of SPIRITS and other signature codes from experts in the field. Each tutorial should be related to a topic listed in paragraph 1. Tutorials should focus on a specific phenomenon or algorithm, provide clear technical instruction, be informative, and carry an academic tone. Tutorials should be limited to two hours or less. Please communicate your interest.

Exhaust Plume and Signatures Subcommittee Chair

Dr. Milton E. Vaughn, AMRDEC / Redstone Arsenal, AL

Telephone: (256) 876-3726

Email: milton.e.vaughn.civ@mail.mil

Exhaust Plume and Signatures Subcommittee Deputy Chair

Dr. Manish Mehta, NASA-MSFC / Huntsville, AL

Telephone: (256) 544-0076

Email: manish.mehta@nasa.gov

JHU-WSE ERG Technical Representative

Nick Keim, JHU WSE Energetics Research Group / Columbia, MD

Telephone: (443) 718-5005

Email: nkeim@erg.jhu.edu

PSHS MISSION AREAS

The JANNAF 30th Propulsion Systems Hazards Subcommittee meeting will address hazards and related technology areas for strategic missile, tactical missile, gun, and rocket propulsion systems. Papers are invited that (1) address all aspects of vulnerability and survivability, loading and firing hazards of propulsion systems, and weapon systems safety or (2) aid in synthesizing, interpreting, and validating current knowledge to make research and development results more useful to the design engineer. Meeting topics generally fall into two groups: (1) hazards evaluation and (2) hazards mitigation technology.

Mission Area I: Thermal Decomposition and Cookoff

Co-Chairs: Ms. Aubrey D. Farmer, NAWCWD / China Lake, CA

Telephone: (760) 939-7582

Email: aubrey.farmer@navy.mil

Dr. William W. Erikson, SNL / Albuquerque, NM

Telephone: (505) 284-5867

Email: wwerks@sandia.gov

- *Thermal Decomposition, Ignition, and Combustion:* Fundamental experimental and modeling studies of decomposition of ingredients and propellants (including kinetics, mechanisms, microstructure, and thermochemistry); ignition of ingredients and propellants (including ignition mechanisms, ignition transients, and effects of heating rate); combustion of ingredients and propellants (including burn rate, pressure exponent, and temperature sensitivity; understanding of the microstructural combustion zone, chemistry and heat release; burning in cracks, defects, and thermally

damaged materials; convective combustion and DDT); characterization of thermally damaged materials; coupled thermal-chemical-mechanical modeling of cookoff. (Papers in this area will be considered for joint PSHS/CS sessions.)

- *Cookoff Hazards Assessment and Mitigation:* Cookoff response of propulsion systems and components; cookoff mitigation technologies; threat/hazards assessment (THA) of cookoff scenarios; relationships between THA and cookoff test procedures; small scale test methodologies for predicting cookoff of full scale systems.

Mission Area II: Impact / Shock-Induced Reactions

Chair: Dr. Joel B. Stewart, ARL / Aberdeen Proving Ground, MD

Telephone: (410) 278-3129

Email: joel.b.stewart2.civ@mail.mil

- *Coupling in Energetic Materials between Mechanical and Reactive Response:* Modeling and experimental studies on sub-detonative events triggered by impact or low amplitude shock loading; experimental, theoretical, and computational studies on the influence that the damage and fracture of the energetic material has on the initiation and evolution of reaction; development and use of experiments and diagnostics to either 1) identify fundamental mechanisms for the initiation and evolution of reaction (e.g., inter-granular friction vs plastic heating of binder material vs intra-granular fracture), 2) obtain the material response of the individual energetic constituents (e.g., for use in meso-scale modeling), 3) aid in sub-detonative model validation, or 4) better characterize sub-detonative responses in full scale systems.
- *Hot Spot Initiation from Shock and Impact:* Fundamental studies; scaling of fundamental physics to predict full scale events; experimental and theoretical studies of hot spot initiation and growth.
- *Detonation Phenomena:* Modeling and experimental studies of shock-to-detonation transition phenomena; deflagration-to-detonation transition phenomena; delayed detonation phenomena; other detonation phenomena not covered above.
- *Violent Reaction and Detonation of Rocket Propellants:* Micro-characterization of XDT mechanisms and fundamentals associated with explosive response to impact and shock loadings; increased sensitivity to shock leading to detonation of damaged 1.3 propellants; shotgun testing; characterization of impact damage; detonation phenomena of aluminized (underwater) explosives; modeling approaches.

Mission Area III: Insensitive Munitions Technology

Co-Chairs: Ms. Jamie M. Fisher, Army AMRDEC / Redstone Arsenal, AL

Telephone: (256) 876-5115

Email: jamie.m.fisher2.civ@mail.mil

Mr. Stephen R. Struck, AFRL / Eglin AFB, FL

Telephone: (850) 882-3911

Email: stephen.struck@us.af.mil

Areas of interest include but are not limited to:

- historical reviews of prior IM technology developments and lessons learned from integration into munitions;
- ongoing IM technology development efforts whether general in nature or geared to specific systems/munitions;
- design and functional details on mitigation concepts involving both passive and active features;
- results of IM and Safety testing of components and full up systems;
- evaluation of the relationship between small scale and full scale testing.

Mission Area IV: Gun Propellant Vulnerability

Chair: Mr. J. Kevin Boyd, ARL / Aberdeen Proving Ground, MD

Telephone: (410) 278-2505

Email: james.k.boyd.civ@mail.mil

Any aspects related to the response of gun propellants, ammunition, and ammunition compartments to shaped charge jets, other penetrators, and spall; and new LOVA propellant technologies. (Papers in this area will be considered for joint PSHS/CS sessions.)

Mission Area V: Propulsion Systems Safety and Hazard Classification

Chair: Dr. Josephine Covino, DDESB / Alexandria, VA

Telephone: (571) 372-6685

Email: josephine.covino.civ@mail.mil

- *Hazard Classification of Large Solid Rocket Motors:* Test methods/procedures, analysis techniques, experimental data and computer simulation results related to the assessment of hazard response of large solid rocket motors for hazard classification purposes. In particular, papers covering three hazard scenarios are of interest, including: (1) detonation/explosive reaction characteristics of various propellant families subjected to explosive shocks, for example critical diameter, shock sensitivity, and the

relationship between the two parameters; (2) response of large SRMs in an engulfing fire or fast cookoff scenario; and (3) creation and effects of propellant damage on hazard response of large SRMs in impact and other accident scenarios.

- *Propulsion Systems Safety and Hazard Classification:* Harmonization of Hazard Classification and Insensitive Munitions Testing, Issues identified by the service safety offices, Hazard classification issues, Differences between insensitive munitions and hazard classification and safety testing and standardization, Assessment of response and pass/fail criteria, Alternate test protocols and the role of small scale to full scale testing and hazard classification, and miscellaneous safety issues and programs.

Mission Area VI: Energetic Liquid Hazards

Chair: Mr. Adam J. Brand, AFRL / Edwards AFB, CA

Telephone: (661) 275-5787

Email: adam.brand@us.af.mil

- Hazards characterization associated with energetic liquids either as part of bipropellant combinations, monopropellant formulations, or liquid ingredients in solid propellant formulations and their respective propulsion systems.
- Identification and application of meaningful analytical/experimental methods for assessing hazard risk with energetic liquids, and the development and standardization of new test methods for assessing hazards in the different propulsion systems considered.

Propulsion Systems Hazards Subcommittee Chair

Ms. Jamie M. Fisher, Army AMRDEC / China Lake, CA

Telephone: (256) 876-5115

Email: jamie.m.fisher2.civ@mail.mil

JHU WSE ERG Technical Representative

Andrew Taylor, JHU WSE Energetics Research Group / Columbia, MD

Telephone: (410) 992-7306

Email: ataylor@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 22 May 2017.**

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 Liaison or Shelley Cohen scohen@erg.jhu.edu. This form must be submitted to ERG by **Monday, 22 May 2017**. The agenda and invitation list is due **Monday, 28 August 2017** for inclusion in the Preliminary Program, and must be approved no later than **Monday, 23 October 2017** for inclusion in the Final Program.

Specialist Sessions

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 22 May 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.

JANNAF AWARDS PROGRAM

In the tradition of recognizing the outstanding achievements by members of the propulsion community, the JANNAF Technical Executive Committee (TEC) and the Combustion (CS), Airbreathing Propulsion (APS), Exhaust Plume and Signatures (EPSS), and Propulsion Systems Hazards (PSHS) subcommittees are soliciting nominations for awards to be presented at the meeting. An 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.

The award recipients(s) must be able to attend the meeting to receive the award.

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 Technical 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 (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, 2 October 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 ensure to clearly state on your abstract that you wish to be considered for the Best Student Paper Award or contact the appropriate 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 **2 October 2017**. The Best Student Paper Award will be presented at the JANNAF meeting at which the paper is given.

UPCOMING JANNAF MEETINGS

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
30th Safety and Environmental Protection
Joint Subcommittee Meeting

22-25 May 2017

*The Westin Kansas City at Crown Center
Kansas City, Missouri*

48th Combustion
36th Airbreathing Propulsion
36th Exhaust Plume and Signatures
30th Propulsion Systems Hazards
Joint Subcommittee Meeting
Programmatic and Industrial Base Meeting

4-8 December 2017

*Newport News Marriott at City Center
Newport News, Virginia*

65th JANNAF Propulsion Meeting
Programmatic and Industrial Base Meeting
12th Modeling and Simulation
10th Liquid Propulsion
9th Spacecraft Propulsion
Joint Subcommittee Meeting

Spring 2018

Specific Dates and Location TBA

45th Structures and Mechanical Behavior
41st Propellant and Explosives Development and Characterization
32nd Rocket Nozzle Technology
31st Safety and Environmental Protection
Joint Subcommittee Meeting
Programmatic and Industrial Base Meeting

3-7 December 2018

Location TBA