



**43rd Combustion
31st Airbreathing Propulsion
25th Propulsion Systems Hazards
Joint Subcommittee Meeting**

43rd CS / 31st APS / 25th PSHS

Meeting Announcement and Call for Papers



Hyatt Regency La Jolla
La Jolla, California
December 7-11, 2009

ANNOUNCEMENT AND CALL FOR PAPERS

The Joint Army-Navy-NASA-Air Force (JANNAF) 43rd Combustion (CS) / 31st Airbreathing Propulsion (APS) / 25th Propulsion Systems Hazards (PSHS) Joint Subcommittee Meeting will be held Monday through Friday, December 7-11, 2009 at the Hyatt Regency La Jolla in La Jolla, California and the Naval Fleet Training Intelligence Center in San Diego, California. Dr. Michael J. Nusca, Army Research Laboratory, Aberdeen Proving Ground, MD will chair this year's meeting.

Attendance

The overall security classification of this conference is Secret. Unclassified sessions will be held at the Hyatt Regency La Jolla, La Jolla, California; classified sessions will be conducted at the Naval Fleet Training Intelligence Center. Attendance at this JANNAF meeting is restricted to U.S. citizens whose organizations are registered with an appropriately classified contract with the Defense Technical Information Center and certified for receipt of export-controlled technical data with the Defense Logistics Information Service. Please see the "Administrative Information" section located on page 5 for attendance requirements of non-government attendees at JANNAF meetings.

Purpose

The purpose of the JANNAF Interagency Propulsion Committee is to coordinate fundamental research, exploratory development, and advanced development programs; standardize procedures and nomenclature; promote and facilitate the exchange of technical information; and accomplish problem solving in areas of joint agency interest on propulsion systems used in missiles, rockets, boosters, spaceplanes, spacecraft, satellites, and guns. JANNAF subcommittees focus their resources on technical areas of interest to the JANNAF agencies.

Scope

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.

Propulsion Systems Hazards Subcommittee

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

Workshop/Specialist Sessions and Awards

JANNAF is soliciting topics for workshops and specialist sessions; recommendations for nominations for subcommittee recognition awards are also sought. Visit our website at

http://jannaf.org/Dec_2009_meeting.php for complete details.

Abstract Submittal Information

The technical areas for this joint meeting are listed in a table located on page 6. Each area on this table is linked to a subsequent page that contains a complete definition of each area. Topics are not intended to be exclusive; papers on unusual or specific solutions, or novel approaches are especially desired.

Individuals who wish to submit an abstract should carefully review the technical areas being solicited and complete the electronic abstract form provided with this announcement. Abstracts are due on May 25, 2009; submittal instructions are located on the next page.

- Review the areas and complete and submit the electronic abstract form provided with this announcement.
- The submission of an abstract represents an agreement to submit a final paper for publication prior to the meeting, attend the meeting, and deliver a 30-minute presentation.
- 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 what is new or advanced in the state-of-the-art. Highlight important conclusions and include a brief summary of the data used to substantiate them.
- Obtain management approval to ensure availability of resources for your participation in the meeting.
- CPIAC accepts only electronic submission of abstracts and papers via upload, e-mail or on CD-ROM. The deadline date for submission of electronic abstracts is May 25, 2009. Abstracts that are "approved for public release" may be submitted via e-mail to: pats@jhu.edu. Limited distribution abstracts may be uploaded to CPIAC's Secure Document Exchange site (see next page for uploading instructions) or mailed on disk or CD-ROM to: JHU/CPIAC, Attn: CS/APS/PSHS, 10630 Little Patuxent Parkway, Suite 202, Columbia, MD 21044-3286.

Abstract Submittal Instructions

Unclassified/limited-distribution abstracts and papers may be uploaded to CPIAC's secure web-site. Instructions follow:

- 1) Go to www.cpiac.jhu.edu, select Document Submittal [Login required] from the Tools and Resources section.
- 2) Choose info base: JANNAF Document Submission Database
- 3) Type in User Name: JANNAF1
- 4) Type in Password (contact CPIAC (410) 992-7301 for current password)
- 5) Click on Meetings
- 6) Click on CS/APS/PSHS
- 7) Choose Add Document (to the right of the page)
- 8) Complete the Add Document form (being sure to title your document, mark Upload from Client, attach your file via Path, note the appropriate file format under Document Type, and click on Apply)
- 9) E-mail pats@jhu.edu to notify that the file has been successfully uploaded.

Information about this December 2009 JANNAF Joint Subcommittee Meeting can also be found on the JANNAF website at: www.jannaf.org. Questions concerning the meeting may be directed to Patricia Szybist, CPIAC, at (410) 992-7302, ext 215 or or via e-mail: pats@jhu.edu.

Author Schedule of Events

Date	Weeks before Meeting	Action	Date	Weeks before Meeting	Action
25 May 2009	29	Deadline for receipt of abstracts.	2 Nov 2009	5	Deadline for receipt of manuscripts and paper clearance forms. Papers not received by this date are subject to removal from the program.
8 June 2009	26	Proposals for Workshops or Specialist Sessions; and, nominations for Best Student Papers	6 Nov 2009	4	Deadline for submission of changes to the final program.
6 July 2009	22	Acceptance/Rejection Letters mailed.	6 Nov 2009	4	Deadline for hotel reservations.
17 Aug 2009	16	Deadline for changes to the preliminary program.	23 Nov 2009	2	Deadline for receipt of security clearance certification and registration fees at CPIAC.
31 Aug 2009	14	Invitation, preliminary program, and registration materials forwarded.	23 Nov 2009	2	Deadline for receipt for presentations.
7 Sep 2009	13	Nominations for JANNAF Awards.	7-11 Dec 2009	0	43 rd CS / 31 st APS / 25 th PSHS Joint Subcommittee Meeting

Administrative Information

Policy on Non-Government Attendees at JANNAF Meetings. Attendance at JANNAF meetings for non-government employees is restricted to U.S. citizens whose organizations are 1) registered with the Defense Logistics Information Service (DLIS) AND 2) have a government contract registered with the Defense Technical Information Center (DTIC). If the government contract is not registered with DTIC, the attendee's registration form can be certified by a sponsoring government official from one of the participating JANNAF agencies. Additional information concerning registrations with DLIS and DTIC can be obtained by contacting DLIS at 1-800-352-3572 (www.dlis.dla.mil/jcp/) or DTIC at 1-800-225-3842 (www.dtic.mil/dtic/registration/index.html). 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.

Hotel Information

Sleeping rooms have been reserved with the Hyatt Regency La Jolla (www.lajolla.hyatt.com) located at 3777 La Jolla Village Drive, San Diego, California 92122. The government room rate per night will be at the prevailing government per diem rate; the non-government rate is \$209 plus tax (currently 12.5%). These rooms will be held for JANNAF until Friday, November 6, 2009. Each individual is responsible for his/her own reservation. Reservations may be made through the Hyatt central reservations number at (800) 233-1234 or with the hotel directly at (858) 552-1234. There will be two room blocks, one for per diem attendees and one for non-per diem attendees—please refer to the JANNAF meeting when making your reservations to assure the negotiated rates.

Summary of Subcommittee Mission Areas

Please note the relevant subcommittee and mission area on your abstract form to expedite its distribution to the appropriate program committee member for review.

	CS	APS	PSHS
Mission Area			
I	Guns	Conventional Ramjet Propulsion	Thermal Decomposition and Cookoff
II	Solid Propellants & Combustion	Scramjet Propulsion	Impact/Shock-Induced Reactions
III	Explosive Performance/Enhanced Blast	Scramjet Propulsion/Structures	Insensitive Munitions Technology
IV	Airbreathing Combustion	Scramjet Component/Engine Testing	Gun Propellant Vulnerability
V	Combustion Diagnostics	Combined/Advanced Cycle Propulsion	Propulsion Systems Safety and Hazard Classification
VI	Liquid, Hybrid, and Novel Propellants Combustion	Small/Expendable Turbopropulsion	
VII		Fuel Technology	
VIII		Component Modeling and Simulation	

CS MISSION AREAS

The JANNAF 43rd 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: Guns

Co-Chairs: Dr. Michael J. Nusca, ARL/APG
Telephone: (410) 278-6108
e-mail: nusca@arl.army.mil

Mr. John J. O'Reilly, Army RDECOM/Picatinny Arsenal
Telephone: (973) 724-5035, ext. 4708
e-mail: john.oreilly@us.army.mil

Dr. Christine M. Michienzi, NSWC/Indian Head
Telephone: (301) 744-2554
e-mail: christine.michienzi@navy.mil

- ***Ignition and Combustion of Gun Propellants:*** Ignition, combustion and fluid mechanics in solid and liquid propellant guns, ram cannons, electrothermal chemical guns, mortars and other novel gas generator applications; temperature sensitivity; transient and erosive combustion under gun conditions; burning rate measurement techniques; novel gun propelling charge concepts; interior ballistics of bag, stick, consolidated and traveling charges; innovative ignition systems; novel 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 a dynamic pressure wave environment; combustion behavior of damaged propellant; modeling and studies of deterred propellants; and improving gun erosion and ballistic efficiencies through propellant formulations. ***(Papers on gun propellant ignition and combustion and propellant vulnerability will be considered for joint CS/PSHS sessions.)***

CS MISSION AREAS (Continued)

Mission Area II: Solid Propellants & Combustion

Co-Chairs: Dr. Richard R. Behrens, SNL/Livermore
Telephone: (925) 294-2170
e-mail: rbehren@sandia.gov

Dr. Frederick S. Blomshield, NAWCWD/China Lake
Telephone: (760) 939-3650
e-mail: fred.blomshield@navy.mil

Mr. Jeffrey M. Freeman, Aerojet/Sacramento
Telephone: (916) 355-4536
e-mail: jeffrey.freeman@aerojet.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 kinetic studies); hazard initiation of propellants (including inadvertent ignition and effects of high burn rate); and methods of extinguishing propellants and implementing thrust termination. 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. ***(Papers in this area will be considered for joint CS/PSHS sessions.)***
- ***Solid Rocket Propellant Combustion Instability:*** Development, laboratory, and analytical advancements. 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; 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, filigree formation; metal combustion in fuel rich propellants and metal combustion in propellants without ammonium perchlorate; methods for obtaining in situ particle size measurements.

CS MISSION AREAS (Continued)

- **Combustion, Prediction, Performance, and Other Topics in Solid Rocket Motor Behavior:** The combustion related motor behavior and the application of analytical models, experimental research, and subscale testing to their solution. 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 IHRPT Combustion Technologies:** Advancements in the understanding of state-of-the-art in combustion technology in solid rocket motors, modeling, and analysis techniques, funded by IHRPT 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.

Mission Area III: Explosive Performance/Enhanced Blast

Chair: Dr. Richard J. Lee, NSWC/Indian Head
Telephone: (301) 744-2380
e-mail: richard.j.lee@navy.mil

Enhanced Blast: Investigations of post-detonation combustion of products, added fuels, and reactive material dispersal for enhancing blast effects in open-air and various confined structures are sought. Structures of interest include tunnels, caves, multi-room structures, and blast chambers. Papers reporting experimental, theoretical, and computational efforts are welcome but should offer understanding on the concept of producing an enhanced blast through either various formulations or novel charge design. The effect of casing design and structure layout is also of interest.

Detonation Performance: Investigations of the rapid combustion processes associated with detonation are sought. Papers elucidating how variations of formulation, confinement, and charge configuration affect the detonation (e.g., CJ-Pressure, detonation velocity, and Gurney energy), and creation of post-detonation products and aspects of driving metal (e.g., seeded particles, casing, and shaped projectiles). Papers may include studies on explosives and propellant formulations.

CS MISSION AREAS (Continued)

Mission Area IV: Airbreathing Combustion

Co-Chairs: Dr. Mark R. Gruber, AFRL/WPAFB
Telephone: (937) 255-7350
e-mail: mark.gruber@wpafb.af.mil

J. Philip Drummond, NASA-LaRC/Hampton
Telephone: (757) 864-2298
e-mail: j.p.drummond@nasa.gov

Airbreathing Combustion: Theoretical and experimental investigations of subsonic, supersonic, and hypersonic combustion phenomena for airbreathing systems (including small or expendable turbojet engines). 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; and fundamental investigations of airbreathing combustion. ***(Papers in this area will be considered for joint CS/APS sessions.)***

Mission Area V: Combustion Diagnostics

Chair: Dr. Robert J. Balla, NASA-LaRC/Hampton
Telephone: (757) 864-4608
e-mail: r.j.balla@larc.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

Chair: Dr. Dan L. Bulzan, NASA-GRC/Cleveland
Telephone: (216) 433-5848
e-mail: dan.l.bulzan@nasa.gov

- ***Combustion Dynamics of Liquid and Gaseous Rocket Propellants:*** Theoretical and experimental studies of steady and unsteady combustion phenomena in propulsion systems using liquid or

CS MISSION AREAS (Continued)

gaseous propellants. 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 to include: CFD approaches; stability prediction models, (e.g., new models, critiques and/or evaluations of existing models, experimental verification, 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, 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. Areas of interest include injection, mixing, analytical models of combustion and fuel regression rate, 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. 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; 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. 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., 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; diagnostic measurements, simulation and combustion instrumentation for underwater propulsion systems.

Combustion Subcommittee Chair: Dr. Michael J. Nusca, ARL/APG

Telephone: (410) 278-6108, e-mail: nusca@arl.army.mil

CPIAC Technical Representative: Mr. Ronald S. Fry, JHU-CPIAC/Columbia

Telephone: (410) 231-0641, e-mail: rs_fry@jhu.edu

APS MISSION AREAS

The JANNAF 31st 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. This includes technology, components, and engines of the turbojet, ramjet, scramjet, and combined cycle family. 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: Mr. John B. Moore, NAWCWD/China Lake
Telephone: (760) 939-7006
e-mail: john.b.moore1@navy.mil

- ***Ducted Rockets and Ramjets:*** Experimental and theoretical studies related to liquid and solid fuel ramjets and ducted rocket engine systems and components including mixing enhancements, active and passive control, plume signature reduction, instability, fuel studies and ramjet testing. Novel applications of ramjets as applied to turbine afterburners, incineration, high Mach number materials testing, metal combustion and other applications where either high speed and/or high temperature flows are required. ***(Papers in this area will be considered for joint APS/CS sessions.)***
- ***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.

Mission Area II: Scramjet Propulsion

Co-Chairs: Mr. Ronald S. Fry, JHU-CPIAC/Columbia
Telephone: (410) 231-0641
e-mail: rs_fry@jhu.edu

Dr. Christopher M. Brophy, NPS/Monterey
Telephone: (831) 656-2327
e-mail: cmbrophy@nps.edu

- ***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***
Papers are requested for an overview session reviewing current activities in hypersonic R&D.

APS MISSION AREAS (Continued)

Mission Area III: Scramjet Propulsion/Structures

Co-Chairs: Dr. Anthony M. Calomino, NASA-GRC/Cleveland
Telephone: (216) 433-3311
e-mail: anthony.m.calomino@nasa.gov

Mr. Brett Hauber, ARFL/Dayton
Telephone: (937) 904-6871
e-mail: brett.hauber@wpafb.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.
- ***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 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 IV: Scramjet Component/Engine Testing

Chair: Dr. Thomas A. Jackson, AFRL/WPAFB
Telephone: (937) 255-7057
e-mail: thomas.jackson@wpafb.af.mil

- ***Maturation of Fully Integrated, Prototype Propulsion Systems*** - Physical experiment and numerical 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 and 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 vitiation and other 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

APS MISSION AREAS (Continued)

evaluation; instrumentation strategies for both steady and transient performance and operability; 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; prioritization of matching ground test parameters to flight conditions; and, uncertainty assessments of ground and flight test measured and deduced parameters and of numerical analysis, including component and engine performance, operability, and durability. ***(Papers in this area will be considered for joint APS/CS sessions.)***

Mission Area V: Combined/Advanced Cycle Propulsion

Co- Chairs: Mr. Glenn W. Liston, AFRL/WPAFB
Telephone: (937) 255-2449
e-mail: glenn.liston@wpafb.af.mil

Dr. Louis A. Povinelli, NASA-GRC/Cleveland
Telephone: (216) 433-5818
e-mail: louis.a.povinelli@nasa.gov

Dr. Charles J. Trefny, NASA-GRC/Cleveland
Telephone: (216) 433-2162
e-mail: charles.j.trefny@nasa.gov

- ***Fundamental and Applied Technology:*** Combined, combination and advanced cycle airbreathing propulsion technology and systems. Of particular interest are analytical and/or experimental research regarding: 1) integration of multiple propulsive cycles; 2) methods for overcoming practical limitations (e.g. turbine-to-scramjet mode transition); 3) variable gas turbine cycles; and 4) exploration of air breathing propulsive cycles other than the Brayton cycle. ***(Papers in this area will be considered for joint APS/CS sessions.)***
- ***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.

Mission Area VI: Small/Expendable Turbopropulsion

Chair: Mr. Lance E. Chrisinger, AFRL/WPAFB
Telephone: (937) 255-7514
e-mail: lance.chrisinger@wpafb.af.mil

- ***Basic Technology and System Applications:*** Small and expendable turbopropulsion technology and systems related to missiles, drones, UAV's, and JETEC. ***(Papers in this area will be considered for joint APS/CS sessions.)***

APS MISSION AREAS (Continued)

Mission Area VII: Fuel Technology

Chair: Mr. Richard W. Wills, AFRL/WPAFB
Telephone: (937) 255-3113
e-mail: richard.wills@wpafb.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. Douglas L. Davis, AFRL/WPAFB
Telephone: (937) 255-7302
e-mail: douglas.davis@wpafb.af.mil

Dr. Richard L. Gaffney, NASA-LaRC/Hampton
Telephone: (757) 864-7872
e-mail: r.l.gaffney@larc.nasa.gov

- ***Data for Propulsion Simulation Code Validation:*** Papers summarizing data for air-breathing propulsion code verification 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, electro magnetic flow interactions or thermal protection systems. Fundamental thermodynamic verification data on physical properties of fluids including ionized gasses to supercritical fluids is also of interest.
- ***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.

Airbreathing Propulsion Subcommittee Chair: Mr. John B. Moore, NAWCWD/China Lake
Telephone: 760-939-7006, e-mail: john.b.moore1@navy.mil

CPIAC Technical Representative: Mr. Ronald S. Fry, JHU-CPIAC/Columbia
Telephone: 410-992-9951, ext. 206, e-mail: rs_fry@jhu.edu

PSHS MISSION AREAS

The JANNAF 25th 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: Dr. Arthur C. Ratzel, SNL/Albuquerque
Telephone: (505) 884-0824
e-mail: acratze@sandia.gov

Dr. Anita M. Renlund, SNL/Albuquerque
Telephone: (505) 845-9284
e-mail: amrenlu@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, 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: Mr. Brian E. Krzewinski, ARL/APG
Telephone: (410) 278-6206
e-mail: bkrzewinski@arl.army.mil

- ***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; and modeling approaches.

PSHS MISSION AREAS (Continued)

- **Hot Spot Initiation from Shock and Impact:** Fundamental studies; scaling of fundamental physics to predict full scale events; and 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; and other detonation phenomena not covered above.
- **Response of Energetic Materials to Low Amplitude/Long Duration Impact/Shock Loading:** Scenarios where this type of stimulus might be important include hard target penetrator warheads, solid propellant fallback/ground impact from launch vehicle failures, gun setback, shear induced reactions, and vulnerability of energetic materials to some kinetic energy penetrators. Also of interest is the development and use of small scale tests to simulate these types of impact/shock loading responses for full scale systems. Papers are also requested on diagnostics and experimental arrangements that support the understanding of reaction induced from low-amplitude, long-duration mechanical loading. These papers should focus on the measurement techniques (instead of the materials being tested) and how they produce data on the subject of interest. Examples of topics include techniques to measure material response (stress-strain vs. strain rates, cracking, etc.), reaction thresholds, and severity of reaction.

Mission Area III: Insensitive Munitions Technology

Co-Chairs: Ms. Jamie M. Fisher, Army RDECOM/Redstone Arsenal
Telephone: (256) 876-5115
e-mail: jamie.fisher@us.army.mil

Mr. Stephen R. Struck, AFRL/Eglin AFB
Telephone: (850) 882-3911
e-mail: stephen.struck@eglin.af.mil

Technology of interest includes historical documentation of past insensitive munitions issues and their impact on system development; mitigation system design and function; insensitive munitions program and technology status reports; assessment of insensitive munitions response and pass/fail criteria; and relationships between small-scale and full-scale testing relative to insensitive munitions. Papers reporting present progress under SBIR insensitive munitions technology funding are also solicited.

Mission Area IV: Gun Propellant Vulnerability

Chair: Dr. Patrick J. Baker, ARL/APG
Telephone: (410) 278-6800
e-mail: pbaker@arl.army.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.***)

PSHS MISSION AREAS (Continued)

Mission Area V: Propulsion Systems Safety and Hazard Classification

Co-Chairs: Dr. Josephine Covino, DDESB/Alexandria
Telephone: (703) 325-8625
e-mail: josephine.covino@ddesb.osd.mil

Ms. Patricia S. Vittitow, Army SMDC/Huntsville
Telephone: (256) 955-1778
e-mail: patricia.vittitow@us.army.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.
- ***Threat Hazard Assessment:*** MIL-STD-2105C allows variations in testing to stimuli more realistic to a given weapon system. These stimuli are defined by a threat hazard assessment of that weapon system. Papers describing threat hazard assessment methods and results are solicited.

Propulsion Systems Hazards Subcommittee Chair: Ms. Jamie Fisher, US Army RDECOM, Redstone Arsenal, AL; telephone 256-876-5115; e-mail Jamie.fisher@us.army.mil

CPIAC Technical Representative: Dr. Richard V. Cartwright, JHU-CPIAC/Columbia; Telephone: 410-718-5004, ext. 209; e-mail: rcartwright@cpiaac.jhu.edu

Upcoming JANNAF Meetings

April 14-17, 2009

Renaissance Las Vegas,

Las Vegas, Nevada

56th JANNAF Propulsion Meeting / 39th Structures and Mechanical Behavior / 35th Propellant and Explosives Development and Characterization / 26th Rocket Nozzle Technology / 24th Safety and Environmental Protection / 17th Nondestructive Evaluation Joint Subcommittee Meeting

April-May 2010

Location to be Determined

57th JANNAF Propulsion Meeting / 32nd Exhaust Plume and Signatures / 7th Modeling and Simulation / 5th Liquid Propulsion / 4th Spacecraft Propulsion Joint Subcommittee Meeting