



JANNAF Meeting Cycle Update

As communicated by the JANNAF Executive Committee (EC) on November 4, 2013, the JANNAF 42nd Structures and Mechanical Behavior / 38th Propellant and Explosives Development and Characterization / 29th Rocket Nozzle Technology / 27th Safety and Environmental Protection Joint Subcommittee Meeting, originally scheduled for December 9–13, 2013, is postponed until May 19–22, 2014, because of DoD travel restrictions and the continuing resolution that expired on January 15, 2014.

Subsequently, the JANNAF EC has decided to include the 61st JANNAF Propulsion Meeting (JPM) as part of the May 2014 program. An updated Meeting Announcement and Call for Papers, specifically for the 61st JPM was disseminated on November 27, 2013, noting an abstract deadline of February 3, 2014.

This meeting will now be conducted as the 61st JANNAF Propulsion Meeting / 42nd Structures and Mechanical Behavior / 38th Propellant and Explosives Development and Characterization / 29th Rocket Nozzle Technology / 27th Safety and Environmental Protection Joint Subcommittee Meeting, and will be held May 19–22, 2014, at the Charleston Convention Center in Charleston, South Carolina. Information about this meeting, including hotel reservations and a draft version of the preliminary program for sessions of the SMBS, PEDCS, RNTS, and SEPS can be found at: <https://www2.cpiac.jhu.edu/meetings/May2014/pages/index.html>.

This delay has caused an approximate six-month delay in our JANNAF meeting rotation cycle. Plans are underway to conduct the 46th Combustion / 34th Airbreathing Propulsion / 34th Exhaust Plume and Signatures / 28th Propulsion Systems Hazards Joint Subcommittee Meeting during the week of December 8–12, 2014. We anticipate the Meeting Announcement and Call for Papers for this meeting to be disseminated in March of 2014.

The next JANNAF meeting in rotation will include the 62nd JANNAF Propulsion / 10th Modeling and Simulation / 8th Liquid Propulsion / 7th Spacecraft Propulsion Joint Subcommittee Meeting to be conducted in the Spring of 2015.

Sincerely,
The CPIAC Team

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The Chemical Propulsion Information Analysis Center (CPIAC), a DoD Information Analysis Center, is sponsored by the Defense Technical Information Center (DTIC) and the Joint Army-Navy-NASA-Air Force (JANNAF) Interagency Propulsion Committee. The purpose of JANNAF is to solve propulsion problems, affect coordination of technical programs, and promote an exchange of technical information in the areas of missile, space, and gun propulsion technology.

CPIAC is responsible for the acquisition, compilation, analysis, and dissemination of information and data relevant to chemical, electric, and nuclear propulsion technology. A fee commensurate with CPIAC products and services is charged to subscribers, who must meet security and need-to-know requirements.

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CPIAC's Technical/Bibliographic Inquiry Service

CPIAC offers a variety of services to its subscribers, including responses to technical/bibliographic inquiries. Answers are usually provided within three working days, in the form of telephoned, faxed, electronic, or written technical summaries. Customers are provided with copies of JANNAF papers, excerpts from technical reports, bibliographies of pertinent literature, names of recognized experts, propellant/ingredient data sheets, computer programs, and/or theoretical performance calculations. The CPIAC staff responds to nearly 400 inquiries per year, from over 150 customer organizations. For further information, please contact Nick Keim by email to nkeim@cpiac.jhu.edu. Representative recent inquiries include:

TECHNICAL INQUIRIES

- Data on nitrile rubber property degradation for long-term storage at elevated temperatures with exposure to air (Req. 28232)
- Information on HPLC or IC methods for determination of amide content in 2-(5-Cyanotetrazolato)Pentammine Cobalt(III) Perchlorate (BNCP) (Req. 28117)
- Sensitivity, impact (ERL/BOE), friction (Joules), VTS, and shock data for lead azide, lead styphnate, and RDX (Req. 28096)

BIBLIOGRAPHIC INQUIRIES

- Collection of reports related to the Scaled Composites accident in July 2007 (Req. 28221)
- Performance tailoring of extruded double-base propellants. Topics included I_{sp} modification, mechanical properties, sensitivity, etc. (Req. 28089) and noncompositional effects on double-base propellant performance. (Req. 27981)
- Literature on self-ignition or detonation of LOX-RP pools (Req. 28135)

CPIAC Subscriptions

CPIAC forwarded GFY 2014 subscription renewal packets to its customer base for continued products and services. We would like to take this opportunity to inform the community that a minimum subscription of \$1,775 entitles subscribers to unlimited free access for all employees of your organization to our Propulsion Information Retrieval System; any two online databases housed in our Chemical Propulsion Information Network (CPIN); and six hours (prepaid) of technical/bibliographic inquiry hours. For information concerning a CPIAC subscription and/or products and services, please contact Hwei-Ru Chen at 410-992-7300, ext. 212 or email hchen@cpiac.jhu.edu.

JANNAF Heads to Charleston for the 61st JPM, 42nd SMBS, 38th PEDCS, 29th RNTS, 27th SEPS Joint Subcommittee Meeting

May 19–22, 2014

Join us at the Charleston Convention Center in Charleston, South Carolina, from May 19–22, 2014, for the 61st JANNAF Propulsion Meeting / 42nd Structures and Mechanical Behavior / 38th Propellant and Explosives Development and Characterization / 29th Rocket Nozzle Technology / 27th Safety and Environmental Protection Joint Subcommittee Meeting. The Program Planning Committee Chair is Dr. Mark Johnson from the Army Public Health Command. The preliminary program currently consists of 125 papers in 34 technical paper sessions, 5 workshops, 1 training course, and numerous panel meetings.

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 issues of interest to the JANNAF agencies. The subcommittees meeting in May focus on propellants and explosives, including their structure and mechanical behavior, and development and characterization; rocket nozzle technologies and materials; and safety and environmental protection.

The block diagram for the SMBS / PEDCS / RNTS / SEPS portions of this meeting is shown in the Preliminary Program available at: <https://www2.cpiac.jhu.edu/meetings/May2014/images/program.pdf>. The program for the SMBS, RNTS, PEDCS, and SEPS subcommittees has already been set. Any new abstracts submitted to those subcommittees will be reviewed for acceptance on a space-available basis only. However, the JPM Call for Papers has been recently released and is available at: <https://www2.cpiac.jhu.edu/meetings/May2014/images/cfp.pdf>. The JPM is now accepting abstracts until February 3, 2014. For other information, please visit the meeting website: <https://www2.cpiac.jhu.edu/meetings/May2014/pages/index.html>.



Charleston Convention Center

KEYNOTE ADDRESS

The keynote speaker will be Dr. Dominic M. Di Toro, the Edward C. Davis Professor of Civil and Environmental Engineering at the University of Delaware. Dr. Di Toro was elected to the National Academy of Engineering in 2005, named the Institute of Scientific Information Highly Cited Researcher in 2003, and received the Founders Award of the Society of Environmental Toxicology and Chemistry in 1997. He specializes in the development and application of mathematical and statistical models of fate, transport, and toxicity of contaminants in surface waters, soils, and sediments. Dr. Di Toro has published over one hundred technical papers, as well as the book, *Sediment Flux Modeling*. In addition, he has participated as expert consultant, principal investigator, and project manager on numerous water quality and toxicity studies for industry, research foundations, and governmental agencies. His recent work focuses on the development of water and sediment quality criteria for the Environmental Protection Agency (EPA), sediment flux models for nutrients and metals, and partitioning models for munitions components to soil, organisms, and plants.



*Keynote Speaker
Dominic Di Toro*

The keynote address (abstract below) will occur at 8:00 a.m. on Tuesday, May 20. The title is, “Predicting the Partitioning of Contaminants and Munitions Components to Soil, Organisms, and Plants from Molecular Structure for Use in Risk Assessment.”

Predicting contaminant partitioning to environmental phases continues to be a central problem in environmental chemistry and engineering. Contaminant fate and effects are largely determined by the extent to which they partition from the aqueous phase to colloidal, suspended, sediment, and soil particles, and to receptor sites in biota. Historically, soil organic matter has been the most studied phase with a long and distinguished history of

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development and application. For most of this history, the models have been empirical correlations using aqueous, particulate, and chemical parameters. More recently, other phases have been investigated, e.g., organism lipid to predict toxicity and bioaccumulation, and mineral fractions for sorption of more hydrophilic compounds. More mechanistic models that explicitly consider hydrogen bonding, polarization interactions, and van der Waals interactions are now available. Most recently quantum chemical solvation models have also been applied. A review of the available models will be presented with an emphasis on models that can predict these partition coefficients from using only molecular structure. The present state of the art will be reviewed from the point of view of applying these techniques to risk assessment.

61ST JANNAF PROPULSION MEETING (JPM)

The JANNAF Propulsion Meeting (JPM) promotes the exchange of technical information in the fields of missile, space, and gun propulsion. These meetings assemble scientists and engineers who are responsible for leading the research and engineering efforts on government-sponsored and government-performed programs in these areas for the purpose of sharing information and research results; and are part of a series of such meetings dating back to the late 1940s. The JPM sessions cover current propulsion science and technology, propellants, and hardware relevant to government programs, comparative system performances, and technology advances which affect current and future propulsion systems. The JPM program is now soliciting abstracts for the following mission areas:

- I: Tactical Propulsion*
- II: Missile Defense/Strategic Propulsion*
- III: Propulsion Systems for Space Access*
- IV: Gun and Gun-launched Propulsion*
- V: Propulsion and Energetics Test Facilities*
- VI: Sensors for Propulsion Measurement Applications*

42ND STRUCTURES AND MECHANICAL BEHAVIOR SUBCOMMITTEE (SMBS) MEETING

The JANNAF 42nd Structures and Mechanical Behavior Subcommittee's sessions will address the experimental, analytical, and statistical techniques used for the preliminary or detailed structural design of solid rocket motors and liquid rocket engines and gun ammunition, their components, and the prediction and assessment of their structural integrity and structural service life.

The currently planned SMBS paper sessions include, "Material Properties and Characterization," "Service Life/

Missile Sustainment," "Structural Analysis and Design," and "Nondestructive Evaluation." SMBS is also planning on hosting a specialist session, workshop, and short training course. The half-day specialist session on Wednesday, May 21, chaired by Mr. Frank Tse of the Naval Surface Warfare Center, is entitled, "Guidelines for Determining Margin of Safety Calculations in Propellant Grains – Training Session" (description below).

This is a specialist training session for margin of safety calculations based on CPIA PUB 612, *Guidelines for Determining Margin of Safety Calculations in Propellant Grains*. Guidelines are presented for conducting structural analysis of solid rocket motor grains. The primary loadings considered include thermal cool down and ignition pressurization; response properties and failure criteria were also addressed. The guidelines are the result of a JANNAF Structures and Mechanical Behavior Subcommittee effort to enable consistent approaches to margins determination in the industry. Frank Tse, chairman of the committee that wrote CPIA 612, will provide a presentation of what was intended in CPIA PUB 612 as an overview. Others are invited, including ATK and Aerojet, to give examples and differencing views.

A full-day long Joint Service Life and Nondestructive Evaluation (NDE) Workshop is also scheduled during the SMBS meeting. The workshop entitled, "Determine Standardized NDE Monitoring of Fielded Systems for Structural or Chemical Degradation Using New or Existing Technology," will be chaired by Ms. Kara Lormand of Aerojet-Rocketdyne, and is scheduled for Monday, May 19 (description below).

The JANNAF Structures and Mechanical Behavior Subcommittee (SMBS) will hold its first workshop regarding the use of NDE techniques for detection of structural or chemical defects in aged propellant systems. Chemical and structural mechanisms that limit the useful life of solid propellant have been known to the community for decades, but current evaluation involves destruction of the field returned motor to evaluate propellant health. Workshop presentations will educate the community on currently used NDE techniques for determining failure pathways related to chemical degradation in the bulk propellant, cracking or defect growth at the bore surface, and bond line failures. NDE techniques could be used to bridge the gap of monitoring fielded systems until wireless sensor technology can be implemented. During open discussions, regulation challenges, technique limitations/benefits, and detection limits of NDE will be compiled into a document to summarize available

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technology. Participants and attendees of the workshop can provide insight on the following subjects:

1. Technology availability across companies and service branches
2. Standard interpretation methodology
3. New uses for existing NDE techniques
4. Incorporation of critical parameters detectable by NDE into FEM builder and Tex-Chem user groups

All are welcome to participate in the specialist session and workshop.

Additionally, SMBS is in the process of planning a two day FEM-Builder/TEXChem training session with two instructors from ATK. The training session will occur on Thursday and Friday, May 22–23. Advanced registration is required as space is limited. There may be an additional equipment charges or fees for the training session. Please watch for future announcements containing course and registration details. Contact David Owen at dowen@cpiac.jhu.edu for more information.

Panels meeting during this May's Structures and Mechanical Behavior Subcommittee Meeting include Structural Analysis and Design; Material Properties and Characterization; Service Life; and Nondestructive Evaluation.

The program for the SMBS has already been set. Any new abstracts submitted to this subcommittee will be reviewed for acceptance on a space-available basis only.

38TH PROPELLANT AND EXPLOSIVES DEVELOPMENT AND CHARACTERIZATION SUBCOMMITTEE (PEDCS) MEETING

The scope of the Propellant and Explosives Development and Characterization Subcommittee's sessions includes work and issues associated with propellants, explosives, and other energetic formulations used in the development, manufacture, performance, and operation of weapons, propulsion systems, and gas generator devices. Papers presented will discuss the topics of liquid propellants, propellant process engineering, solid propellant chemistry, solid propellant ingredients and formulations, propellant surveillance and aging, gun propellants, green energetic materials, high gas output devices, and explosives.

PEDCS will be well represented at the meeting—there will be a session each on “Detection, Demilitarization and Disposal of Energetics,” “Solid Propulsion Technology for Insensitive Munitions,” “Materials for Explosives,”

“Insensitive Explosive Fills,” “Novel Explosive Formulations,” “Explosive Science,” “Insensitive Propellant Formulations,” and “Advanced Solid Propellant Development,” and a restricted Department of Defense (DoD)/Department of Energy (DoE)-only session on “Initiation and Growth.” Further, there will be two sessions each on “Innovative Solid Propellant Ingredients,” “Liquid Propellants,” “Chemistry and Aging”, and “Guns and Hi Gas Output Devices” sessions, and three sessions on “Propellant and Explosive Process Engineering.” Note that a discussion on subject matter will follow the “Guns and Hi Gas Output Devices” session. Two Joint PEDCS/SEPS sessions on Green Energetic Materials will also convene.

Dr. Kerry Clark of Naval Sea Systems Command (NAVSEA) and Dr. Jamie Neidert of the U.S. Army Aviation and Missile Research Development and Engineering Center (AMRDEC), will co-chair a half-day workshop on Tuesday, May 20, entitled, “Hydroxyl-Terminated Polybutadiene (HTPB): Critical Material Path Forward.” Participation is open to all; a description of the workshop is below.

Hydroxyl-terminated polybutadiene (HTPB)-based solid propellants and explosives are developed, fielded, and utilized widely among the member TTCP nations. Cray Valley (French parent company TOTAL) makes the polymer for many industrial applications. As the propulsion/energetics applications have diminished, combined with the varied specifications and requirements of a myriad of programs, the consistency and reproducibility of the base polymer properties have changed over the years. The overall objectives of this focus area are to coordinate and link activities in the area of HTPB variability to maximize the overall capability and to minimize duplication of effort in developing technologies, tools, and methods. Specific objectives include: (1) establish understanding of the common specification concerns, (2) foster links among participants and their HTPB programs, and (3) update the HTPB community with the status in securing a qualified second source of the material.

This focus area will address issues related to the use of HTPB in the development of rocket propulsion and explosives systems. The primary aim will be to establish/revisit an understanding of the source of the polymer variability, identify common issues relating to the current specifications, and suggest possible changes to Cray Valley Company. The scope of this focus area will include both rocket propellants and explosives—since many of the same issues are common to each family of compositions. With rocket motors, the problems are more acute since the polymer is also employed in the

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liner/bond-lines. The workshop will allow participants to provide an update to issues they have encountered as HTPB equivalent weights and functionality have changed; discuss the updates regarding the SBIR Phase II Topics/Goals related to HTPB sourcing; and provide support for the preparation of formal report.

A half-day Joint Propellant Safety and Surveillance Board (JPSSB) meeting will be occurring concurrently with the JANNAF PEDCS on Monday, May 19, and will be led by co-chairs Dr. Kerry Clark of NAVSEA Indian Head Division and Ms. Kathryn Hunt of Marine Corps Systems Command. The description is as follows.

The JPSSB is a joint services council that advises the Joint Ordnance Commanders Group - Quality Assurance Sub-group (JOCG-QAS) in matters principally related to the stability of solid gun propellants. The objective of our annual meeting is to provide a comfortable and relaxed forum for the exchange of technical information, and to offer lively discussions on the surveillance of gun propellants and related ordnance assessment test and evaluation programs, techniques, and issues. The information presented should be of interest to anyone who is involved in the research, development, production, or service life monitoring of solid gun propellants. The JPSSB invites presentations from DoD, private industry, and academia in all subject areas related to propellant and ordnance containing gun propellant. Presentations typically are 20–30 minutes in length followed by a 10-minute Q&A period.

A Critical Energetic Materials workshop is currently in the early planning phases and is scheduled for the JANNAF meeting. Further information can be found in future updates to the Preliminary Program.

Panels meeting during this JANNAF PEDCS meeting include Solid Propellant Ingredients and Formulations; Propellant and Explosive Formulations Processing; Energetic Materials Development; Liquid Propellants; Propellant and Explosive Aging and Surveillance; and Green Energetic Materials (Joint PEDCS/SEPS).

The program for the PEDCS has already been set. Any new abstracts submitted to this subcommittee will be reviewed for acceptance on a space-available basis only.

29TH ROCKET NOZZLE TECHNOLOGY SUBCOMMITTEE (RNTS) MEETING

The 29th Rocket Nozzle Technology Subcommittee's sessions will focus on materials, processing, testing, evaluation, design, analysis, and other topics of interest

in the rocket nozzle technology area. One of the areas of interest for this upcoming meeting is material obsolescence.

Sessions currently planned for RNTS include "Thrust Control," "Innovative Nozzle Materials," "Thermal, Structural and Fluid Analysis and Modeling," and "Nozzle Design, Test, and Evaluation." RNTS will also host a workshop on "Advanced Thermal/Structural Modeling of Carbon Cloth Phenolic." This half-day unclassified workshop on Wednesday, May 21, will be chaired by Dr. David Richardson of ATK Aerospace Systems. A description of the workshop follows.

This workshop is proposed to develop an industry-accepted physics-based, nonlinear, fully integrated coupled thermal and structural material model for accurate prediction of the response of heated phenolic material used in ablative thermal protection systems (TPS). These TPS materials are used on systems such as reentry vehicles and solid rocket motor nozzles. Currently, many of the thermal/structural models have been empirically based involving approximations for the complex nonlinear nature of the material response of heated phenolic material. Most models have had a loose/independent coupling of the thermal and structural models. These models tend to cause designers to overdesign systems (particularly for man-rated systems). Past attempts have been unsuccessful due to the complexity of the modeling and the computer resource requirements. This task is now achievable with improvements in computer technology coupled with the significant advancements made in the past numerous historical studies. Historical efforts from previous investigators need to be combined into one finalized model. The objective of this workshop is to followup on the status of analytical efforts which were conducted in response to the interagency code evaluation that was initiated last JANNAF RNTS conference. Participants will share the analytical evaluations of the pre-defined test cases. Discussions will then be held on the shortcomings of the current industry standard analysis approaches. Technical discussions will also be held on possible approaches for improving the standard techniques.

The RNTS panel meetings include Enabling Technologies for Thrust Control; Nozzle Materials Obsolescence/Next Generation Nozzle Materials; and Nozzle Design, Analysis and Testing.

The program for the RNTS has already been set. Any new abstracts submitted to this subcommittee will be reviewed for acceptance on a space-available basis only.

27TH SAFETY AND ENVIRONMENTAL

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PROTECTION SUBCOMMITTEE (SEPS) MEETING

The Safety and Environmental Protection Subcommittee's sessions will cover chemical propulsion safety and environmental protection issues such as space launch range safety; risk assessments of rocket propellants, explosives, and pyrotechnics; environmental and health effects of propellants and explosive compounds, precursors, combustion products, wastes, etc.; packaging, storage, and transportability; propellant handling and use; demilitarization, disposal, and reclamation of energetic materials; emergency management activities; explosives safety aspects of propellants and related energetic materials; and manufacturing/processing hazards of energetic materials.

SEPS sessions currently planned include, "Toxicology and Occupational Health," "Detection, Demilitarization and Disposal of Energetics," and "Range and Explosive Safety." There will also be two joint PEDCS/SEPS sessions on "Green Energetic Materials," followed by a joint PEDCS/SEPS Green Energetic Materials Panel Meeting. The other panels meeting include Environmental Protection; Occupational Health and Toxicology; Range Safety and Atmospheric Modeling; Industrial Hygiene; Demilitarization, Reclamation and Re-use Technology; and Environment, Safety, and Occupational Health (ESOH) Impacts of Insensitive Formulations.

SEPS is also hosting a full-day workshop on the environmental, safety, and occupational health aspects of insensitive munitions. The workshop titled, "Fate, Transport and Effects of Insensitive Munitions: Issues and Recent Data," scheduled for Monday, May 19, will be chaired by Dr. Mark Johnson, U.S. Army Public Health Command. The workshop description follows:



*Meeting and Workshop Chair
Mark Johnson*

This is a follow-on to workshops held previously where research and data needs were identified. The purpose and primary goal of this workshop is to discuss what we have learned and to share this information with the energetics community. Since this meeting includes other JANNAF subcommittees, it is an excellent opportunity to transfer this information to the Research Development Test & Evaluation (RDT&E) and acquisition stakeholders. The workshop will begin with an introduction to charge issues

(recap past workshops, discuss evolving science for IM and path forward, workshop goals), and then research from four key functional areas will be presented: Nature and Extent, Fate and Transport, Occupational Toxicology, and Environmental Toxicology.

The program for the SEPS has already been set. Any new abstracts submitted to this subcommittee will be reviewed for acceptance on a space-available basis only.

PRELIMINARY PROGRAM: The preliminary program can be found at: <https://www2.cpiac.jhu.edu/meetings/may2014/images/program.pdf>.

REGISTRATION: The JANNAF registration fee is \$850 on or before May 5, and \$975 starting May 6. Registration is currently open at the meeting's website: <https://www2.cpiac.jhu.edu/meetings/May2014/pages/registration.html>.

HOTEL INFORMATION: JANNAF has negotiated special discounted room rates with the Embassy Suites North Charleston, located near the Charleston Airport and attached to the Charleston Convention Center. Staying at the official hotel affords the best networking opportunities and support to JANNAF. When booked through the JANNAF registration web link, or by phone with the JANNAF registration code, the room rate per night for all attendees is currently \$149 plus tax (currently 13.5%). The room rate also includes free wireless internet, complimentary breakfast, and other amenities. These rooms will be held for JANNAF attendees only until April 25. Detailed information on how to obtain the discounted room rate and make your reservation is located on the "Hotel" information page on the JANNAF meeting website: <https://www2.cpiac.jhu.edu/meetings/may2014/pages/hotel.html>.

NETWORKING NIGHT: Meet with other attendees at the JANNAF Networking Night on Wednesday, May 21. The networking night is complementary for those displaying a JANNAF badge. Guest passes may be purchased for \$40.00 each.

ADDITIONAL INFORMATION: Additional information on this meeting is available at: <https://www2.cpiac.jhu.edu/meetings/may2014/pages/index.html>. If you have technical questions regarding SMBS, PEDCS, or RNTS, please contact David Owen at dowen@cpiac.jhu.edu, or 410-992-7300, ext. 210. For technical questions related to SEPS, please contact Andy Taylor at ataylor@cpiac.jhu.edu, or 410-992-7300, ext. 220. For technical questions regarding the JPM, please contact Pete Zeender at pzeender@cpiac.jhu.edu.

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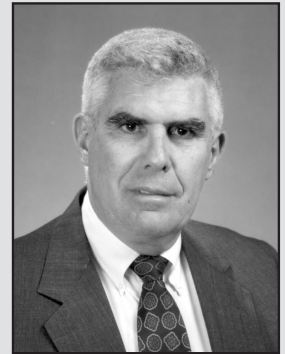
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jhu.edu, or 410-992-7300, ext. 205. Security questions should be directed to Mary Gannaway at mgannaway@cpiac.jhu.edu, or 410-992-7300, ext. 211. Please contact Shelley Cohen at scohen@cpiac.jhu.edu, or 410-992-7302, ext. 215, with your meeting planning questions.

In Memoriam

Robert L. Sackheim lost his battle with respiratory illness on December 22, 2013. Sackheim worked at TRW and NASA's Marshall Space Flight Center (Assistant Center Director/Chief Engineer for Space Propulsion). During his distinguished career, Sackheim wrote more than 150 technical papers and contributed to four books on rocket propulsion. He holds eight patents in spacecraft propulsion/control systems technologies. In Marshall's 40-plus years, Sackheim was only the third inductee to the prestigious National Academy of Engineering. He received numerous awards/honors from TRW, NASA, the academic/aerospace communities, and organizations/colleagues worldwide. Always eager to pass along his knowledge and experience, Sackheim leaves behind a generation of aerospace engineers who have benefitted from his mentorship as a university professor and a frequent lecturer/author. He is survived by his wife, daughter, son, and three grandchildren.

*Modified from www.legacy.com
Photo courtesy of CPIAC*



Update Notice to PIRS Customers

CPIAC's Propulsion Information Retrieval System (PIRS) now contains over 600 new searchable citations from JANNAF meetings conducted in 2011 and 2012. The meetings included the "JANNAF 8th Modeling and Simulation / 6th Liquid Propulsion / 5th Spacecraft Propulsion Joint Subcommittee Meeting," held in December 2011; the "JANNAF 41st Structures and Mechanical Behavior / 37th Propellant and Explosives Development and Characterization / 28th Rocket Nozzle Technology / 26th Safety and Environmental Protection Joint Subcommittee Meeting," held May 2012; the "59th JANNAF Propulsion Meeting," held May 2012; and the "JANNAF 45th Combustion / 33rd Airbreathing Propulsion / 33rd Exhaust Plume and Signatures / 27th Propulsion Systems Hazards Joint Subcommittee Meeting," held in December 2012.

PIRS now consists of almost 114,000 document citations that relate to missile, space, and gun propulsion research and technology. PIRS contains citations of technical documents covering the years 1960 through the present. Unlimited access to PIRS is available free to all individuals employed by organizations who are annual subscribers to CPIAC's products and services and by DoD and NASA organizations that block fund the JANNAF IPC. For information concerning access to PIRS, please contact CPIAC Customer Service at (410) 992-7300.

APS Selects Best Paper Award

Following the very successful 33rd Airbreathing Propulsion Subcommittee Meeting held December 3–6, 2012, in Monterey, CA, 19 of the 90 technical papers that were presented were nominated by APS Technical Steering Group Members and Session Chairs for detailed review to determine the Best Paper from the meeting. That distinction has been awarded to the paper entitled, “Introduction to the HIFiRE Flight 2 Data Set,” by Mark Gruber and Michael Brown of the Air Force Research Laboratory, Wright-Patterson Air Force Base, OH.

The paper provides an excellent summary of the various elements of the extensive data set obtained during Hypersonic International Flight Research Experimentation (HIFiRE) Flight 2, including a summary of the mission timeline; the approach used to synchronize data from various payload systems; assessments of the electrical, instrumentation, and payload system performance; and data examples to support the various experimental objectives of the flight.

On behalf of the best paper review committee co-chairs, Barry Kiel and James Weber, as well as the other 16 APS members who reviewed papers, I hope you join me in offering a hearty congratulations on this well-deserved award.

*Larry Huebner, Chairman
Airbreathing Propulsion Subcommittee*

In Memoriam



Robert Garcia, 51, of Huntsville, AL, passed away October 10, 2013. Garcia served as the NASA Propulsion Technical Fellow at Marshall Space Flight Center (MSFC). Prior to being selected for this role, he managed Marshall's Solid Propulsion Systems and Propulsion Systems Divisions. In both of these assignments, Garcia was responsible for assuring excellence in propulsion systems engineering support to the projects. Prior to becoming the division chief, he managed the Applied Fluid Dynamics Analysis Group (TD64) for six years. This group was responsible for providing MSFC programs with fluid analysis, designs, and technology development support.

In total, Mr. Garcia had 17 years of experience in performing aerodynamic, hydrodynamic, and engine system design and analysis of rocket propulsion. Key experience included fluid design and analysis in support of the SSME, ATD turbopumps, X-33 propulsion system, Fastrac (MC-1), COBRA, RS-83, TR-107, and RS-84 rocket engines. He was heavily involved in the Simplex and Fastrac design and development activities, providing CFD analysis support to the former, and was the lead pump hydrodynamic designer and CFD analyst for the latter. During the early 1990s, Mr. Garcia led a team of national fluids experts to develop advance pump technology for the upcoming NASA propulsion activities.

Mr. Garcia earned a B.S. in aerospace engineering from the University of Florida (1986), and took many graduate-level courses in mathematics and engineering from the University of Alabama in Huntsville. Mr. Garcia received numerous awards through his career at NASA, most notable among them being a Silver Snoopy Award and the NASA Exceptional Service Medal (2002).

Garcia was preceded in death by his sister. He is survived by his three daughters, son, and parents.

*Modified from nasa.gov and obits.al.com
Photo courtesy of CPIAC*

The 60th JANNAF Joint Propulsion Meeting and 9th Modeling and Simulation, 7th Liquid Propulsion, and 6th Spacecraft Propulsion Subcommittees Meet in Colorado Springs

From April 29–May 2, 2013, the Joint Army-Navy-NASA-Air Force (JANNAF) Propulsion Interagency Committee held the 60th JANNAF Propulsion Meeting (JPM) in Colorado Springs, CO. This year's JPM met with an unprecedented challenge to our Department of Defense and NASA constituents: sequester and travel restriction. But, thanks to significant hard work and dedication by many of those involved, the meeting was well patronized and



highly successful. In addition to the 125 attendees on site at the meeting, 213 government individuals across the country were supported remotely in 28 special virtual sessions, bringing total participation in the meeting to over 300 people. Also, in a special expansion of the Subcommittee program, the MSS, LPS, and SPS were joined by four Combustion Subcommittee (CS) and two Propulsion Systems Hazards Subcommittee (PSHS) sessions held in conjunction with the JPM. CPIAC would like to thank again the program committee, session chairs, off-site session chairs, and community members for their hard work and dedication to JANNAF; without your efforts, this past April/May meeting would not have been a success!



Todd May presents the SLS program.

KEYNOTE

Those in attendance were treated to a rousing keynote address given by Mr. Todd May, Space Launch System (SLS) Program Manager at NASA Marshall Space Flight Center. Mr. May shared his insights into the SLS program and his belief in the SLS vehicle as an enabler for exploration. The current design for the SLS includes an initial capability to be available for launch in 2017; this design includes the five-segment solid rocket boosters developed for the Constellation program, four RS-25 SSME inventory assets for the core stage, and an Interim Cryogenic Propulsion Stage (ICPS) based on the Delta IV EELV upper stage. Post 2021, the SLS will be upgraded with advanced boosters and an upper stage featuring the J-2X engine. The initial capability will provide a vehicle capable of delivering 70 metric tons to low earth orbit, growing to 130 metric tons after 2021.



HIGHLIGHTS *JPM*

Highlights of the JANNAF Propulsion Meeting included a strong collaboration between the JPM Program Committee and the Combustion Subcommittee in the areas of guns and combustion kinetics. In addition to the regular JPM sessions, also held were a specialist session on simulation of blast environments for rocket engine test facilities as well as a workshop to discuss utilization of excess RS 34 stages from decommissioned Peacekeeper Intercontinental Ballistic Missiles (ICBMs). Finally, the National Institute for Rocket Propulsion Systems (NIRPS) held a workshop to showcase plans for a secure portal

for the U.S. propulsion community. (The portal was released following the meeting—see announcement on page 14.) Used to foster collaboration between organizations, the portal includes a database of skills and capabilities provided by the

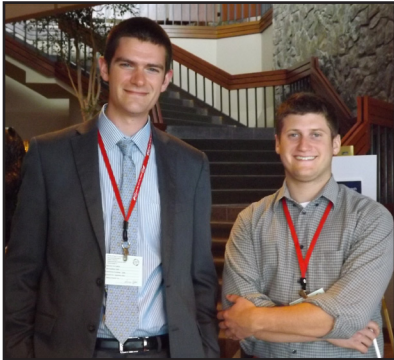


(continued on page 11)

60th JPM in Colorado Springs...*continued from page 10*

government, industry, and academia.

MSS



The Modeling and Simulation Subcommittee (MSS) had five sessions covering Integrated Health Management (IHM) sensors, Virtual Engineering, Simulation Credibility, and Modeling and Simulation of Systems. In addition to the regular sessions, MSS held a workshop on using computational fluid dynamics (CFD) to simulate environments and performance of solid rocket motors. Featuring presentations from the major solid rocket motor (SRM) players, this workshop was very well attended and produced lively discussion of how best to utilize the available commercial tools to advance current modeling and prediction capabilities. A number of MSS/IHM-related papers on solid rocket motor life management will also be presented at the May S&MBS JANNAF meeting.

LPS

The Liquid Propulsion Subcommittee (LPS) meeting held sessions covering a broad range of rocket engine technologies, including a dedicated session on the Hydrocarbon Boost program and sessions on combustion stability and dynamics, advanced materials, liquid engine systems, hydrocarbon fuel properties and performance, and a very strong contingent of turbomachinery papers. In addition, the LPS held a joint session with the Combustion Subcommittee (CS) on modeling and kinetics of liquid/gel propellants.



SPS



Highlights from the Spacecraft Propulsion Subcommittee (SPS) meeting included sessions on advanced propulsion systems, advanced monopropellants, nanosats, and electric propulsion technology. A particular highlight was a session about on-board hall thruster plume measurement instruments on the Advanced Extremely High Frequency (AEHF) satellite. A session on thermal protection systems was not held in Colorado Springs, however, the papers will be published as part of the proceedings.

CS & PSHS

The Combustion (CS) and Propulsion Systems Hazards Subcommittees (PSHS) held a total of six sessions out of cycle at the JPM meeting. These sessions provided an opportunity for authors not able to participate in the Monterey CS/PSHS meeting to present their work without the need to wait for the April 2014 meeting. The CS subcommittee held a number of joint sessions with the JPM on gun systems, charge ignition, and propellant characterization, as well as a joint session with LPS on modeling and kinetics. The number of joint sessions highlights the potential for future collaboration among subcommittees and the benefits of cross-pollination between regular JANNAF meetings.

PROCEEDINGS

The proceedings of the April/May JANNAF meeting are available now; qualified customers may contact CPIAC at 410-992-7300 for more information or to order.

A separate JANNAF workshop compilation will include final reports of the December 2012 workshops and the workshops from this past April/May meeting.



(continued on page 12)

60th JPM in Colorado Springs...continued from page 11

NETWORKING NIGHT



Volume 6, Issue 1 of the *JANNAF Journal of Propulsion and Energetics* Available This Spring!

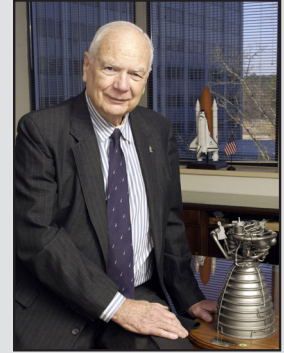
Volume 6, Issue 1 of the *JANNAF Journal of Propulsion and Energetics* will be released this spring and distributed at the May 2014 JPM in Charleston, SC. The issue features papers in the areas of electric propulsion, hypersonic propulsion, liquid propulsion, energetics and reactive materials, and solid propulsion technologies.

A special issue (Volume 6, Issue 2) devoted to hypersonic air-breathing propulsion topics is scheduled to be released in December of 2014. Manuscripts are currently being accepted for consideration in Volume 7, Issue 1, and subsequent issues. For questions about manuscript style or preparation, figures and graphics, submission procedures, and deadlines, please contact Journal Managing Editor Nicole Miklus at nmiklus@cpiac.jhu.edu. For matters related to technical topics, special focus areas, research, and data, please contact Technical Advisor Ron Bates at JournalTA@cpiac.jhu.edu.



In Memoriam

George David Hopson, 86, passed away in Madison, AL. He was born in Birmingham, AL, and graduated from Woodlawn High School in Birmingham. He enlisted in the U.S. Marine Corps and served from 1945–1946. He then attended the University of Alabama where he earned a B.S. in mechanical engineering in 1950. He served as an officer in the U.S. Army from 1951–1953, earning the Bronze Star in Korea. He then returned to the University of Alabama and earned a M.S. in mechanical engineering in 1954. He began his engineering career at General Dynamics in Fort Worth, TX (1954–1962), then returned home to AL to begin a distinguished 45-year career at NASA Marshall Space Flight Center. He held numerous positions at NASA including Fluid Dynamics Branch Chief, Structures and Thermal Branch Chief, Skylab Analysis Lab Director, Space Systems Chief Engineer, Space Transportation Systems Chief Engineer, Space Station Projects Office Manager, Deputy Director for Space Systems, Space Shuttle Main Engine Manager, and NASA Technical Fellow for Propulsion. He received significant recognition throughout his career including the Exceptional Service Award, two Outstanding Leadership Awards, two Presidential Rank Awards, the Distinguished Service Award, and induction into the State of Alabama Engineering Hall of Fame. Mr. Hopson loved his family and friends; enjoyed being a gentleman cattle farmer and gardener; and attentively watched over all of his pets. Mr. Hopson was preceded in death by his parents, beloved wife, and brother. He is survived by his three sons, daughter, brother, and four grandchildren.



*Modified from obits.al.com
Photo from NASA*

Recent CPIAC Products and Publications

JSC CD-70, *45th Combustion / 33rd Airbreathing Propulsion / 33rd Exhaust Plume and Signatures / 27th Propulsion System Hazards Joint Subcommittee Meeting*, December 2012

JSC CD-71, *Classified Papers from the JANNAF 33rd Airbreathing Propulsion / 33rd Exhaust Plume and Signatures Joint Subcommittee Meeting*, December 2012 (U)

JSC CD-72, *9th Modeling and Simulation / 7th Liquid Propulsion / 6th Spacecraft Propulsion Joint Subcommittee Meeting*, May 2013

JPM CD-12, *60th JANNAF Propulsion Meeting*, May 2013

Pat Szybist Leaves CPIAC

CPIAC has said goodbye to **Pat Szybist**, JANNAF Meeting Planner since September 2006. Although Pat truly treasured members of the JANNAF community and her coworkers at CPIAC, she has been expanding her education in recent years by earning a B.A. degree in Communications – Technical Writing and several Meeting Planning certifications. She has been seeking to advance her career and, in August 2013, began employment with Jhpiego, an international, nonprofit health organization affiliated with the Johns Hopkins University. For nearly 40 years, Jhpiego has empowered front-line health workers by designing and implementing effective, low-cost, hands-on solutions to strengthen the delivery of health care services for women and their families. By putting evidence-based health innovations into everyday practice, Jhpiego works to break down barriers to high-quality health care for the world's most vulnerable populations. We will miss Pat and wish her well in her global endeavors.



National Institute for Rocket Propulsion Systems Launches Secure Portal for the Propulsion Community

As part of the national strategy to support the U.S. propulsion industry and the broader propulsion community, the National Institute for Rocket Propulsion Systems (NIRPS) has developed a secure website (portal) for capturing skills, capabilities, lessons learned, needs, and opportunities from the DoD, NASA, contractors, and academia.

NIRPS was announced at the December 2011 JANNAF meeting in Huntsville, Alabama, as a cross-agency advocate for the advancement and preservation of the U.S. rocket propulsion industrial base. To achieve the goals of fostering collaboration within the industry, NIRPS identified a critical need for a secure online environment that will serve as the nexus for communication and cooperation. The plan for the NIRPS secure online portal was presented at the December 2012 JANNAF meeting in Monterey, California, and included a three-phase development approach. The first phase called for the development of a *Skills & Capabilities Tool* allowing government, industry, and academia to provide information on unique capabilities and experience they can offer to potential partners. This database is available now and is currently being populated by points of contact at various organizations. The database can be searched by users to identify where critically needed skills and capabilities exist within the industry, as well as the person to contact to start a potential collaboration.

Over the coming months, the NIRPS Portal will be expanded to offer additional functionality to users. Features include small-team collaboration spaces and community-wide collaboration areas organized around key technologies.

The *Portal* and *Skills & Capabilities Tool* are available now; to gain access to the portal go to the NIRPS website (<https://nirps.msfc.nasa.gov>) and click on “Collaboration Login” to register for an account.

NIRPS
NATIONAL INSTITUTE FOR ROCKET PROPULSION SYSTEMS

Home
Small Team Collaboration
Skills & Capabilities
Search
Manage
Communities of Interest
Help
My Account
Logout

Skills & Capabilities Tool

The NIRPS Skill and Capabilities tool exists to facilitate identifying experts in the field and to foster collaboration. You can either browse by topic or search using a combination of categories and keywords.

Keywords
NASA
Search

Select a Category

- ☐ Chemical Propulsion
 - ☐ Liquid
 - ☐ Solid
 - ☐ Hybrid
 - ☐ Gel
 - ☐ Air Breathing
 - ☐ Cold/Warm Gas
 - ☐ Micropropulsion
- ☐ Non-Chemical Propulsion
 - ☐ Electric
 - ☐ Nuclear
 - ☐ Thermal
 - ☐ Sail
 - ☐ Advanced
- ☐ Common Supporting Technologies
 - ☐ Power
 - ☐ Health Monitoring & Management
 - ☐ Control Systems

Organization	Sub-Organization	Skill/Capability
ATK/Aerospace Group, Propulsion Systems	Science and Engineering, Research and Development	Inert Materials Testing
NASA Glenn Research Center (GRC)	Space Propulsion Branch	Chemical propulsion system design and analysis
Description Complete engineering capability to perform all propulsion engineering functions over the project lifecycle including development, verification, certification, integration and sustaining engineering. Specific tasks include requirements development, tank sizing, thruster selection, pressurization system design, fluid system/isolation scheme design, interface definition, dynamic fluid analysis, pressure drop analysis, fault detection isolation and recovery, hazard analysis, failure modes and effects analysis, reliability, plume analysis, etc.		
Examples Projects/Programs Centaur, Shuttle Centaur, Orion service module propulsion system, AA-1 RCS		
Years of Experience >50 years		
Category: Chemical Propulsion, Liquid, Solid, Hybrid, Gel, Air Breathing, Cold/Warm Gas, Micropropulsion, Health Monitoring & Management, Control Systems Application: In-Space Propulsion Systems Discipline: None POC: David Jacobson David.T.Jacobson@nasa.gov 216-433-3691		
NASA Glenn Research Center (GRC)	Space Propulsion Branch	Chemical propulsion system definition
NASA Glenn Research Center (GRC)	Mission Design and Analysis Branch	Mission analysis, integrated vehicle systems analysis and conceptual space vehicle design
NASA Glenn Research Center (GRC)	NASA Plumbrook Station	Engine level and integrated propulsion stage testing
NASA Glenn Research Center (GRC)	Space Propulsion Branch	Component technology development and test

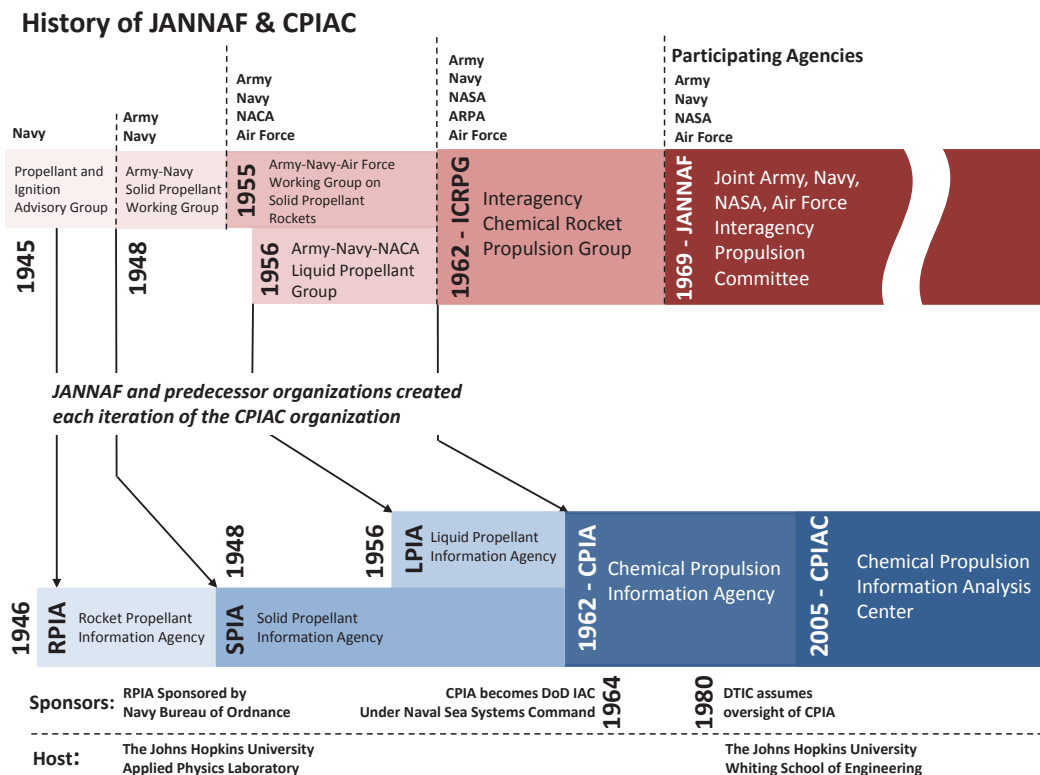
The History of CPIAC and JANNAF

In 1946, the Navy Bureau of Ordnance stressed “the need for a rocket intelligence agency with one main responsibility – that of promoting rapid circulation of technical information to all activities concerned.” On September 11, 1946, the Bureau made \$20,000 available to the Johns Hopkins University Applied Physics Laboratory (JHU/APL) for the establishment of a Rocket Propellant Intelligence Agency (RPIA). The unit was tasked to “abstract reports, store a master copy of each report-issuing activity, organize a filing and cross-indexing system, keep up-to-date a circulation list for distribution to each report-issuing activity, send out accession lists by title, be able to obtain local and foreign reports requested, and provide microfilm service.”

After passage of the Defense Reorganization Act in 1946, the Air Force also became a participant in RPIA by funding this program on rocket research and development. In May of 1948, RPIA became the Solid Propellant Information Agency (SPIA). The Army Office of the Chief of Ordnance endorsed establishment of the SPIA and the Army-Navy Solid Propellant Working Group. This working group was the first formal joint agency information exchange organization and a predecessor to JANNAF.

A large expansion in rocket research and development during the Korean conflict and the ensuing guided missiles era resulted in an unprecedented output of technical literature. Tri-Service programs increased greatly in magnitude and scope. The number of technical and management personnel engaged in solid propellant rocket work, within both government and contractor organizations, increased proportionately at an extremely rapid rate. SPIA was the mechanism for fast exchange of technical information deemed to be of inestimable value to the Department of Defense (DoD) and the solid rocket community.

There was a problem, however. Program planning between the Tri-Services was not efficient. A committee was established in 1955 by the Research and Engineering Advisory Panel on Ordnance to review the DoD solid propellant rocket programs. This committee, led by Dr. William Avery of the JHU/APL, recommended that cooperative exchange of information at the technical management level with service organizations be improved. This recommendation resulted in the formation of a Tri-Service Working Group on Solid Propellant Rockets. The group was comprised of key individuals in the Army, Navy, and Air Force, having primary responsibility for propulsion research and development in their respective services.



(continued on page 16)

History of CPIAC and JANNAF...*continued from page 15*

The situation with respect to the liquid propellant rocket field was somewhat different as information was already being exchanged in several ways. After World War II, the Navy had established an Inter-Bureau Technical Committee on Guided Missiles. The Propulsion Panel of the committee was responsible for interchange of information on Navy efforts on liquid rockets. The Air Force and Navy, having a collateral interest in petroleum derivable fuels for liquid rockets, initiated a joint working group to exchange information. This group began functioning in the late 1940s and eventually expanded its field of interest to include other liquids. During this period, the DoD Defense Research and Engineering Advisory Panel on Liquid Propellants was also effectively coordinating program planning and fostering the exchange of information in this field.

In 1956, an ad hoc group, chaired by Dr. Abe Silverstein of the National Advisory Committee for Aeronautics (NACA) Lewis Laboratory, was established by the Research and Engineering Advisory Panel on Aeronautics to review the DoD liquid propellant rocket programs. This committee noted the success and effectiveness of the SPIA operation and recommended that a similar information agency be initiated to handle the rapidly increasing quantity of technical matter in this field. As a result, the Liquid Propellant Information Agency (LPIA) was started at the JHU/APL, also under contract with the Navy Bureau of Ordnance. A Tri-Service Steering Committee (Army-Navy-NACA) was formed to foster exchange of information in the liquid rocket field and to monitor the LPIA operations. In 1959, the Advanced Research Projects Agency (ARPA) appointed representatives from its extensive research program on propellant chemistry to the Tri-Service Working Groups.

Finally, in 1961, individuals directly involved in information exchange activities in the solid and liquid and related propulsion fields agreed that there was a necessity and desirability for official recognition. They believed that reorganization of the information groups would improve the effectiveness of information exchange activities. The charter was drafted, then authenticated by the five agencies – Army, Navy, Air Force, ARPA, NASA – and approved by DoD and NASA. With this action, the Interagency Chemical Rocket Propulsion Group (ICRPG), predecessor of the current JANNAF Interagency Propulsion Committee, was formally activated on November 28, 1962. One of the first actions of the ICRPG was to consolidate the propellant information centers (SPIA and LPIA) into the Chemical Propulsion Information Agency (CPIA).

As stipulated in its charter, the ICRPG consisted of a Steering Group, a Solid Propulsion Subgroup, a Liquid Propulsion Subgroup, and such Working Groups as required

to achieve the purpose of the ICRPG. The Steering Group was the governing body of the ICRPG composed of one member from each participating agency. Working Groups, for which each Subgroup was responsible, consisted of not more than two members from each agency. Working groups were directly responsible to promote the exchange of technical information in specialized areas of solid, liquid, and related rocket propulsion where technical problems existed or standardized procedures were lacking.

In 1964, CPIA became a DoD Information Analysis Center, still operated by the JHU/APL, but now under contract with the Naval Sea Systems Command.

In 1965, with cancellation of the energetic propellant synthesis program, Project Principia, ARPA withdrew its support. The name of the ICRPG was changed to the Joint Army-Navy-NASA-Air Force (JANNAF) Interagency Propulsion Committee (IPC) in November 1969. While the JANNAF IPC already included information exchange on airbreathing propulsion systems for missile applications, it was accorded formal recognition by the formation of the Airbreathing Propulsion Working Group in 1972. In 1973, the JANNAF scope was expanded to include gun propulsion and electric propulsion was subsequently added. The JANNAF working groups comprised the Chemical Propulsion Advisory Committee (CPAC) from March 1977 until October 1977, when CPAC was abolished as part of a drive to reduce the number of Federal Advisory Committees. The working groups were disestablished, subcommittees were formed, and nongovernmental participation was invited to strengthen information exchange activities.

Today – *Not much has changed!* The JANNAF IPC continues to be the defining and unifying force behind rocket propulsion developments in the United States. It remains to promote and facilitate the exchange of technical information; establish standards; effect coordination of research, exploratory development, and advanced development programs in the areas of missile, gun, and space propulsion; and accomplish problem solving in areas of joint interest. Objectives continue to be accomplished through the activities of an Executive Committee, individual subcommittees, and ad hoc committees.

Although CPIA is now the Chemical Propulsion Information Analysis Center (CPIAC), it is still operated by the Johns Hopkins University (it transitioned from the Applied Physics Laboratory to the Whiting School of Engineering in August 1990). CPIAC continues to provide technical and administrative support to the JANNAF IPC and remains the U.S. national resource for worldwide information, data, and analysis on chemical, electrical, and nuclear propulsion for missile, space, and gun propulsion systems.

In Memoriam

Retired rocket engineer **Don Ross**, 96, passed away on May 3, 2013, in Lancaster, CA. Born in Portland, OR, he earned a bachelor of science degree in mechanical engineering from the University of Washington (1939), and took graduate courses at Ohio State University and the University of California, Los Angeles. Ross served in the Army Air Corps for four years during World War II. He also served two years in the Air Force during the Korean War, attaining the rank of lieutenant colonel.

In 1939, Ross began employment at Wright Field in Dayton, OH. He worked there for 20 years, researching and developing aircraft and rocket engines. Ross transferred to Edwards Air Force Base in 1959, where he concentrated on solid- and liquid-propellant rocket engines, in a group that helped in the goal to put an American on the moon. Ross retired as deputy director of Edwards' Rocket Propulsion Laboratory in 1971, after receiving honors that included Decorations for Exceptional Performance of Duty from 1961 to 1962 and 1966 to 1969. He worked as a consulting engineer to the rocket industry until 1981.

Ross coauthored the textbook, *Rocket Propulsion Elements*, and authored "Flight Propulsion Fundamentals" in the *Encyclopedia of Physics* and the *Energy Technology Handbook's* "Propellants" chapter. He served on the Antelope Valley College board for 32 years, was a Boy Scout leader for 20 years, and participated in many other community organizations. He also enjoyed restoring antique automobiles and participating in auto shows and parades.

Ross is survived by his children, grandchildren, and great-grandchildren. His wife, Irene, whom he married in 1939, passed away in September 2012, at the age of 96, after more than 72 years of marriage.

*Modified from the Antelope Valley Press
Photo not available*

In Memoriam



Billy J. Walker, 71, of Madison, Alabama, passed away November 9, 2012. Born in Jay, Oklahoma, he obtained his degrees in mechanical engineering from the University of Oklahoma (B.S. 1963, M.S. 1964, Ph.D. 1967). Walker retired from the U.S. Army Aviation and Missile Research, Development and Engineering Command (AMRDEC) as a Senior Research Scientist for Computational Fluid Dynamics. Throughout his 43-year career of government service, he studied the development of computational fluid dynamics (CFD) to advance the state of the art in aero-propulsion problems for missiles. Specifically, he applied CFD to rocket exhaust plume phenomenology, aero-optics phenomenology, and hypersonic air breathing propulsion.

In 1968, Walker became the first Army member of what became the JANNAF Rocket Exhaust Plume Technology Subcommittee. Holding the position for many years, he served several terms as chairman of this subcommittee (now known as Exhaust Plume Technology and Signatures). During this time, he initiated an effort to develop an industry-standard rocket exhaust plume flowfield code (named SPF) that was used with the Standardized Infrared Radiation Model (SIRRM) to predict signatures.

Starting in 1978, he was deeply involved in the development of a third-generation rocket exhaust plume model known as the Standardized Plume Flowfield (SPF-III). This code is still in use by all U.S. government and industry research and development organizations and was later combined with an Air Force aircraft infrared target simulation to become the Spectral Infrared Imaging of Targets and Scenes (SPIRITS).

Additionally, Walker was active in the development of other advanced technologies, including chemical lasers, aero-optic windows and cavities, boost phase detection, window cooling technologies, and nonintrusive flowfield measurement techniques. These measurement techniques include first-ever use of Laser Doppler Velocimeter (LDV) and Raman spectroscopy for very high speed chemically reactive missile base/exhaust flows. He also displayed great foresight in leading the Army/MDA to construct and implement the world's largest and most powerful shock tunnel that reproduced true missile flight environments. Over the last ten years of his career, Walker led the research and development associated with hypersonic air breathing propulsion for the U.S. Army, an effort that served as a primary element of the National Aerospace Initiative (NAI).

Modified from Kevin Kennedy and Laughlin Service

JANNAF Executive Committee

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Naval Air Warfare Center Weapons Division/China Lake

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U.S. Army Research Laboratory/Aberdeen Proving Ground

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U.S. Army AMRDEC/Redstone Arsenal

NAVY

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Naval Air Warfare Center Weapons Division/China Lake

Mr. Robert E. Kaczmarek

Naval Surface Warfare Center Indian Head Explosive
Ordnance Disposal Technology Division

NASA

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NASA Marshall Space Flight Center/Huntsville

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NASA Glenn Research Center/Cleveland

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ODDR&E/OUUSD(AT&L)/Washington, DC

Mr. Garry M. Lyles

NASA Headquarters/Washington, DC



JANNAF Subcommittee Chairmen and CPIAC Representatives

Subcommittee/Chair	Deputy Chair	CPIAC Representative
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AIRBREATHING PROPULSION (APS)

Mr. Lawrence D. “Larry” Huebner NASA Marshall Space Flight Center	Dr. James W. Weber Air Force Research Laboratory/WPAFB	Mr. Ronald Bates
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COMBUSTION (CS)

Dr. Michael J. Nusca U.S. Army Research Laboratory	Dr. Christine M. Michienzi OUSD(AT&L)/LW&M	Mr. Ronald Bates
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EXHAUST PLUME and SIGNATURES (EPSS)

Dr. Marty J. Venner Air Force Research Laboratory/EAFFB	Ms. Robin L. Miller Naval Air Warfare Center Weapons Div.	Mr. Nicholas Keim
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LIQUID PROPULSION (LPS)

Mr. James L. Cannon (Co-Chair) NASA Marshall Space Flight Center	Dr. Richard K. Cohn (Co-Chair) Air Force Research Laboratory/EAFFB	Mr. Peter Zeender
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MODELING and SIMULATION (MSS)

Mr. Eric J. Paulson Air Force Research Laboratory/EAFFB	Mr. Joseph C. Boyle Naval Air Warfare Center Weapons Div.	Mr. Nicholas Keim
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PROPELLANT and EXPLOSIVES DEVELOPMENT and CHARACTERIZATION (PEDCS)

Dr. James Carver U.S. Army AMRDEC	TBD	Mr. David Owen
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PROPULSION SYSTEMS HAZARDS (PSHS)

Mr. Daniel F. Schwartz Air Force Research Laboratory/EAFFB	Mr. Kevin P. Ford Naval Air Warfare Center Weapons Div.	Mr. Andrew Taylor
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ROCKET NOZZLE TECHNOLOGY (RNTS)

Mr. Rob Esslinger U.S. Army AMRDEC	Mr. Louie Clayton NASA Marshall Space Flight Center	Mr. David Owen
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SAFETY and ENVIRONMENTAL PROTECTION (SEPS)

Dr. Mark S. Johnson Army Public Health Command/APG	Dr. David R. Mattie Air Force Research Laboratory/WPAFB	Mr. Andrew Taylor
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SPACECRAFT PROPULSION (SPS)

Mr. Daniel L. Brown Air Force Research Laboratory/EAFFB	Mr. David J. Anderson NASA Glenn Research Center	Mr. David Owen
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STRUCTURES and MECHANICAL BEHAVIOR (SMBS)

Mr. Robert W. Pritchard Naval Air Warfare Center Weapons Div.	Dr. Timothy C. Miller Air Force Research Laboratory/EAFFB	Mr. David Owen
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Calendar of JANNAF Meetings

61st JPM / 42nd SMBS / 38th PEDCS / 29th RNTS / 27th SEPS: May 19–22, 2014

Charleston Convention Center, Charleston, SC

Deadlines:

Feb 3	Deadline to submit JPM abstracts
Mar 10	Deadline for award nominations
Mar 24	Deadline to submit student paper award nominations
Apr 21	Deadline for changes to final program
Apr 21	Papers and paper clearance forms due to CPIAC
Apr 25	Deadline for hotel reservations at Embassy Suites North Charleston
May 5	Registration forms due. Deadline for discounted registration fee of \$850; after May 5, the fee is \$975.

For additional information and registration, please visit:

<https://www2.cpiac.jhu.edu/meetings/May2014/pages/index.html>.

46th CS / 34th APS / 34th EPSS / 28th PSHS: December 2014

Location TBD

For additional information on the above JANNAF meetings, contact CPIAC at 410-992-7300 and ask for Shelley Cohen.

Visit the JANNAF website for meeting updates: www.jannaf.org

Policy on Non-Government Attendees at JANNAF Meetings: Attendance is restricted to invited U.S. citizens. Non-government attendees must have their employment confirmed with an organization certified with the Defense Logistics Agency (DLA) to obtain export-controlled technical data AND be certified by a sponsoring government official from one of the participating JANNAF agencies. 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. Information concerning registrations with DLA can be obtained by contacting DLA at (800) 352-3572 (www.dlis.dla.mil/jcp/). Questions concerning attendance eligibility should be directed to the CPIAC Facility Security Officer, Mary Gannaway, at (410) 992-7304, ext. 211.