

## DRAFT AGENDA

### JANNAF Technical Information Meetings

17 – 20 Sep 2018

BRICC, Arlington, VA

Classification Level: Unclassified, Distribution C (government and government contractors)

#### Topic 1 – Investigating the Relationship between Mechanical and Reactive Behavior in Energetic Materials

Purpose: The objective of this panel task is to foster communication and collaborations within the JANNAF community to better understand the coupling between mechanical insult to and chemical reactions in energetic materials.

#### Organizers:

- Joel Stewart and Joshua Felts (JANNAF PSHS Shock/Impact-Induced Reactions panel chairs)
- Barrie Homan and Eric Welle (JANNAF CS Explosive Performance / Enhanced Blast panel chairs)
- Martin Schmidt (AFOSR Program Officer for Dynamic Materials and Interactions)

#### Mon, 17 Sep 2018

0815 Opening Remarks

0830 Morning Session 1

- James Anderson/Barrie Homan (Army, ARL): Overview of ARL's EMBURE efforts
- H.S. Udaykumar (University of Iowa): "Meso-Informed Ignition and Growth Model for Multiscale Shock-to-Detonation Simulations in Heterogeneous Explosives"
- Pradeep Guduru (Brown University): Temperature measurement experimental development
- Al Nichols (LLNL): Overview of ALE3D's chemistry module

1030 Break

1045 Morning Session 2

- Steven Son (Purdue University): Overview of Purdue efforts
- Patrick Bowden (LANL): "Stand-Off Detonator Fragment Initiation of HE and Modeling Flyer and HE Response"
- Michael Bonanno (Navy, Indian Head): "Review of Small-Scale Compression and Impact Testing of Gun Propellants"

1215 Lunch

1345 Afternoon Session 1

- Paul Peterson (LANL): Overview of LANL explosive hazards
- Kyle Ramos (LANL): "Mesoscale Mechanics of Energetic Materials: A Coordinated Experiment-Theory Effort Using New In Situ Probes"
- Chris Meredith (Army, ARL): "Overview of the First SHPB Experiments on Single Crystal Explosives"

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1515 Break

1545 Afternoon Session 2

- Manny Gonzales (Air Force, AFRL): Effects of microstructure on shock propagation in reactive powder mixtures
- Afternoon Talk 5

1645 Adjourn

### **Tue, 18 Sep 2018**

0815 Discussion/Brainstorming

1. Based on the previous talks and discussion, what are the main challenges associated with predicting the response in sub-detonative events?
2. Are currently available high explosive violent reaction (HEVR) models adequate to predict system-level response of sub-detonative events? Do we have the experimental data necessary to answer the question?
3. What can be done to make the HEVR models more practically useful for system-level analyses? Can computations at lower length scales (e.g., meso-scale modeling) be used to estimate at least a subset of the dozens of parameters typically required in HEVR models? Do we have the experimental data necessary to parameterize and validate these lower length scale models (e.g., constituent strength and failure data)?
4. What can JANNAF's Shock/Impact Induced Reactions panel do to assist (e.g., documenting this meeting's findings in a report, organizing technical sessions at a future JANNAF subcommittee meeting, hosting follow-on informational meetings, etc.)?

1200 Adjourn/Lunch

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### Topic 2 – Experimental and Computational Investigations in Polymer Behavior

Purpose: Discuss polymer research being undertaken at the DOE and DoD laboratories and its relevance to both the coupling between mechanical and chemical behavior in energetic materials as well as gap testing.

Organizers:

- Jennifer Jordan (LANL Group Leader for Shock and Detonation Physics)
- Joel Stewart and Joshua Felts (JANNAF PSHS Shock/Impact-Induced Reactions panel chairs)
- Martin Schmidt (AFOSR Program Officer for Dynamic Materials and Interactions)

#### Tue, 18 Sep 2018

1315 Opening Remarks

1330 Afternoon Session 1

- Dana Dattelbaum (LANL): “Dynamic Properties and Strength of Polyethylene”
- Dan Casem (Army, ARL): High-rate PMMA data
- Michael Murphy (LANL): PMMA shock response

1500 Break

1515 Afternoon Session 2

- Josh Coe (LANL): “EOS/Hydrodynamic Modeling of Polymers under Performance Conditions”
- Afternoon Talk 5
- Afternoon Talk 6

1645 Adjourn

#### Wed, 19 Sep 2018

0815 Discussion/Brainstorming

1. Based on the previous talks and discussion, what are the main challenges associated with understanding and accurately predicting polymer behavior?
2. Are we able to accurately model the behavior of typical polymers used in polymer bonded explosives (e.g., for use in meso-scale calculations)?
3. Are we able to accurately model the behavior of PMMA (including the viscoelastic response, release, and failure) for use in gap test calculations?
4. What can the community do to overcome the remaining challenges?

1200 Lunch

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### Topic 3 – Investigation of Gap Test Modeling and Instrumentation

Purpose: The objective of this panel task is to facilitate collaboration across the JANNAF community investigating shortcomings in gap test modeling. These investigations include the assessment of material models used to describe the behavior of the components in the various gap tests and the review of different diagnostic techniques that can provide data for use in model parameterization and validation.

Organizers:

- Joel Stewart and Joshua Felts (JANNAF PSHS Shock/Impact-Induced Reactions panel chairs)
- Martin Schmidt (AFOSR Program Officer for Dynamic Materials and Interactions)

#### Wed, 19 Sep 2018

1315 Opening Remarks

1330 Afternoon Session 1 (Unlimited/Distribution A)

- Douglas Kooker (Army, ARL): “Inherent Problems with Gap Tests”
- Chris Braithwaite (UK) / Eric Welle (Air Force, AFRL): Gap testing in water
- Gerrit Sutherland (Army, ARL): “Recent Pentolite 1.56 g/cc CYLEX Test Results”
- Elizabeth Francois (LANL): “Shock Sensitivity Tailoring of IM Formulations using the IHE Gap Test”

1530 Break

1545 Afternoon Session 2 (Unlimited/Distribution A)

- Larry Hill (LANL): “Gap test and Gapstick: Data and Data Analysis”
- Carl Johnson (LANL): “Reactive Burn Model Validation for HE Safety Applications”

1645 Adjourn

#### Thurs, 20 Sep 2018

0815 Morning Session 1

- Josephine Covino (OSD, OUSD ATL): Hazard classification and TB 700-2
- Devlin Hayduke (Materials Sciences, Inc.): “Modified Gap Testing to Evaluate Composite Materials for Shock Attenuation”
- Michaela Fasano (Navy, Indian Head): “Simple Explosive Plane Wave Booster Designs for 1-D Shock Experiments”
- David Littlefield (University of Alabama Birmingham): SwRI PMMA Model Implementation Efforts into DOE codes

1015 Break

1030 Morning Session 2

- Morning Talk 5
- Morning Talk 6

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- Morning Talk 7

1200 Lunch

1315 Discussion/Brainstorming

1. Based on the previous talks and discussion, what are the main challenges on which the gap test community needs to focus?
2. Do the standard materials (e.g., pentolite donor and PMMA attenuator) need to be modified? Is the behavior of the PMMA repeatable and can it be modeled with sufficient accuracy?
3. Do additional diagnostics need to be incorporated to improve the utility of the gap tests and obtain more useful data (with appropriate considerations for cost and complexity)? Can we get experimental information on reaction initiation, detonation wave build-up (or reaction quenching), and location of detonation breakout? Can we determine a standardized setup for an instrumented gap test configuration?
4. Do issues such as secondary waves in the various gap test configurations and radial ringing due to reflections off high-impedance confinement need to be investigated more fully (e.g., advanced diagnostics and/or detailed numerical study)?
5. What can JANNAF's Shock/Impact Induced Reactions panel do to assist (e.g., documenting this meeting's findings in a report, organizing technical sessions at a future JANNAF subcommittee meeting, hosting follow-on informational meetings, etc.)?

1645 Adjourn