Abstract Submittal Form

Abstract Due Date: Monday, 11 July 2016

Fields with an asterisk (*) are required.

**Title:** Assessing Spontaneous Combustion Instability with Recurrence Quantification Analysis

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IF MORE THAN 4 AUTHORS, PLACE THEIR COMPLETE CONTACT INFORMATION (as requested below) ON P.2 AFTER ABSTRACT TEXT.

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☐ Author(s) has confirmed management support (i.e., required resources) is available to prepare, submit, and present this paper at the above subject JANNAF Meeting.  

The presenting author for this paper will be Chad J. Eberhart. ERG must be notified of any change to the presenting author immediately. Presenter must be a U.S. Citizen; attendance at this meeting is restricted to U.S. Citizens.
Spontaneous instabilities can pose a significant challenge to verification of combustion stability, and characterizing its onset is an important avenue of improvement for stability assessments of liquid propellant rocket engines. Recurrence Quantification Analysis (RQA) is used here to explore nonlinear combustion dynamics that might give insight into instability. Multiple types of patterns representative of different dynamical states are identified within fluctuating chamber pressure data, and markers for impending instability are found. A class of metrics which describe these patterns is also calculated. RQA metrics are compared with and interpreted against another metric from nonlinear time series analysis, the Hurst exponent, to help better distinguish between stable and unstable operation.