1145-65-2037 **Sean Ryan Breckling*** (sbreckli@nd.edu), IN, and **Daniele Schiavazzi** (dschiavazzi@nd.edu) and **Thomas Juliano** (tjuliano@nd.edu). *Unified Bayesian Networks for Uncertain Inputs and Partial Model Ensembles.*

We present a prototype system for probabilistic assessment of thermo-structural failure in hypersonic vehicles, based on a unified Bayesian network. A probabilistic characterization of failure in such systems presents significant challenges due to the complex dependence among a large number of uncertain parameters, the availability of an ensemble of models each describing a particular aspect of the underlying physics, and the presence of multiple mission-critical components like thermal protection system (TPS) and control surfaces. We start by considering an idealized model of the Space Shuttle orbiter, where parameters are assigned to the vehicle geometry, the flight trajectory, and TPS material properties. We use a simplified method to compute the heat flux and pressure load histories on the TPS surface and a two-dimensional plane strain characterization of its structural response. Failure is assessed based on thermal stress and maximum temperature in operation. Using a Bayesian network with discrete random variables, we perform inference using brute-force approaches and message passing. We also investigate how the results are affected by observations from pressure and temperature sensors. (Received September 24, 2018)