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A Viscoelastic Fracture Model for Simulation of Solid Propellant Impacts ERIK R. MATHESON, Lockheed Martin Corporation — A viscoelastic kinetics (VEK) model for deformation and damage in solid rocket propellant has been previously developed and correlated to an extensive set of experiments to determine mechanical properties. Ultimately, VEK will be extended to perform coupled damage and reaction modeling of XDT during propellant impacts. There are two types of damage considered in VEK: 1) decohesion at particle/binder interfaces, and 2) scission of the binder. The first type of damage leads to formation of essentially spherical voids around the decohered particles, and development of a model for the surface area that supports combustion is rather straightforward. The second type of damage leads to formation of propellant rubble, and the fineness depends on the impact stresses. Thus, a kinetic fracture model describing surface area generation due to scission damage has been added to the VEK model. To obtain data on the surface area generated, 25 mm L/D=1 propellant samples were fired into steel target plates at various velocities, and the resultant fragments were collected and burned in a combustion bomb. The total surface area generated was then estimated for each impacted sample. The upgraded VEK model is used to simulate the 25 mm impact experiments and is correlated to the combustion bomb data.

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