

EXPLORER 46 METEOROID BUMPER EXPERIMENT:  
EARTH ORBITAL DEBRIS INTERPRETATION

D. J. Kessler,  
NASA, Johnson Space Center  
Houston, Texas  
U.S.A.

ABSTRACT.

The Meteoroid Bumper Experiment on Explorer 46 (launched 1972) was placed in Earth orbit to evaluate the effectiveness of using double-wall structures against meteoroids. This paper re-examines the data from this experiment. Certain sets of sensors were found to be penetrated much more frequently than other sets. The most plausible explanation is that nearly all of the penetrations were from an Earth orbiting population of particulates. In addition, because a large percentage of the penetrations occurred soon after solid rocket motors were fired in space, the particulates are most likely 75  $\mu\text{m}$  diameter aluminum oxide. Aluminum oxide particulates are a major exhaust product from solid rocket motors. The size of particulates from most current solid rocket motors is found to range between 0.1  $\mu\text{m}$  to 20  $\mu\text{m}$ . Modeling the orbits of particulates from these rockets predicts that measurements in Earth orbit of interplanetary dust in this size range are also likely to include Earth orbiting particulates from solid rocket motors.