REDUCING THE METEOROID RISK TO SPACECRAFT: THE NEED FOR NEW RADAR METEOR OBSERVATIONS.

Cooke, W.J.[1], Suggs, R.M.[2]
[1]UNITeS Contract, Space Environments Team, Marshall Space Flight Center
[2]Space Environments Team, Marshall Space Flight Center

Abstract Submission Form

2004 National Radio Science Meeting

Abstract: cooke1457

Date Received: September 16, 2004

The recent loss of the orbiter Columbia and its crew, while not caused by a meteoroid strike, has resulted in re-evaluations of the current meteoroid models used by NASA and other agencies. The most prevalent of these, that published by Grun et al. in 1985, assumes an isotropic meteoroid background in which all meteors travel at speeds of 20 km s-1, and is clearly oversimplified. The standard Divine NASA interplanetary model, currently called METEM, is a set of empirical fits to data using distributions that have little or no resemblance to reality; consequently, the models environment directionality and velocity distributions are in error. The recommendation of the Columbia Accident Investigation Boards (CAIB) report that meteoroid risk to Space Shuttle missions be evaluated in a manner similar to that used for the International Space Station, combined with the insistence that these environment assessments be accompanied by confidence levels or uncertainties, is a driving force behind the development of new, physics-based meteoroid environment models for near-Earth space and elsewhere.

Such models, of course, must be calibrated. In-situ measurements by spacecraft would be ideal, as they can sample throughout the Solar System. However, the small collecting area of current detectors renders them useless for detecting particles with sizes capable of causing spacecraft damage, which is greater than 100 microns. Fortunately, ground-based sensors, such as radar, can, at least in principle, measure the fluxes of particles in the threat regime, thereby providing the necessary calibration points. This paper will discuss the role classical meteor radars and High Power Large Aperture (HPLA) systems can play in helping to mitigate the meteoroid threat to spacecraft and highlight specific areas, such as velocity measurements, where such data are urgently needed.

1. (a)
William Cooke
Space Environments Team/UNIT
ED44
Engineering Directorate
Marshall Space Flight Center
Huntsville, AL
35812 USA
bill.cooke@msfc.nasa.gov
   (b) 256 544-9136
   (c) 256 544-0242
2. G - Ionospheric Radio and Propagation
3. (a) Meteor Physics
4. I - Invited Paper, Program chair: Dr. Diego Janches
5. No special instructions