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Author: Dr. James Burke
The Planetary Society, United States

Mr. George Dyke
International Space University (ISU), Australia

ARCHITECTURE FOR IMPACT PROTECTION OF A MOON VILLAGE

Abstract

ESA and collaborating agencies are proceeding with serious work toward establishing a Moon Village near the south lunar pole. In this paper we discuss architectural concepts for dealing with the hazard of meteoric impacts on protective shielding over village structures. An estimate of hazard statistics can be derived from the record of new impact craters observed during seven years of operation by the Lunar Reconnaissance Orbiter. A minimum class of shielding can be estimated from the knowledge that at least a meter of protection is required anyway due to the cosmic and solar radiation hazard. For any given degree of shielding robustness, one can imagine five classes of impact damage: (1) small enough to be ignored, (2) able to be repaired without loss of structural integrity, (3) demanding emergency action to prevent loss of habitat atmosphere, (4) severely damaging roof so as to demand inhabitant retreat into pressure shelter followed by EVA repair if possible, (5) obliteration of the village and its inhabitants. The only way to deal with (5) and perhaps the best way to deal with (4) are by deflecting the oncoming hazardous object, as now proposed for the terrestrial impact hazard. Among the tradeoffs to be considered by village architects and engineers is whether to build one large dome over the village or to shield individual structures comprising it. A distinction may need to be addressed between large areas for agriculture and smaller ones for living and working. In any event the known impact risk offers an interesting and important challenge for Moon Village designers and builders.