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Demonstration of Survivable Space Penetrator P. CHURCH, W. HUNTINGTON-THRESHER, N. PENNY, A. BRUCE, Qiniteq, UK, A. SMITH, R. GOWAN, Mullard Space Science Laboratory, UK — This work was performed in support of MoonLITE which is a proposed UK space mission to the moon. The basic premise is to deploy 4 instrumented penetrators, one each on the near-side, far-side and at the poles of the moon, with an impact velocity of approximately 300m/s. The primary science aims are to set up a passive seismometer network, investigate the presence of water and volatiles and determine thermal gradients in the lunar soil (i.e. regolith). A key requirement is that the penetrator shell survives the impact together with the instrument payload and supporting subsystems. The material chosen for the penetrator shell was 7075 aluminum alloy, which is a good compromise between high compressive strength and low mass. The baseline penetrator design was evaluated and refined using the DYNA3D hydrocode to determine the survivability of the penetrator in sand at an impact velocity of 300m/s and an attack angle of 8 degrees. The simulations predicted that the penetrator design would survive this severe impact condition which was confirmed by experiments on the Pendine rocket test track.

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