

## IAASS - Abstract Draft

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**Paper Title:** Calculating and Mitigating the Risk of a Cut Glove to a Spacewalking Astronaut

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**Abstract:** One of the high risk operations on the International Space Station (ISS) is conducting a space walk, or an Extra Vehicular Activity (EVA). Threats to the spacewalking crew include airlock failures, space suit failures, and strikes from micro-meteoroids and orbital debris (MM/OD). There are risks of becoming untethered from the space station, being pinched between the robotic arm and a piece of equipment, tearing your suit on a sharp edge, and other human errors that can be catastrophic. For decades NASA identified and tried to control sharp edges on external structure and equipment by design; however a new and unexpected source of sharp edges has since become apparent.

Until recently, one of the underappreciated environmental risks was damage to EVA gloves during a spacewalk. The ISS has some elements which have been flying in the environment of space for over 14 years. It has and continues to be bombarded with MM/OD strikes that have created small, sharp craters all over the structure, including the dedicated EVA handrails and surrounding structure. These craters are capable of cutting through several layers of the EVA gloves. Starting in 2006, five EVA crewmembers reported cuts in their gloves so large they rendered the gloves unusable and in some cases cut the spacewalk short for the safety of the crew. This new hazard took engineers and managers by surprise.

NASA has set out to mitigate this risk to safety and operations by redesigning the spacesuit gloves to be more resilient and designing a clamp to isolate MM/OD strikes on handrails, and is considering the necessity of an additional tool to repair strikes on non-handrail surfaces (such as a file). This paper will address how the ISS Risk Team quantified an estimate of the MM/OD damage to the ISS, and the resulting likelihood of sustaining a cut glove in order to measure the effectiveness of the solutions being investigated to mitigate this risk to the mission and crew.