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Modelling and Risk Analysis (2)

Author: Dr. Carsten Wiedemann
Technische Universität Braunschweig, Germany, c.wiedemann@tu-braunschweig.de

Mr. Eduard Gamper
Technische Universität Braunschweig, Germany, e.gamper@tu-braunschweig.de

Mr. Andre Horstmann
TU Braunschweig, Germany, andre.horstmann@tu-braunschweig.de

Mr. Vitali Braun
ESOC - European Space Agency, Germany, vitali.braun@esa.int

Prof. Enrico Stoll
TU Braunschweig, Germany, e.stoll@tu-braunschweig.de

RELEASE OF LIQUID METAL DROPLETS FROM COSMOS 1818 AND 1867

Abstract

Sodium-potassium droplets released from orbital nuclear reactors are an important contribution to the space debris environment in the centimeter range. This liquid metal release has been perceived and described as uncontrolled side effect of the end-of-life procedure of a specific type of reactors. There have been several historical events of this kind some decades ago. However, two events have occurred in the recent past that do not fit into this explanation scheme. The events relate to a different type of reactor. This reactor of the type TOPAZ was not designed for an operational release of liquid metal according to current knowledge. The release events occurred decades after the shutdown of the reactors. These two new coolant releases differ significantly from the historical events. The new events seem to be leakages. The cause of the leakage is unknown. It is speculated here that a burst of cooling pipes has led to the release of coolant. These two events have released a small number of droplets. In this work, a model will be developed to describe the droplet release. The events are modelled with the objective of an implementation into the new version of the space debris model MASTER. The description includes the number distribution of the droplet size and its release velocity. The focus of the investigation will be on the size distribution. The number of leaked droplets is relatively low. Their diameter is, however, large enough to track the objects. An attempt is made to find an explanation for this phenomenon. The events are modeled as a leakage of coolant originated from a pipe with larger diameter. The reasons for this assumption will be explained. The contribution of the droplets to the existing debris population is analyzed.