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For a successful space program : Quality and Safety! (1)

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## ANALYSIS ON SMALL SATELLITE PRODUCT ASSURANCE AND ON-ORBIT FAILURES

**Abstract**

Product safety has a major impact on the success of a space mission and on the financial side of the project. With a higher PA level, the financial amount to be invested also increases. It is difficult for industry and government institutions to decide which level of PA to use for their space program. However, to ensure the quality and safety of the overall mission, an appropriate level of PA must be used. Small space programs have tighter funding constraints, which limits the amount of PA that can be used compared to large space programs. Nonetheless, orbital failures occur in both cases where the initial risk was not identified and mitigated through the PA process. Since statistical data on the tailored PA level is not available for the small satellite segment, an interpolation between CubeSats and large space programs must be performed. Here, CubeSats have a minimum PA level and large space programs have the full range of PA. To obtain the analysis, the number of satellite failures must be compared to the size of the space program or the mass class of satellites. In this way, it can be determined how many failures can be attributed to the level of PA. Combine this with an understanding of the failures gives a clear view on important PA areas.

This study presents an analysis of small satellite product assurance and on-orbit failures. The ratio of satellite failures (payload and/or platform related) versus their space program or weight class is analyzed. In addition, an initial comparison of failure types with on-orbit failures is made. From this and any information about the failure caused, it is possible to trace back whether a high-level PA could have prevented the satellite failure. In addition, an outlook is given on how this data can help and support the space community.