Pre-Qualification of a Mathematical Library for Flight Software

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Mathematical libraries are used in nearly any Flight Software and in particular in the AOCS/GNC and scientific algorithms. The common practice to manage the mathematical functions in a flight software project is to isolate well known and established functions from libraries like libm from newlib, and to characterise these functions with respect to input ranges, errors and performance. This common practice doesn't typically cover corner cases where some of these functions might reveal an unexpected behaviour in term of accuracy or timing. Further, most of the projects happen to re-qualify the mathematical library for each new project again. The objective of this activity is the development a mathematical library for flight software, reusing libm present in newlib and pre-qualifying the library to ECSS criticality category B. For this purpose a test suite is developed, enabling future users of this library to qualify it on their environment. Full set of ECSS documentation will be provided too, allowing the delta-qualification of the mathematical library in space projects with minimized effort. The presentation will address the library to be reused and pre-qualified, the process applied and the challenges encountered when code from the 80's is qualified to today's software standards.