

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)

Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Ms. Antonia Grethen-Bußmann
Luleå University of Technology, Sweden

Mrs. Malin Thuswaldner
RUAG Space AB, Sweden

Mr. Leif Håkansson
RUAG Space AB, Sweden

Prof. Rene Laufer
Luleå University of Technology, Sweden

COMPARATIVE STUDY OF NON-LINEAR ANALYSIS TOOLS FOR RELEASE SIMULATIONS OF
CLAMPBAND-JOINT SEPARATION SYSTEMS

Abstract

Reliable payload separation systems are of fundamental importance in any satellite mission. Due to the unique requirements of satellite missions, separation adapters must be modified for every novel spacecraft. Efficient and reliable analysis is needed to minimize the demand for qualification testing. The goal of this paper is to compare different modelling tools in order to develop a verified analysis approach to simulate spacecraft release using separation systems. This will be achieved by validating the analysis results using data of a high speed imaging test.

A release system by RUAG Space AB is used as a representation of a separation system, incorporating a clamp band based connection and a Clamp Band Opening Device (CBOD) as a release actuator. The two commonly used programs MSC Nastran and Abaqus will be investigated as non-linear Finite Element analysis methods. To evaluate the performance of the programs, simulation time and the result deviations compared to the test results are being taken into account as parameters. Additionally the use of an analytical model implementing a spring-damper approach will be investigated in order to overall justify the use of a finite element analysis. The key challenges are the required considerations of non-linearity while maintaining computational efficiency and effectiveness.

The paper will provide recommendations on numerical analysis for release simulations of clamp band based separation adapters.