

NEW ROBUST DESIGN GUIDELINE FOR IMPERFECTION SENSITIVE COMPOSITE LAUNCHER STRUCTURES

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The Space industry demand for lighter and cheaper launcher transport systems. The upcoming EU project DESICOS (New Robust DESIgn Guideline for Imperfection Sensitive COMposite Launcher Structures), which will start in 2012, contributes to these aims by a new design procedure for imperfection sensitive composite launcher structures, exploiting the worst imperfection approach efficiently by implementation of the *Single Perturbation Load Approach* [1]. Currently, imperfection sensitive shell structures prone to buckling are commonly designed according the NASA SP 8007 guideline using the conservative lower bound curve. The guideline dates from 1968, and the structural behaviour of composite material is not considered appropriately, in particular since buckling load and imperfection sensitivity of shells made from such materials substantially depend on the lay-up design. This is not considered in the NASA SP 8007, which allows designing only so called "black metal" structures. Here is a high need for a new precise and efficient design approach for imperfection sensitive composite structures which allows significant reduction of structural weight and design cost. For most relevant architectures of cylindrical and conical launcher structures (monolithic, sandwich - without and with holes) DESICOS will investigate a combined methodology from the *Single Perturbation Load Approach* and a *Specific Stochastic Approach* which guarantees an effective and robust design. A recent investigation demonstrated, that an axially loaded unstiffened cylinder, which is disturbed by a large enough single perturbation load, is leading directly to the design buckling load 45% higher compared with the respective NASA SP 8007 design [2]. Within DESICOS the new methods will be further developed, validated by tests and summarized in a handbook for the design of imperfection sensitive composite structures. The potential will be demonstrated within different industrially driven use cases. This presentation deals with the objectives of the DESICOS project, describes the line of actions of the new approach, and specifies the theoretical and experimental work to be carried out in order to meet the objectives.

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