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CONSTRUCTION OF A KNOWLEDGE WEB TO IMPROVE EXPERIMENTAL SOUNDING ROCKET DESIGN.

Abstract

Delft Aerospace Rocket Engineering is a student organization in the Netherlands specialized in design and launching of rockets. Through the years its projects have grown in complexity . In 2009 DARE launched the Stratos I rocket to 12,5km altitude and plans are being made to launch a rocket to 50km carrying several scientific experiments (www.projectstratos.nl).

These higher ambitions sets a new demand on the design process. Interaction between different fields of expertise: structural design, motor design, aerodynamics, are of increased importance. Design decisions made in the early stages of the project have increasingly consequences for the final performance, so the design process has to be better understood and improved. A solution to improve this design process might be found in the application of Knowledge Based Engineering (KBE) systems. In which knowledge based computer systems aid in the design of complex aerospace products.

This study maps the design process for small experimental sounding rockets. Rockets with a maximum payload mass of 100kg, apogee altitudes below 250km and designed and built by amateur groups. As a starting point current systems engineering approaches are used on the process of sounding rocket design within the context of DARE. Following the guidelines as set by MOKA an informal knowledge model on this process is developed in the software tool PC PACK by Epistemics.

The model is used to provide the required insight in the design process and enable identification of driving design parameters and the best performing design approach. It is also used to identify so called 'low hanging fruits' which can significantly improve the design process at a small investment.

For verification the model is applied on the design of the Stratos I rocket, which had already a well-documented and finished design using current design methods. As most important result the time required for the design process has been significantly decreased. As well as a more optimal design solution was found under the same constraints.

Concluding the application of Knowledge Based methodology on the design process of small experimental sounding rockets has a beneficial and significant positive influence on this design process and also on the final design performance. Proving the tool necessary for the further development of DARE and enabling it to chase higher ambitions.