Summary of the confidential thesis:

Initiating the Testing Phase of a Deployable Space Telescope: *An Experimental Characterization of Hysteresis in CORE Hinges*

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In modern society, there is an ever increasing need for high-quality Earth imagery for various applications. This can be broken up into a need for increased spatial and temporal resolution, as well as a necessity for decreased cost of this imagery. The Deployable Space Telescope (DST) was proposed by Delft University of Technology in 2015 and it aims to achieve these goals by deploying the primary and secondary mirror as well as the baffle structure. By deploying these elements, the launch mass and volume decrease substantially compared to state-of-the-art satellites such as Worldview-4, yet achieving similar ground sampling distances. The great difficulty for the mechanical side of the team is deploying these mirrors with sufficient precision in order to arrive at a diffraction limited image with a ground sampling distance of 0.30 m. This thesis has focused on the Secondary Mirror Support Structure (SMSS) of the telescope and it has been investigated how the testing phase of the project could best be initiated. Two prototypes of the essential CORE hinge have been developed and the hysteresis behaviour of these hinges has been experimentally characterised.

Several improvements for the CORE hinge have been proposed. Shear rims were designed in such a way that protection during launch is guaranteed, but their presence is not detrimental during operations. Furthermore, the mid rollers were removed in order to prevent shearing of the metal strips against these mid rollers. Lastly, a material reselection to aluminium was proposed. Other improvements of the Secondary Mirror Support Structure include the selection of cable cutters as the most suitable hold-down-and-release mechanism for the SMSS deployment.

A test rationale was developed and it was decided to initiate the DST testing with the development of two prototypes of the CORE hinge in order to experimentally characterise the hysteresis in these hinges when subjected to load cycling. The CORE hinge has never been flown in space, however, it is proposed as a very promising concept for the deployment of optical surfaces, amongst others due to their beneficial hysteretic response. The first prototype that was developed was created by rapid prototyping and served as a proof of concept version. The second prototype was used for the characterisation of hysteresis. Digital image correlation (DIC) was selected as a measurement system. The DIC set-up was capable of capturing the sub-micron displacements in the hinge.

Note: Conclusions are confidential and omitted from this summary