



## Bachelor Thesis Work

### Low Cost RWA -A technological and commercial market study

### Industrielle Reaktionsräder - Eine technologische und kommerzielle Marktstudie

#### Motivation:

Rockwell Collins Deutschland GmbH (RCD), located in Heidelberg, is the second largest Reaction Wheel Assembly (RWA) supplier worldwide that manufactures Momentum and Reaction Wheels since 1976. Up to now 1450 wheels on board of 475 satellites for all kind of missions have been launched resulting in a 11.400 years accumulated in orbit life time. RWAs as angular AOCS actuators provide permanent angular stability (24/7) or torque to any satellite regardless of size and purpose/mission. The actuators vary significantly in design depending on equipment manufacturer, satellite size, sort of mission, orbit and intended life time. Recent market developments (New Space/LEO constellations) tend to generate much more simple and cost efficient solutions at a price level of app 10% of the classical unit sales price for GEO/scientific missions, while permanent operation over 7 years life time is still required. Moreover production rates require rather mass production (1 SAT per day) than manufacture of individual satellites. This tendency necessitates a structured review of the available technical solutions in combination with the applied manufacture technologies fitting the current and/or future project specific market demand technically as well as commercially. The obtained results will be of utmost importance and baseline reference for RCD's strategic decision regarding a future engagement in this promising and prospering market segment.

#### Task description of the bachelor thesis work breakdown:

- Training period to understand key requirements, major market and technology trends (RCD support)
- Market study to 1st determine the vital RWA concepts and their major subassemblies providing the essential equipment functions (commercial aspects, e.g. costs sales prices would be a plus)
- Document the analysis in a structured way e.g. morphological box
- Based on previous structured analysis evaluate the possible RWA solutions technically. Try to determine their Rough order of magnitude costs with RCD support and perform a trade-off towards a favourite solution.

A certain lump-sum fee for elaboration of the thesis is foreseen. It could be accomplished in close cooperation with Rockwell Collins Deutschland GmbH in Heidelberg

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External supervisor: Klaus Bangert, Sebastian Stein

Starting date: as soon as possible

Submission until: 4 months after starting date

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