

SDI2-OSE-HR-0148

Announcement of Graduation Thesis (Examensarbete) opening

## Satellite Attitude Control using Control Moment Gyroscopes

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Project Title	Satellite Attitude Control Using Control Moment Gyroscopes
Project ID	
Area	Satellite attitude control
Project time period	January-June 2022
Last date to apply	Nov 24, 2021
Company	OHb Sweden
Physical location	Viderögatan 6, Kista, Stockholm, Sweden
Working Language	Must: English, Nice to have: Swedish
Contact Persons	Per Bodin, Head of AOCS Dept, per.bodin@ohb-sweden.se
<b>Send application to:</b>	<b>student@ohb-sweden.se</b>

### Project description

OHb Sweden produces advanced low-earth orbiting (LEO) satellites for both institutional and commercial customers. This thesis work addresses the use of Control Moment Gyroscopes (CMG) for attitude control of Earth Observation imaging satellites.

Due to their significantly higher reaction torques, the use of CMG for attitude control significantly increases a satellite's ability to rapidly change its orientation compared to a satellite using fixed reaction wheels. As an example, CMGs are used on the International Space Station (ISS).

A satellite equipped with CMGs can thus collect more images than a standard satellite equipped only with reaction wheels.

A challenge when using CMGs is to avoid singularities at which their torque capability becomes limited, and their use requires careful planning on both short- and long-term in order to make sure that they are used efficiently.

The thesis will investigate how CMGs can be efficiently used for attitude control of Earth Observation imaging satellites by developing models of the equipment, formulating the associated optimization problems, and developing and testing associated solutions. The work is organized in the following tasks:



- Literature study on CMG for attitude control
- Modelling of CMG equipment, orbit, and S/C dynamics
- Formulation of singularity avoidance problem and development of associated solutions (as hoc and/or by optimization)
- Assessment of computational and implementation aspects
- Formulation of attitude guidance optimization problem
- Development of simulation with attitude guidance and control
- Simulation tests to verify performance

## **Suitable background skill set**

Engineering area: Control engineering, software engineering

Good analytical and programming skills, experience of MatLab and Simulink highly desirable.

## **Application Preparation**

The submitted application shall be maximum two pages covering

- First and last name
- Contact details (e-mail, phone and home address)
- Attended College/University & grades
- A short personal description
- Education, work experience and skill sets (a summarized Curriculum Vitae)
- A motivation to why the student is interested in the position

## **Selection Process**

The submitted applications will be processed internally in the company after the above stated due date. One or a few candidates may be invited for an interview (in person or per phone) should it be needed before the final selection is made. The appointment will be made well in time of the starting date.

## **General Company Policy**

OH B Sweden offers Graduation Thesis (Examensjobb) openings that shall be beneficial to both the company and the student. The scope of the Graduation Thesis shall contribute and enhanced skills and knowledge within the company and allow the student to actively work in a space industrial environment and gain work experience relevant to his/her education.



OH B Sweden's ambition with offered student positions is to:

- Be an attractive company for project workers by offering interesting projects in an international environment and good supervision with market-based compensation
- Allow all students to get a positive image of OH B Sweden as an employer
- Use Graduation Thesis students as an important source for future recruitment

Additionally, OH B Sweden's long-term ambition is that offered students positions will:

- Promote contact and knowledge exchange between the company and colleges/ universities
- Allow contact and knowledge exchange to contribute to innovations and long-term developments within the company
- Disseminate information about OH B Sweden to promote future collaborations and businesses

Upon successful completion of the thesis work, a gratification is paid to the student.

## **Contacts**

Any questions prior to sending in your application shall be sent to [per.bodin@ohb-sweden.se](mailto:per.bodin@ohb-sweden.se)

The application shall be sent via E-mail to [student@ohb-sweden.se](mailto:student@ohb-sweden.se)