Document of personal reflection

1 Introduction:

This document presents the reflections on the work completed during our bachelor's thesis. The primary challenges we have addressed are focused on supplying power to a secondary circuit only when the motors are rotating. We explored multiple methods of how to generate power while focusing on safety and reliability. Another key challenge was designing additional systems to be as unobtrusive as possible, minimizing their impact on the drone's performance and structure.

2 Desctription:

In this project, we tested several energy harvesting methods by integrating them into a drone to evaluate how much electrical energy they could generate during flight. The primary objective was to determine the effectiveness of each method without compromising the drone's performance or safety.

The methods we explored included:

- Motor Coil Induction: We placed magnetic coils around one of the drone's motors to investigate whether we could generate current from the motor's rotation, essentially using it as a form of unconventional electric generator.
- ESC Wire Induction: We wrapped several turns of wire around the power leads going from the Electronic Speed Controller (ESC) to one of the motors, aiming to harvest energy through electromagnetic induction.
- Peltier Element: A Peltier module was mounted underneath the ESC to convert the heat it generates during operation into usable electrical energy through thermoelectric generation.
- Piezoelectric Elements: We attached piezo elements beneath each of the drone's arms to capture mechanical energy from vibrations and slight flexing during flight.
- Turbine Generator: A small turbine was installed on the top of the drone to utilize headwind during flight for generating current, functioning like a miniature wind generator.

Each of these setups was designed to operate passively and safely, ensuring they would not interfere with the drone's normal flight capabilities.

3 Reflection:

3.1 What Went Well and What Could Have Been Done Differently

Several parts of the project went very well. Testing proceeded as expected, and both the soldering work and breadboard testing went smoothly, even though we had to resolder some components. Programming, design, and system assembly were completed without major issues, and the 3D printing of components also worked satisfactorily. Additionally, we found that writing the actual bachelor's thesis went smoothly, which reflects good planning and effective collaboration.

As for areas of improvement, we recognize that some parts of the testing could have been carried out in a more systematic manner. We also could have conducted more tests to ensure more reliable results. The sensor package could have been designed to be more compact, with better housing and a more robust mounting solution for the sensors. Moreover, we could have devoted more effort to the Peltier part of the project, as it had greater potential than we managed to explore. Another area for improvement was our communication with Nammo; we could have maintained more contact throughout the project. That said, we truly appreciate the support and supplies we received from them, which contributed positively to the project.

3.2 What We Learned from the Experience

Through this project, we have learned a great deal about how to plan and execute an engineering project from start to finish. It gave us insight into both the technical and collaborative aspects of such work. We learned how valuable it is to work in a team, especially when team members bring different strengths that complement each other. We also realized how important it is to have a solid schedule and clear goals — that is when we work most efficiently.

We discovered that we often underestimate how long certain tasks will take, and this is something we need to improve through better planning. At the same time, we gained a deeper understanding of how crucial good communication and the ability to give and receive constructive feedback are to creating effective teamwork. When we faced unforeseen challenges, such as tests that didn't go as planned, we learned the importance of being flexible and solution-oriented.

3.3 How We Can Apply This Knowledge in the Future

The lessons we've learned from this project are definitely things we will carry with us into future studies and projects. We will especially apply what we have learned about time management and goal setting to better structure our work, both in large tasks and in team collaborations. In future group projects, we will be more conscious about establishing clear roles early on and ensuring open and effective communication throughout. The experiences we have gained here provide a strong foundation for both academic and practical work moving forward.