Process report

Introduction:

The reason why we make this process report is to make a final conclusion for the project: EE4 Building a SSV. This final conclusion can be used for projects in the future that we have to do. We write what we did wrong, or what parts can use some improvements. But also all the choices we made, and why we made them.

Cooperation:

There were several activities that has to be done to make our SSV.
The frame of the car, and the method to shift and to steer we made all together.
We made our car mainly ourselves in Fablab. The drawings for our car were made by Arnout Dejans. He made the drawings so that we could print everything in Fablab.
Also the building of our small solar vehicle we did together. This was mainly under the lead of Arnout Dejans because he was the guy who made the drawings. He knew exactly where everything belonged on the frame.
The calculating part is mainly done by Michiel and Rik, but also with help from Arnout D. and Arnout V.T.
The organizing part, which means the making of the meeting reports is done by Jisca.
Writing the cases is done by everyone. Everyone had its own share to do.

There were no major problems concerning the cooperation. Sometimes it was difficult to gather everyone for a meeting. This because of the different schedules.

Skills:

The skills that were sufficiently present within the team is definitely creativity. We all had different ideas, and all these ideas came together in our car.
There was also enough knowledge within our team. The realization of our car happened without many problems.

Which skills have you developed during the project?

Jisca:

The skills I developed were mostly the working of the solar panel, the components we used, working of the new programs and calculation methods. Also how further we got in the project how more easy solutions we found for a problem. So I think me and the rest of the team learned to think more logical.
I also learned that in next projects meetings should be better prepared so we can bring everything we can possibly need.

Arnout Dejans:

The most important things I learned during this project where the components of the solar car and their working. The Sankey diagram and the working of the solar panel are the most important new skills I developed. These are topics that are covered in other classes, but this time, we had the chance to use the knowledge in a practical way.

Gertjan:

I learned to make a Sankey diagram, performing detailed calculations. I got used to a numerical approximation method, called the bisection method. I also learned to apply the knowledge I gained during the classes of Electromechanical Technology and Strength of Materials. These are the most important skills I developed during the project. Secondly, I worked with new computer software (Matlab/Simulink) to simulate the behaviour of our SSV. I also refreshed my technical drawing skills, using Solid Edge.

Michiel:

The ability to quickly learn how to work with new computer software or use recently learned theories from classes in practice. We have had to use software that was completely new to us without any classes or whatnot. This is an important skill.

Rik:

During our project EE4, making a SSV, I developed a few skills. I learned how to work with simulink and matlab. I became familiar with the bisection method, and learned how gears work. Another skill I developed is how to steer a small vehicle. This isn't as easy as it seems. What I definitely learned is that it is sometimes better to think than to make something and test it. Because the growing popularity of Fablab we had to think off everything at once, otherwise we should go several times at Fablab.

Arnout Van Tricht:

I learned that it’s important to discuss every little thing. We took a lot of time to think everything through, and that worked out fine. If you think enough about everything, the best solutions come out in a simple way. I learned how to perform a bisection method and that your acceleration depends on factors I first didn't know about.

Team:

We don't think that there were skills which caused much problems. Maybe the creativity was sometimes a problem. Everyone had in the beginning of the project his/her own idea of the car. So eventually we all had to make some concessions.
There was one quiet big problem, that was with the deadline of Case 1. We didn't knew that everything should be in one big report. So here was the problem communication. Afterwards we solved this problem right away.

What is the final judgement of the team on the process?

Our team made very good process whenever it was necessary. It might have been better to spread out the work somewhat more so there wouldn't have been so much work still necessary to be done right before the deadline. But it was never too much for the team to handle

What is the final judgement of the team on the product (compared to plan of approach)?

The product, our SSV, has reached the shape and the performance we wanted to create, as planned in our plan of approach.

Conclusion:

Design:

1) Shape.

   As shape we chose a simple triangular form, considering this is easy to make and still has a decent enough air resistance factor. The solar panel on top is the biggest factor in the air resistance anyway, so the actual shape of the vehicle itself isn't that important. Especially considering the maximum velocity of our vehicle.
   The fact that we want to navigate our vehicle also played a factor in this decision. With a triangular shape, the steering wheel is easily connected to the front of the vehicle.

2) Building material.

   As building material we chose MDF. Our first choice was Balsa wood, but this material is not strong enough for the weight of the vehicle. Thus MDF seems like the better choice, considering it's also quite cheap.

3) Propulsion and steering.

   The energy for the propulsion is given only by the solar panel, so we need to find the optimal gear ratio for a certain wheel radius. To make an adequate decision about this ratio and wheel radius we simulated many values in Matlab. During these simulations we noticed it might be a good decision to use two gear ratios. A larger one to accelerate quickly, then switch to the smaller one to achieve a higher maximum velocity up to the start of the slope. Then, when the vehicle is just on the slope, switch back to the larger ratio. The first gear ratios we were going to use were 12 and 8 with a wheel radius of 0,04m. But afterwards some other values had to be changed, like the diode factor of the solar panel, because of some mistakes. Because of this, a more optimal gear ratio seemed to be 10 and 6, with the same wheel radius.
   The steering of the vehicle will be done with a steering wheel at the front of the vehicle. We will steer it with a controller that's connected through a receiver on the vehicle with a servo. This servo will be receiving its power from a 6V battery. Switching the gears will be done in a similar way. The two gears are on an axle, which will be moved with a servo as well. This servo will also be manually switched with the controller.

4) Wheels.

   The wheels will have a radius of 0,04m as mentioned above. They will be cut out of Plexiglas, considering we will cut the gears out of this as well. This will save some money and we can choose our wheel radius, unlike

when we would use wheels from a different vehicle or CD's or such. The rolling resistance won't be that much more than that of a CD because our Plexiglas will be quite thin as well.

5) Solar panel positioning.

The solar panel will be fastened to the vehicle with a ball and socket joint received from a GPS-holder. This way we can adjust the panel towards the sun at any point and time.