Reflection [1]Report for Product-Based Assignments

Design of an 'AFP HALO' safety device for Formula Italia Championship

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Group Number 18

[1] Reflection is "the practice of periodically stepping back to ponder the meaning to self and to others in one's immediate environment about what has recently transpired" Raelin, J. A. (2001). "Public Reflection as the Basis of Learning." Management Learning **32**(1): 11–30. A reflective practitioner is a person capable of learning, acting and adapting to environments, someone who is constantly seeking to widen their experience and knowledge by adapting their manner of work in the profession. Someone who always learns through what they do, and who continually combines action with reflection on what has been done.

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1. Introduction

Formula Italia is an Italian championship for single-seater cars organized from 2022 by Gruppo Peroni Racing s.r.l. company, with the approval of ACI Sport (Automobile Club D'Italia). The competition consists of a total of 14 races and is intended as a first step for young drivers from 16 years of age towards the following national and international single-seater categories.

The technical rulebook requires the use of Formula 4 Tatuus T104 cars: this model, which has been designed in 2014, was used until 2021 in the FIA F4 championship and is still appreciated both for performance as well as limited maintenance costs.

Nevertheless, the car is not equipped with the HALO safety device already in use in the F1, F2 and FE series from 2018. For contextualization, the function of the AFP HALO (AFP stands for Additional Frontal Protection, from now it will be called just HALO for simplicity purposes) is to protect the drivers' head from the impact of medium to large external objects. Because of this, looking to the second edition of the championship, it was imagined that the organizing company would decide to work on this issue by upgrading the cars to FIA 2020 GEN1 standards through the adoption of this safety device. HALO's introduction in the Formula Italia championship is considered necessary due to the average age of the competing drivers, which is well under 18. The increase in costs, which must be faced by participating teams to equip their cars with the device, is more than balanced by the safety benefits of its adoption.

As of April 2022, according to FIA Technical List No. 62, there are 7 HALO systems homologated in accordance with FIA Standard 8869-2018: 4 HALO-TI type and 3 HALO-STL type (please look for reference at Chapter 1 of our pre-report for further details). Three of these are by Italian companies, respectively V-System and Dallara for the first category and Tatuus Racing S.p.A. for the second one. The group has chosen to identify itself with a multidisciplinary team from Tatuus Racing S.p.A. company. It was considered likely that the championship organizing company (Gruppo Peroni Racing s.r.l.) would consult this manufacturer requiring to design the protection system since the car used in the championship was designed by them in 2014. Moreover, the manufacturer has an extensive previous background in the product, having already registered a HALO-STL system in the past.

The project starts with the commissioning of the project by the company to our team and ends with the submission of the digital deliverable to our employer. The deliverable is the result of the design process and consists of CAD files, 2D technical drawings and FEM analysis. In addition, the system would need to be tested by an accredited institute according to the FIA 8869-2018 standard, to be

homologated and prior to production phase. Since it cannot physically be conducted, this empirical step will only be mentioned but it is considered outside the scope of this project.

2. Evaluation of Project Management effort

a) In the evaluation of the organization of our team we need to start from the heterogeneous knowledge which enabled our team to entrust each person with a role and a responsibility as follows:
   - Project Manager (1 person): responsible for initiating, planning, executing, controlling and closing the project.
   - Engineering Division (3 people): responsible for analytical design, CAD modeling and FEM structural analysis.
   - IT Division (1 person): preparing technical update reports and presentations for company meetings.
   - R&D Division (1 person): carrying analysis of results and comparison with design standards.

   During the planning of the project, we focused on delivering our product on time. Furthermore, for succeeding on it, the role of engineering division was more crucial than the others. This branch of our workgroup managed to realize the final digital product, assuring quality and safety. Our result strongly depended on their efforts, on their ability to overcome the different issues, their knowledge, and technical capacities. Proficient organization has been possible thanks to some tools we applied to identify and set the intermediate step of the product: the WBS (Work Breakdown Structure) and the Gantt Diagram. For reference, please refer to Appendix 2. On the other hand, the R&D division initially faced difficulties in obtaining the required design software licenses (Dassault Systems Solidworks and Altair HyperMesh). The same happened to the IT division with the Luxion Keyshot rendering software, which was used in the last part of the project to visually present the results achieved.

b) Thinking about our risk management plan required some efforts throughout the project life cycle: From the beginning, we made it clear what risks could arise. In this regard, we can cite time constraints and the development of well-structured FEM models (using the functions of the Altair HyperMesh structural simulation software) as examples, which were well respected. Even before that, the design of our product required preliminary knowledge

and time to study the design requirements as required by technical regulations: we used CAD software (Solidworks from Dassault Systems) which initially caused us some technical problems and thus wasted time. The delay which could eventually emerge from the adoption of such software is strictly linked to our main risk assessed: the time constraint. An initial analytical design phase was also required. It was crucial to meet the delivery time because the customer considered it urgent. It was necessary to deliver the project in time so that other companies could physically produce the component for testing (outside the scope of our project), homologate it and deliver it to the championship teams. These had to have enough time to install it on the cars and carry out fitting tests before the start of the season. In conclusion, we cannot forget to mention the budget constraints the team managed to comply with, without incurring being a burden to our company.

c) Regarding the communication plan, we managed to share information throughout the whole project chain, facilitated by the team structure we applied to ourselves. All the team members had a complete awareness of the whole project direct, of its timetable and of how the different activities were scheduled (ex. WBS). In addition, for what regards the external communications we succeed in keeping interaction with the client (Gruppo Peroni Racing s.r.l.) to have, at the beginning, adherence to the requirements of it and then, with the development of the final product we organized a final meeting to present how our result match the customer's constraints. Finally, the interaction with the FIA posed some problems, as the organization was not extremely helpful and responsive to our requests during the development phase.

d) The group managed to deliver the project as planned in terms of delivering on time, respecting also the intermediate deadline scheduled by it. These criteria were the most critical for our work, as the customer (Gruppo Peroni Racing s.r.l.) needed to implement the HALO before the start of the next championship, so that the teams could conduct the required fitting tests. In addition, the team has successfully respected compliance with the legislation, which represented one of the most problematic aspects. We needed to interact with the FIA, the governing body of world motorsport. It was difficult to establish an effective channel of communication with them because they used to respond to our input with great delay. We managed to solve this problem by exploiting a "buffer" of time gained through our forward-looking organization.

   Finally, we did not exceed our budget limits. These were a function of, for example, the delivery time, the cost of licenses for any additional software required, the need to allocate

additional workforce to the project, and so on. Delivering outside the schedule would also have caused monetary sanctions for our company. We could afford to carry out more executive FEM analysis of the product, which has not impacted drastically on our costs, to tailor it increasingly to the customer's specific without forgetting to match the regulators' requirements.

We evaluate our project management effort as a success:

Scale	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Your response				X	

3. Evaluation of the impact (Project success)

a) To ensure the success of a project it is important to identify its target audience, that could be individuals, groups or organizations that benefit from the results of the project itself. Given this, project strategies must be adapted to the expectations of end users to receive positive feedback from them once the final product is delivered.

   In our case, the HALO device we designed was intended to be implemented on single-seaters participating in Formula Italia, a single-brand Italian championship organized from 2022 by the company Gruppo Peroni Racing s.r.l. The target audience of our project are drivers with an average age under 18, since this competition is intended as a first step for young drivers towards national and international single-seater categories.

b) The quality of our final product can be evaluated through defining its project success: it is important to keep in mind that the evaluation of project success takes time, and it extends during the project life cycle. The effectiveness of our project is linked to the identification of project successes that have been achieved: before we need to think about if our project could be classified as a success or a failure project. According to Hussein (2018), one of the two clusters that are usually used to evaluate a project is the project success cluster that includes many indicators of success that have connections with our project work. In fact, we can identify our project as a success because firstly it achieved the purpose and secondly it was completed well on time. From the beginning the team had a clear overview of roles and knowledge and this helped to improve a good collaboration. Having a good collaboration and communication implicates sharing ideas and opinions faster and with no

worries between members, and has been evidenced also in literature, for example in case studies analyzed by Hussein (2018). This can be identified as one of our project successes that was evident during the whole project life cycle. As far as our collaboration was concerned, the working environment was pleasant, it brought good vibes and, despite the enormous amount of work and different deadlines we had to meet, each member was more stimulated and more interested in working.

Moreover, we can state that our budget management was carried out in a proper way, since the top management of the company congratulated our team for the way we dealt with the budget constraints. Our group managed to use the available resource in the right way, listing the priorities and giving to such activities the required resources (for instance, the Engineering Division) to avoid bloody wasting.

Regarding other project success criteria, we also need to mention the quality of our deliverables. In Motorsport, the aesthetic requirements of products are high and take time to be defined, improved, adapted, and redefined: in our project, the HALO is a functional device, but it must also present an attractive visual impact. Especially as soon as it was introduced in competitions, this device was criticized as it was widely believed to ruin the aesthetics of cars. After almost five years it has been accepted by mass opinion, sponsors often find it attractive, and it is widely used for sponsorships. Nevertheless, as mentioned above, the most critical point of the design phase was the functional aspect. This is clear since we are talking about a safety device that can be decisive in saving a human life in case of a racing accident. In this regard, the technical standard FIA 8869-2018 explains in detail the requirements that the device must fulfil and played a key role, especially during the preliminary design phase. The technical report prescribes the design requirements regarding geometry, material, minimum weight, reports the performance assessments that must be met (in terms of 2 different quasi-static tests). It also shows the homologation procedure to which the device must be subjected to be fitted on the cars (outside the scope of our project). Furthermore, it reports a series of aspects of a more legal and administrative nature. Respecting legal restrictions affects not only the product itself but also employees' and managers' skills and knowledge: therefore, in our team we have two members in charge of studying and understanding bureaucratic aspects. From a qualitative point of view, our project can be considered as a success: the analytical calculation phase was carried out in an accurate manner, this made it possible to create a first CAD file of the device which, once structurally simulated using the FEM software, provided far more than excellent

results. After modeling a final CAD file, executive structural simulations returned excellent results:

- Subcase 1 (frontal impact simulation): the maximum displacement of the structure is equal to 1.3 mm, the maximum allowed value is equal to 17.5 mm.
- Subcase 2 (lateral impact simulation): the maximum displacement of the structure is equal to 6.8 mm, the maximum allowed value is 45 mm.

The results are aligned with the values declared by competitors and even better.

Another element by which the success of a project can be assessed is feedback. The customer who commissioned the project is the Gruppo Peroni Racing s.r.l. company, but the feedback we were interested in receiving during the design phase was directly from the drivers, who represent the end user. Because of this, during the preliminary phase, we collected feedback from a representative of championship drivers regarding the potential lack of visibility caused by the HALO and difficulties in getting out of the car in case of need (accident, fire and so on). From then on, the drivers' association was kept informed on the developments of the project.

We evaluate the quality of our final results as outstanding:

Scale	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Your response				X	

4. Factors that have contributed to failure/success

With so many tasks going on simultaneously during a project's lifecycle, it can be quite difficult identifying the critical success factors in project management. It's important to know that success factors refer to elements in a project that are critical to the project achieving its mission or goal: in this definition we establish the success factors of our project. A clear definition of Critical Success Factors can be done, and, in our team, this helped to facilitate our communication, to monitor and control scope and changes, to identify and prioritize our goals, to allocate resources and to remove bottlenecks in knowledge-sharing flows. Firstly, we clarified our purpose in order to understand the scope of our project, then we identified our task dependencies and set our priorities: in this way we understood which tasks are the most important and which tasks cannot be completed until other tasks are completed first. From the beginning, our project was very dynamic and stimulating and these two elements brought our team to establish roles and responsibilities for those involved in

the project, in addiction, thinking about all the stakeholders was fundamental to planning each collaboration. Roles and responsibilities can be set to understand the involvement of each individual or team: obviously more attention is required for those who have decision-making powers. Furthermore, sharing information with all key stakeholders is considered as one of the most crucial success factors that a company can identify in order to assure their support and contribution to the project but also that their interests will be supported. In this way, we could make our organizational complexity more agile and understandable. These success factors can be classified as structural factors.

Among the factors which contributed most to our successful project we must mention the cultural aspect represented by our diverse backgrounds which, merged, enhanced our single efforts. Members come from different fields of study: economics, computer science, mechanical and biomedical engineering. This represented an asset for our work, since the different points of view we were able to combine gave us the possibility to identify earlier some possible issues emerging during the execution of the several tasks. As we know has high relevance the identification of issues at an early stage, giving the team the possibility to schedule the countermoves needed to solve them. Even if it seems more difficult to find coordination and collaboration coming from different areas, we managed to team up in an efficient way and add to the final project every different shade of our own background.

5. Most important lessons from your project

First, a group which is going to approach a similar project should organize the members in an efficient way. This means that internal communication must be carried out to let each team member to be aware of every decision and step during the project life. It could be useful in this case to apply some pillars of the Agile philosophy: for example, the team could schedule some updating meetings, give each person a role in the team, apply the use of Kanban to check up the project development. In addition, looking at the external stakeholders' interaction the group should identify some referents appointed to keep the relationship with the stakeholders of our project, for example the top management, the client, or the regulators.

Then our experience suggests that each single activity that compose the whole project should be addressed of a certain degree of importance compared to the others, in other words we suggest giving each activity an own weight, based on the time-requirement of it, the allocated resources on it and the required personnel involved. The next step is to list the activities based on the weight in

descendent order, this will result in the identification of the most important activities which need to be prioritized. Actually, we suggest building a precedence diagram of the activities in order to identify the successors/predecessors, the critical path, and the linkages of the project. This will be helpful to cope with the lack of the weight method, resulting in saving time and resources. The experience of the single members of the team becomes important when the time planning is set. Indeed, having a clear idea of how long every single process is going to take is a key factor in complying with the final delivery deadline.

Last but not least, in our opinion the team must be formed by people who share the final aim and are strongly involved in it, along with the process to reach it, even if they come from different fields. The group should become a safe environment for all, where each member can feel faith in his/her own skills and where his/her efforts are appreciated and taken into consideration. This requires that both the company and each member of the team collaborate: the company should involve all the members in some team-building activities needed to acquire a common spirit and to get know with each other, positive aspects, and drawbacks, while each member should focalize his/her efforts on the project success and on reaching the targets, avoiding selfishness.

6. Reflection on learning and unlearning

The entire process of project assignment has required us to modify some of our pre-existent beliefs and knowledge, both acquiring new skills and discarding outdated or wrong practices.

1) First, during the development phase of the project, we learnt the importance of having members from diverse backgrounds. Our multidisciplinary background became a relevant and positive aspect during the work, as it gave us the opportunity to maximize the potential of each figure. For instance, we were able to use Giacomo's previous knowledge in CAD design and in performing FEM analyses. This knowledge was gained through participation in university projects such as the international FSAE competition. Damiano was able to solve several interdisciplinary problems and simplify our work using his computer science background. We were able to take advantage of Ilaria's economic-management background for budgeting and work planning by implementing operational tools such as the WBS and Gantt chart.

   Later, as we developed our work, we had to improve to cope with the many unexpected events that occurred at each stage. We learnt that inconveniences are inevitable in a project of any kind, so we had to be flexible and adaptive to deal with all incoming problems. To set such condition on our working mind we applied some principles of Agile philosophy, in order to

have a group structure and a whole group attitude more prone to address such unexpected events. For example, in our working group we applied the Scrum framework, which is one of the most practical applications of Agile. This set of practices and rules resulted in becoming more transparent in our activities, in reducing the task complexity and therefore duration, to work on an iterative way and check the intermediate results of each micro-task, and in conclusion in giving to us a more adaptive approach to cope with the unexpected events.

In the end, we learnt the crucial impact that proper time planning can have on the success or failure of a project. Related to the previous point, scheduling activities in the right way is the best option to have a clear view of the project requirements in terms of efforts and results. It also helps the team to create some useful "buffers" of time to deal with potentially incoming problems and have time to solve them. For instance, we were able to schedule activities in the right order (checking interdependencies and priorities) and stick to the schedule we had set.

2) In second place, the entire process required us to discard some of our previous beliefs and practices to reach the targets on time and with a satisfying result. An example situation in which this need emerged can be identified with the need to involve more the commissioner of the product, along with the different stakeholders. In the first lesson of the course, for example, we were split into teams, and we were assigned a project of building a tower composed by sheets of paper only. In that case, as the professor pointed out, none of the groups showed up to ask for more information about the project and its aims from the commissioner, which was the teacher. This made clear that the customer needs to be involved in the project. As a result, in the project we needed to discard the procedure we used in that small project and acquire a new one, involving the customer along with all the stakeholders. This helped both in a better understanding of their aims, their needs, and the real importance of the deadlines in this project.

7. Acknowledgments

We want to express as a group gratefulness to all of us for the efforts spent in the realization of this project, for the availability shown to find the time and the location to work with commitment, for the way we were able to discuss about our own ideas and our way to analyse each aspect of our work to find the best solution.

We desire to express our appreciation to NTNU for granting us the tools and the accommodation necessary to work and discuss efficiently. Moreover, we need to be thankful, since we are all exchange students, to our home universities which let us to take such possibility of living the experience of studying abroad.

Last but not least, we are especially grateful with Professor Bassam Hussein who had arranged the course and the lectures in a way which has been useful for us to expand our knowledge in a topic that will represent a leitmotiv in our postgraduation career, in a way that caught our attention making easier for the students to store the information. We also appreciated the work of the learning assistants, which provided useful insights along the entire project processes.

Giacomo Andrighetto

Alberto Caon

Damiano Duranti

Davide Ferrari

Ilaria Guardiero

Samuele Mucci

Trondheim, Fall 2022

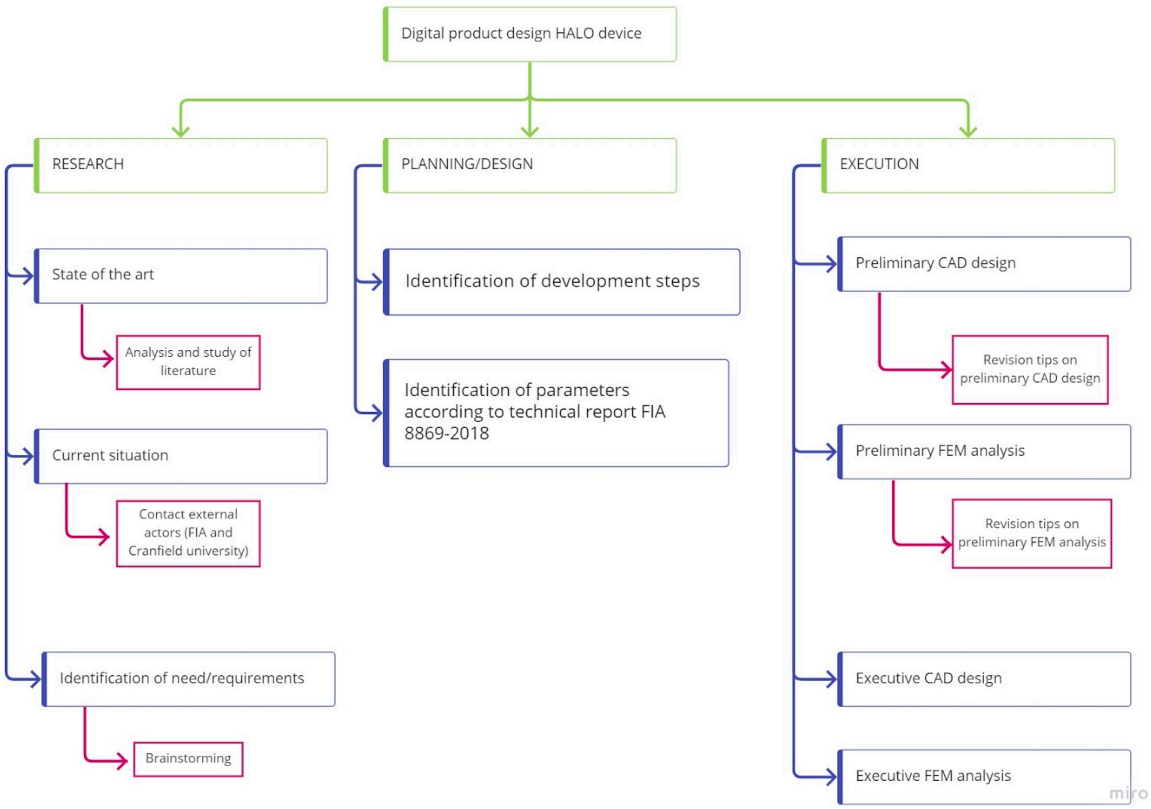
8. References

Hussein, B. (2018). The Road to Success: Narratives and Insights from Real-Life Projects, Fagbokforlaget.

Appendix 1 – Pre-report

Pre-report Project Plan Group 18.pdf

Appendix 2.1 – WBS and Gantt chart



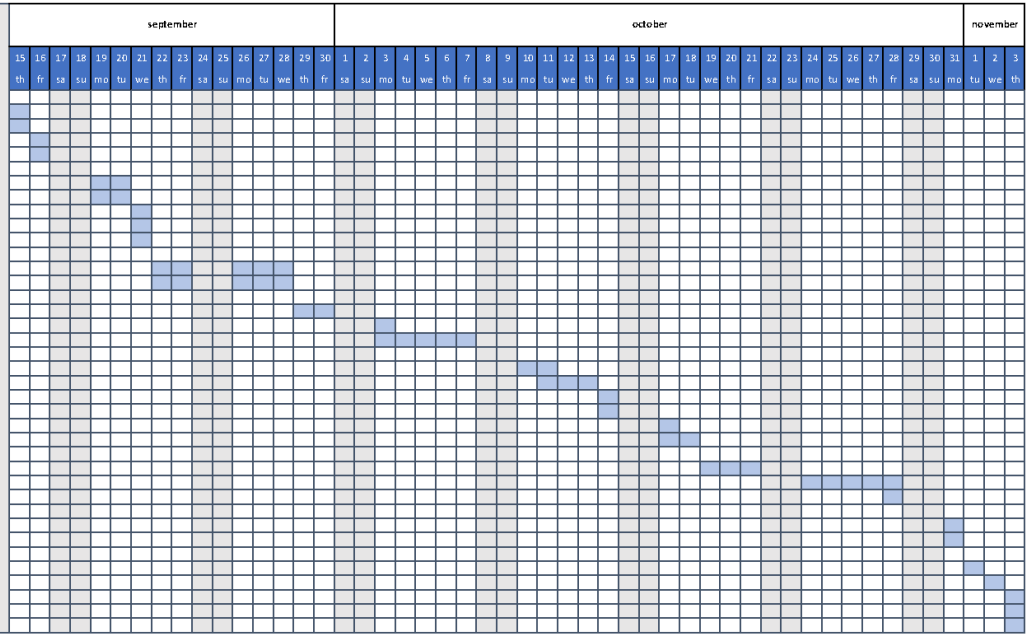
Design of an "AFP HALO" safety device for Formula Italia Championship

Project owner: Tatuus Racing S.p.a.

Client: Gruppo Peroni Racing SRL

Project start date: 15/09/2022
Project end date: 03/11/2022

ID	Activity description	Resource	Progress	Starting date	Days
	00-Initiating Project Management activities				
I-1	One-on-one meeting: Management+CLIENT		100%	15/09/2022	1
I-2	One-on-one meeting: Management+PM	PM	100%	15/09/2022	1
I-3	TEAM size and roles	PM	100%	16/09/2022	1
I-4	Stakeholders Engagement Plan	PM	100%	16/09/2022	1
	01-Planning Project Management activities				
P-1	Schedule: tasks-milestones	PM	100%	19/09/2022	2
P-2	Risk analysis and mitigation	PM+ED	100%	19/09/2022	2
P-3	Signed Contract: Authorization to proceed	PM	100%	21/09/2022	1
P-4	NDA signing	PM	100%	21/09/2022	1
P-5	Kick-off meeting: TEAM	TEAM	100%	21/09/2022	1
	02-Technical documents TO REQUIRE				
P-6	FIA 8869-2018 standard	ED	20%	22/09/2022	5
P-7	Structural tests Cranfield UNI	ED	20%	22/09/2022	5
	03-Design				
E-1	Technical documentation analysis	ED+RD	0%	29/09/2022	2
E-2	Brainstorming meeting: TEAM	TEAM	0%	03/10/2022	1
E-3	Structural design	ED	0%	03/10/2022	5
	04-Preliminary CAD/FEM analysis				
E-4	Preliminary CAD design	ED	0%	10/10/2022	2
E-5	Preliminary FEM analysis	ED	0%	11/10/2022	3
E-6	Data analysis+benchmark	RD	0%	14/10/2022	1
E-7	Preliminay report	IT	0%	14/10/2022	1
E-8	Problem-solving meeting: TEAM	TEAM	0%	17/10/2022	1
E-9	Design changes (IF NECESSARY)	ED	0%	17/10/2022	2
	05-Executive CAD/FEM analysis				
E-10	Executive CAD design	ED	0%	19/10/2022	3
E-11	Executive FEM analysis	ED	0%	24/10/2022	5
E-12	Data analysis+benchmark	RD	0%	28/10/2022	1
	06-Internal approval				
E-13	Executive report	ED+RD+IT	0%	31/10/2022	1
E-14	Decision-making meeting: TEAM	TEAM	0%	31/11/2022	1
	07-Project approval				
C-1	Final report for Management	IT	0%	01/10/2022	1
C-2	APPROVAL MEETING: Management+PM	PM	0%	02/11/2022	1
C-3	One-on-one meeting: Management+PM+CLIENT	PM	0%	03/11/2022	1
C-4	Product delivery	PM	0%	03/11/2022	1
C-5	Meeting: Drivers' association inform	PM	0%	03/11/2022	1

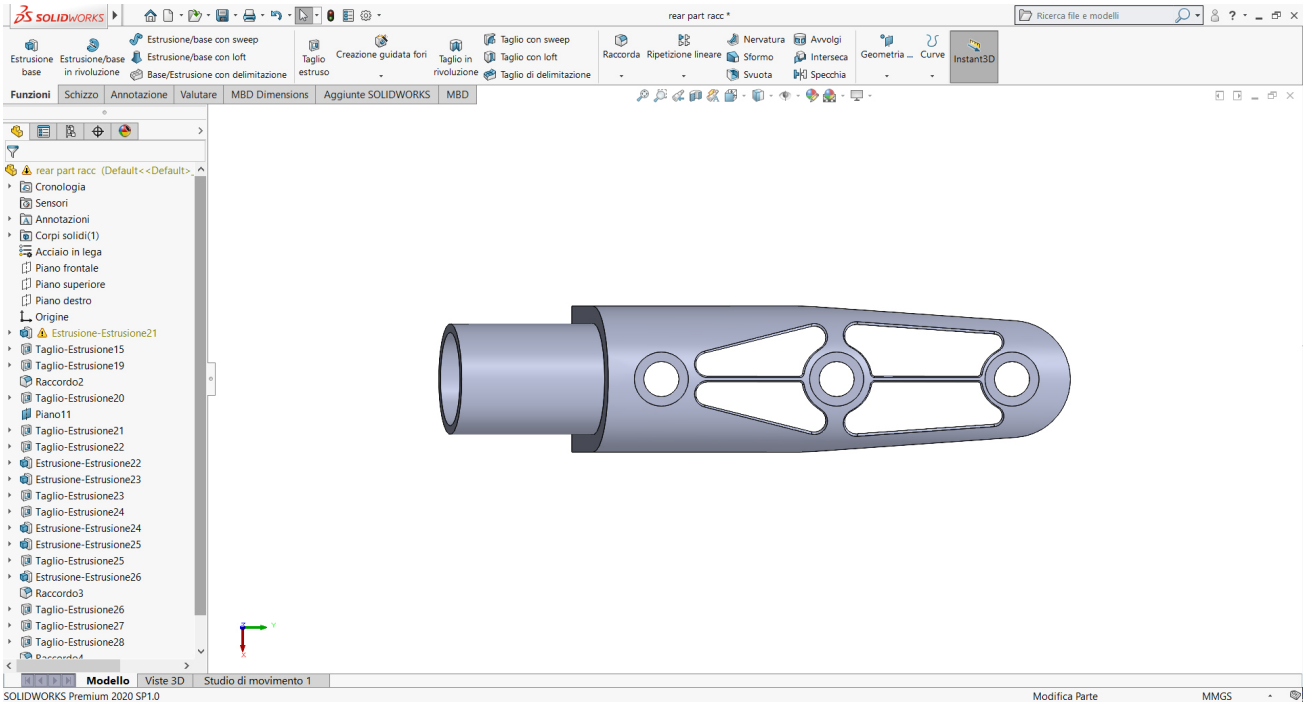


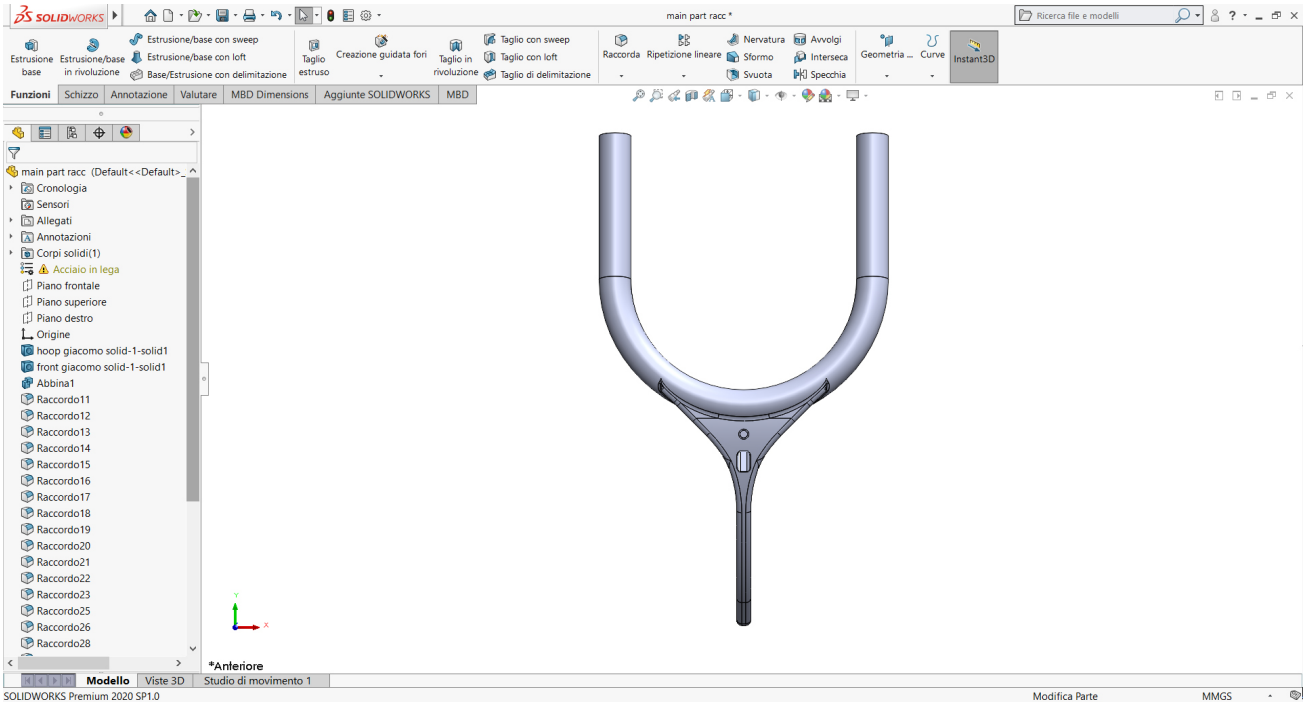
TEAM ROLES LEGEND			
TEAM	All the members		
PM	Project Manager		
ED	Engineering Division		
IT	IT Division		
RD	Research and Development Division		

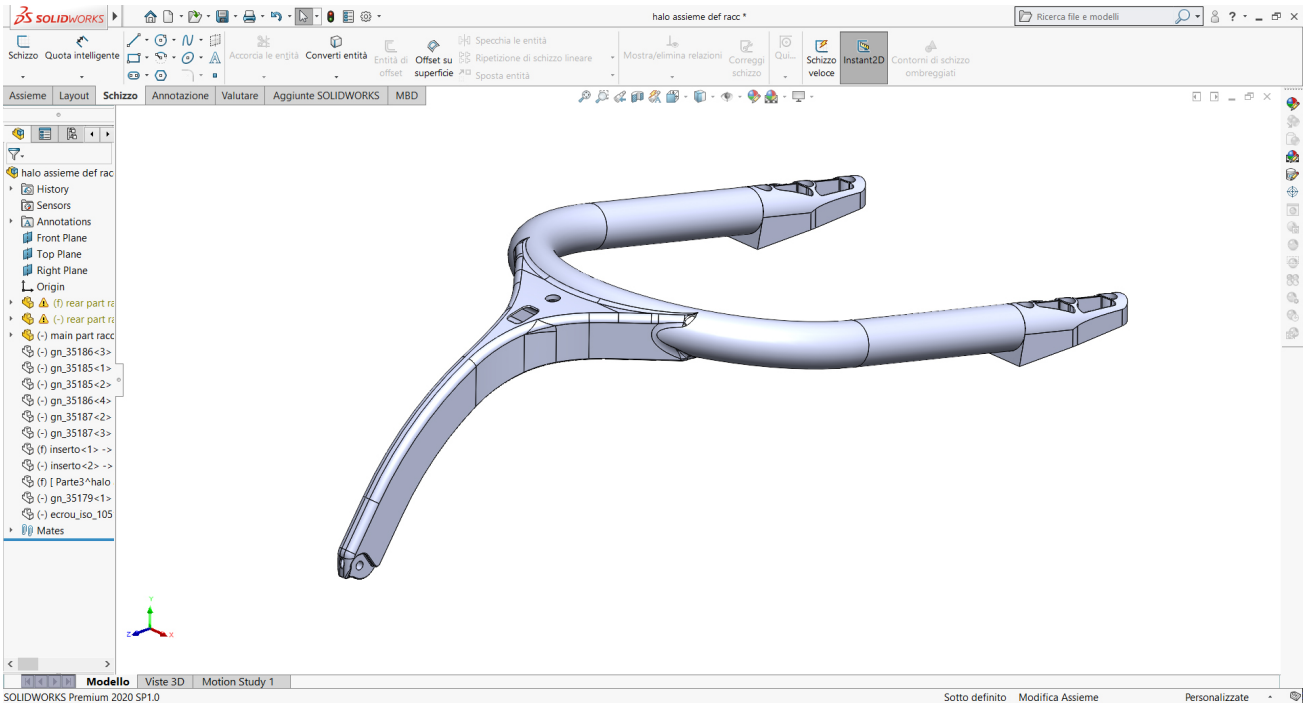
Appendix 2.2 – CAD Design

CAD design, following preliminary structural design in accordance with the FIA 8869-2018 technical standard, was performed by using Dassault Systemes Solidworks CAD software. If you need to ask for CAD project files, please feel free to contact Giacomo Andrighetto via the following e-mail: giacomoa@stud.ntnu.no.

Link to renderings and animations used to show the final product.



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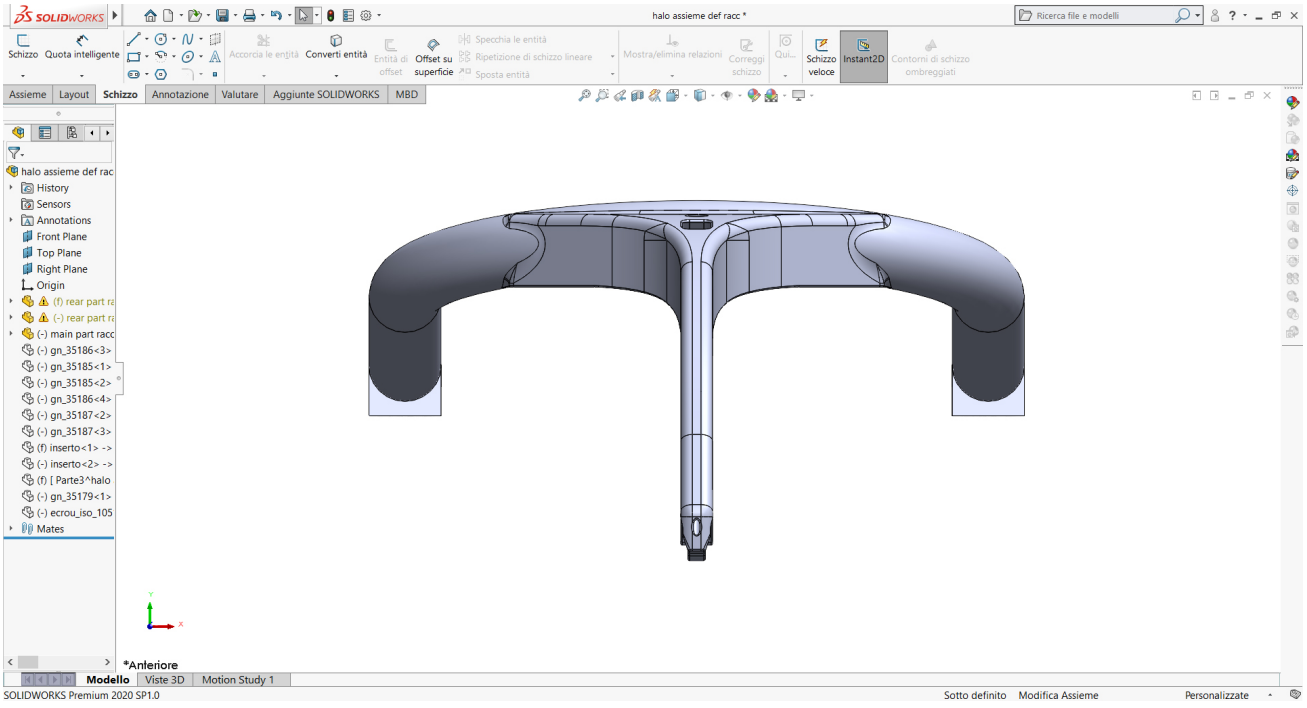
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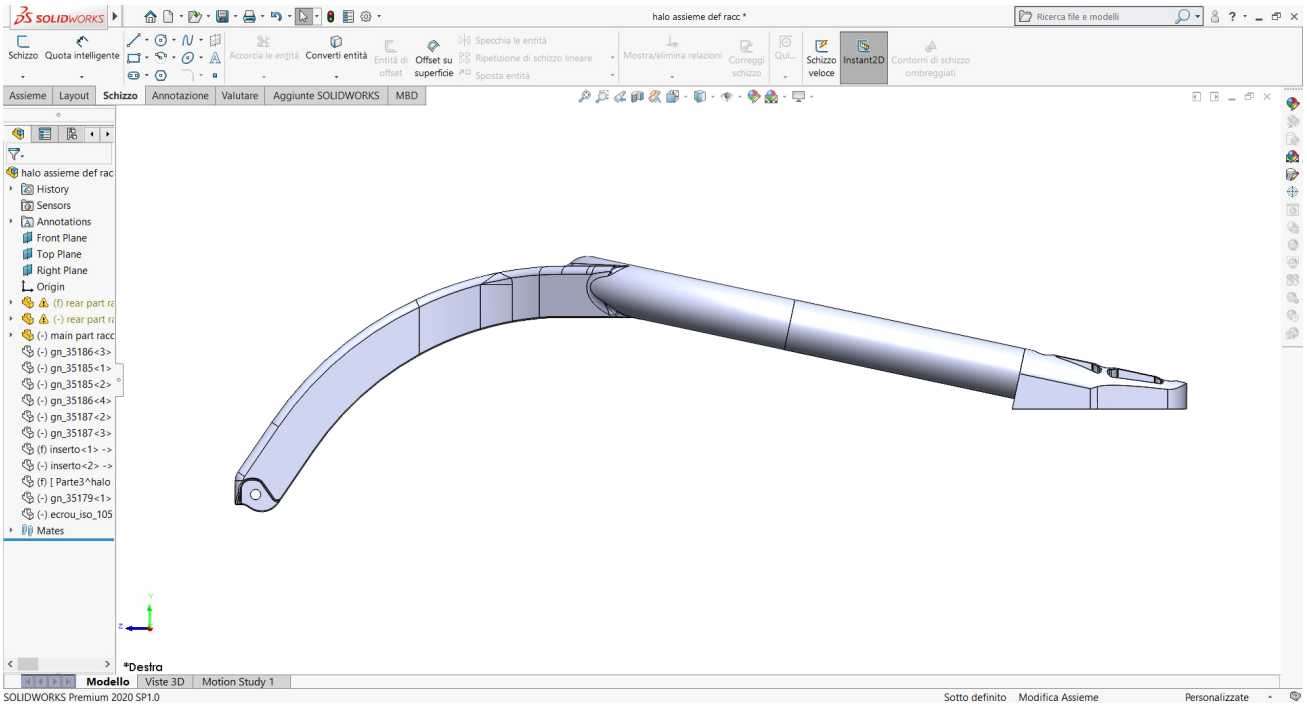
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Viste 3D
Motion Study 1
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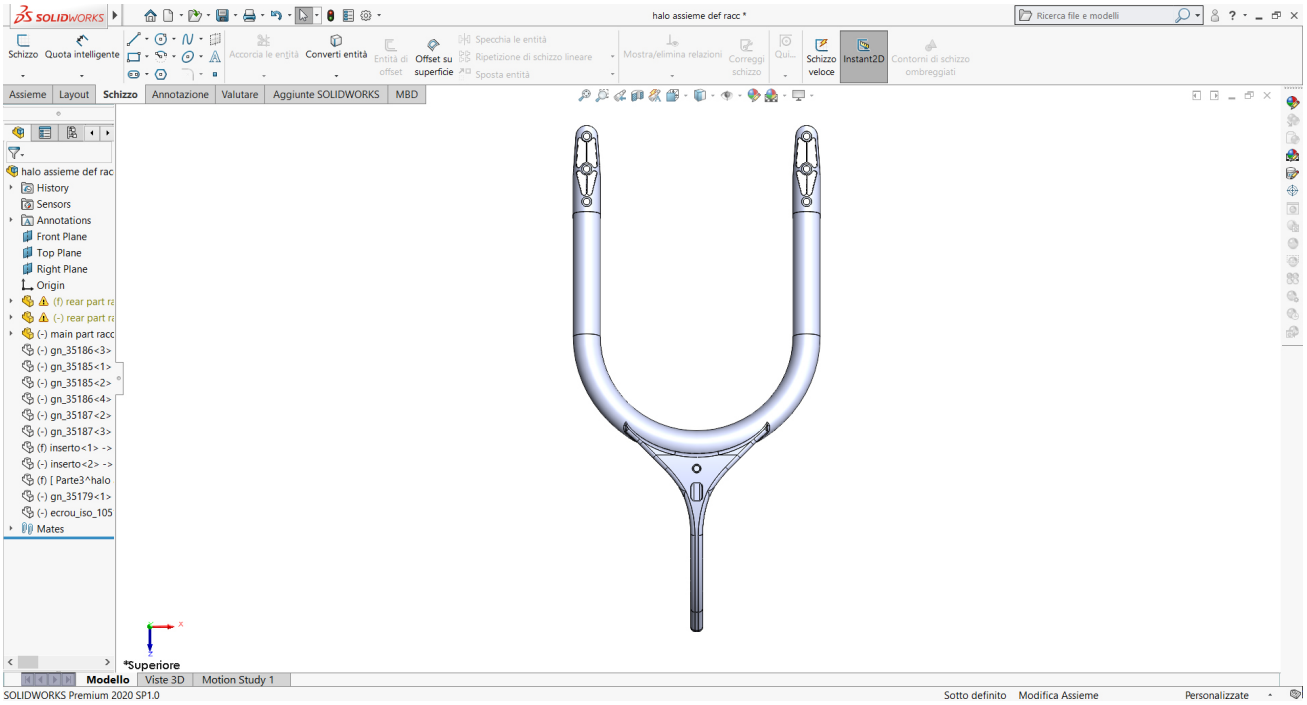
Personalizzate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Offset su superficie
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Ripetizione di schizzo lineare
Sposta entità
Mostra/elimina relazioni
Correggi schizzo
Schizzo veloce
Instant2D
Contorni di schizzo ombreggiati
Assieme
Layout
Schizzo
Annotazione
Valutare
Aggiunte SOLIDWORKS
MBD
halo assieme def rac
History
Sensors
Annotations
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Top Plane
Right Plane
Origin
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Viste 3D
Motion Study 1
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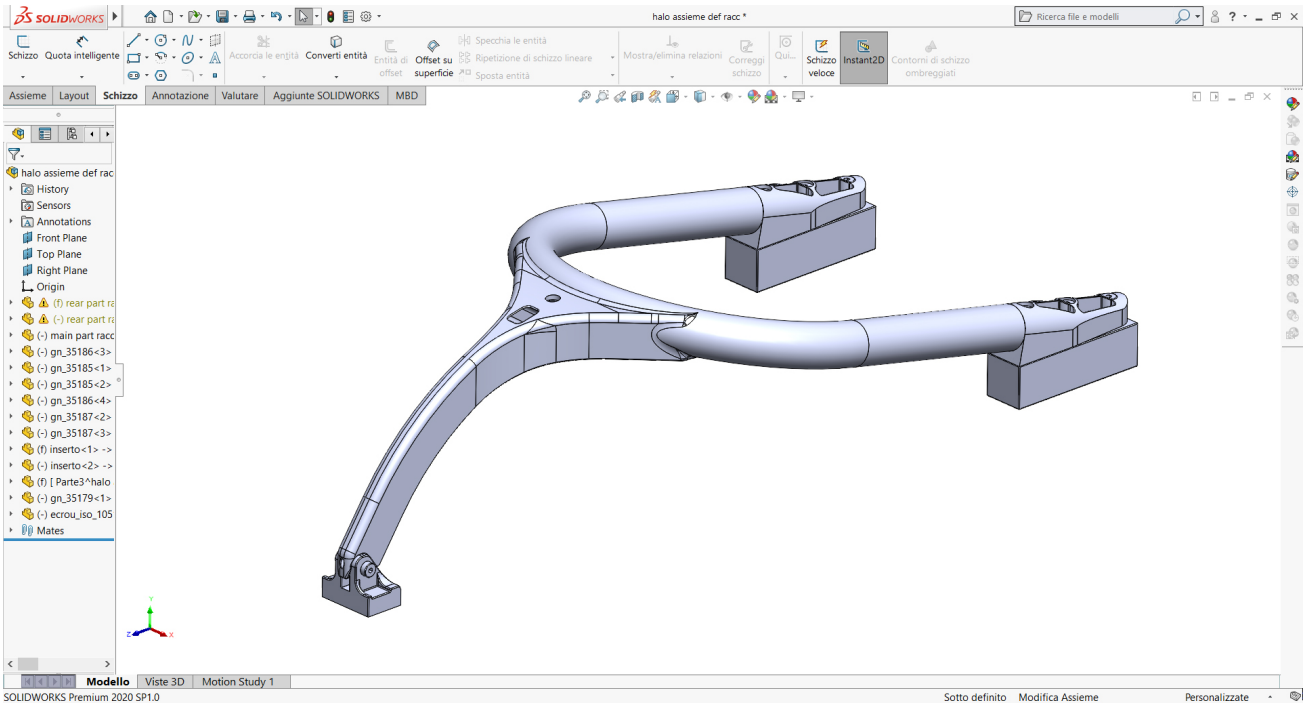
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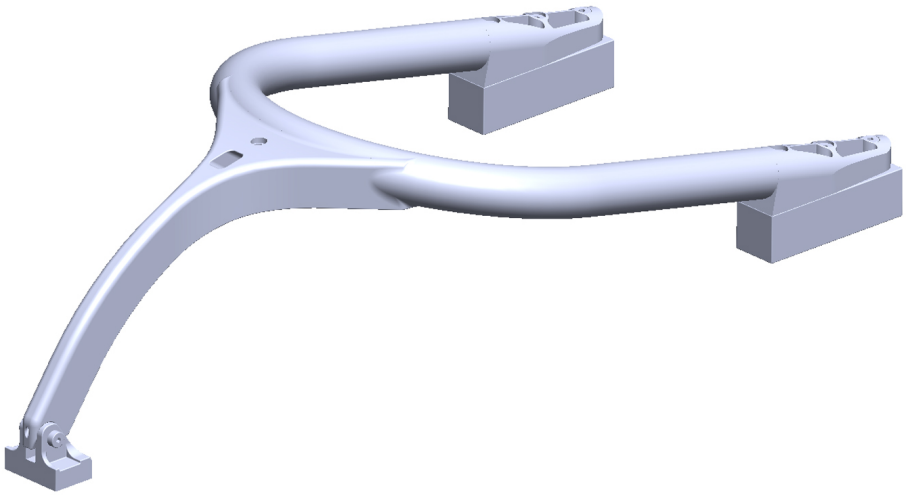

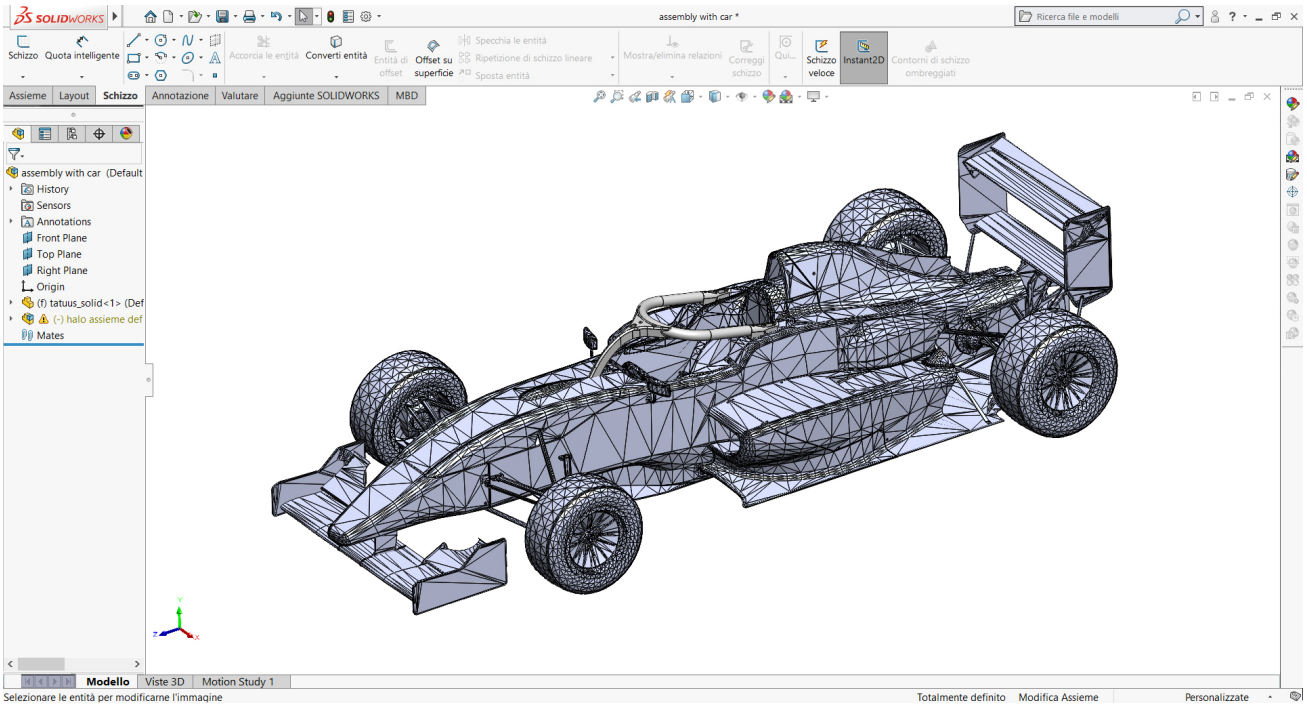
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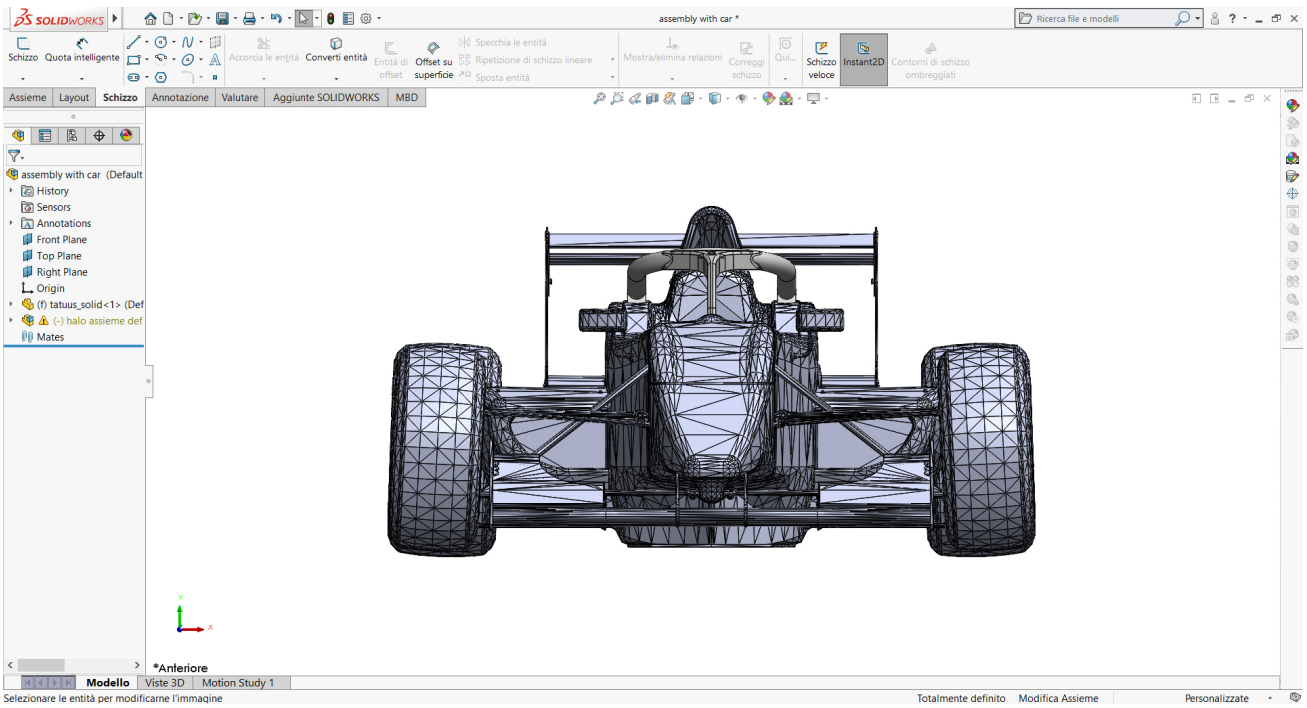
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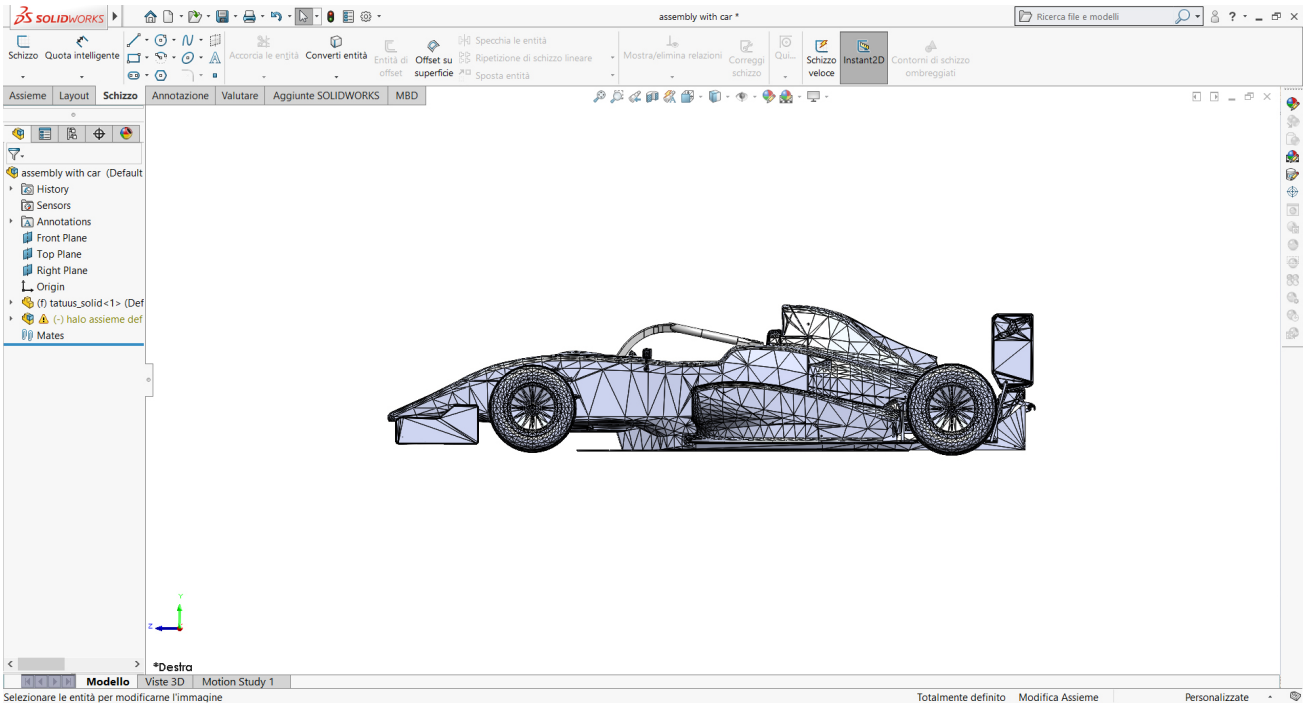
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Sposta entità
Mostra/elimina relazioni
Correggi schizzo
Schizzo veloce
Instant2D
Contorni di schizzo ombreggiati
Assieme
Layout
Schizzo
Annotazione
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Right Plane
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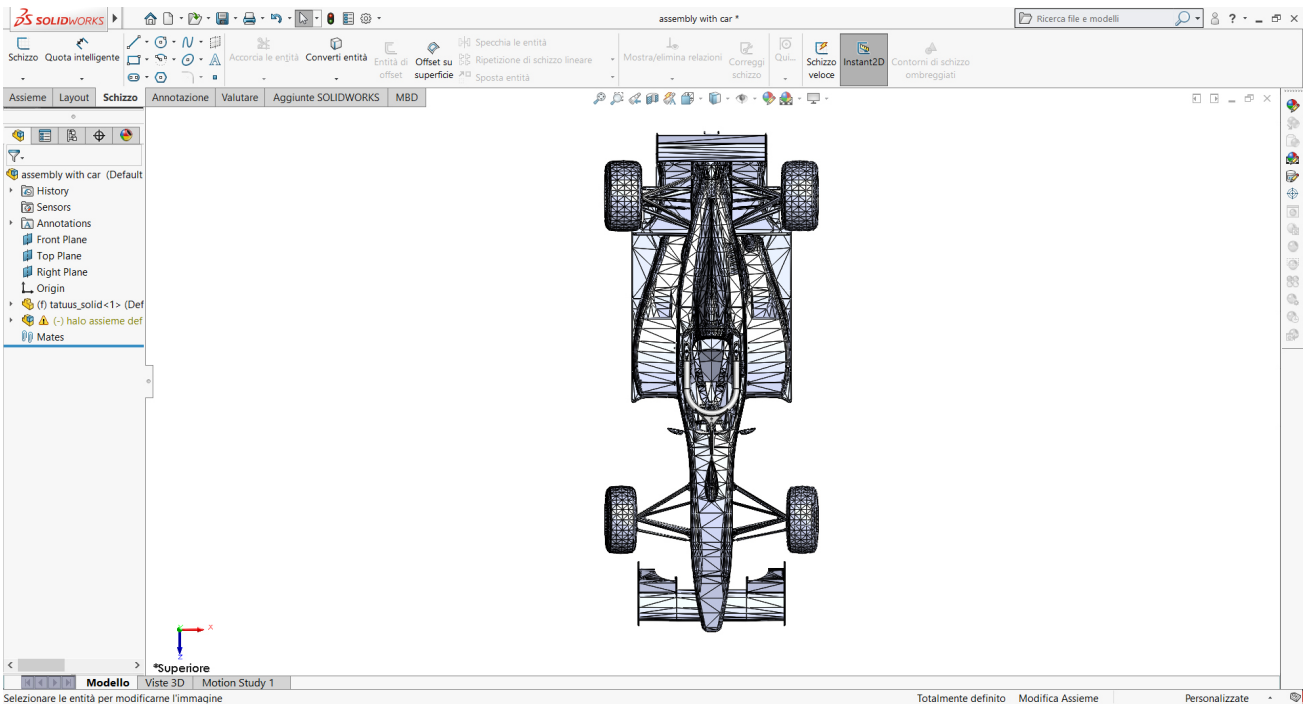
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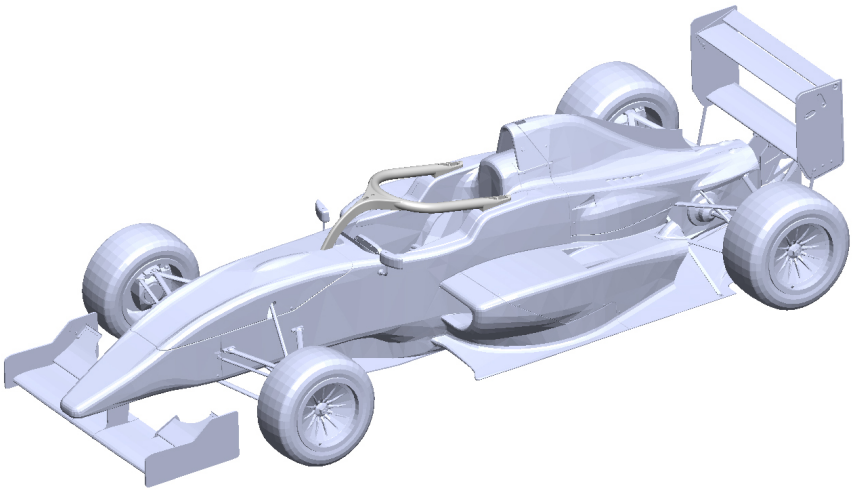
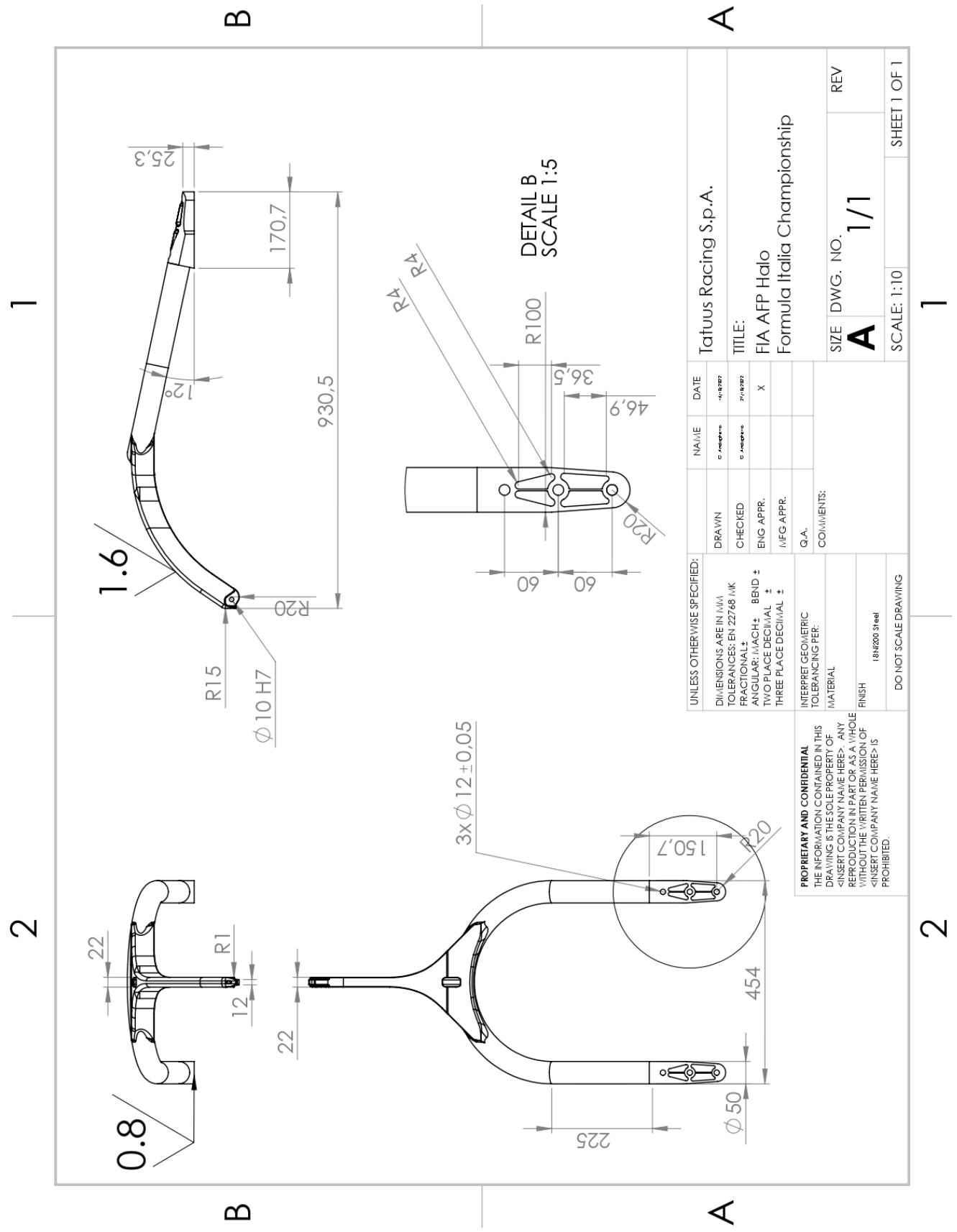
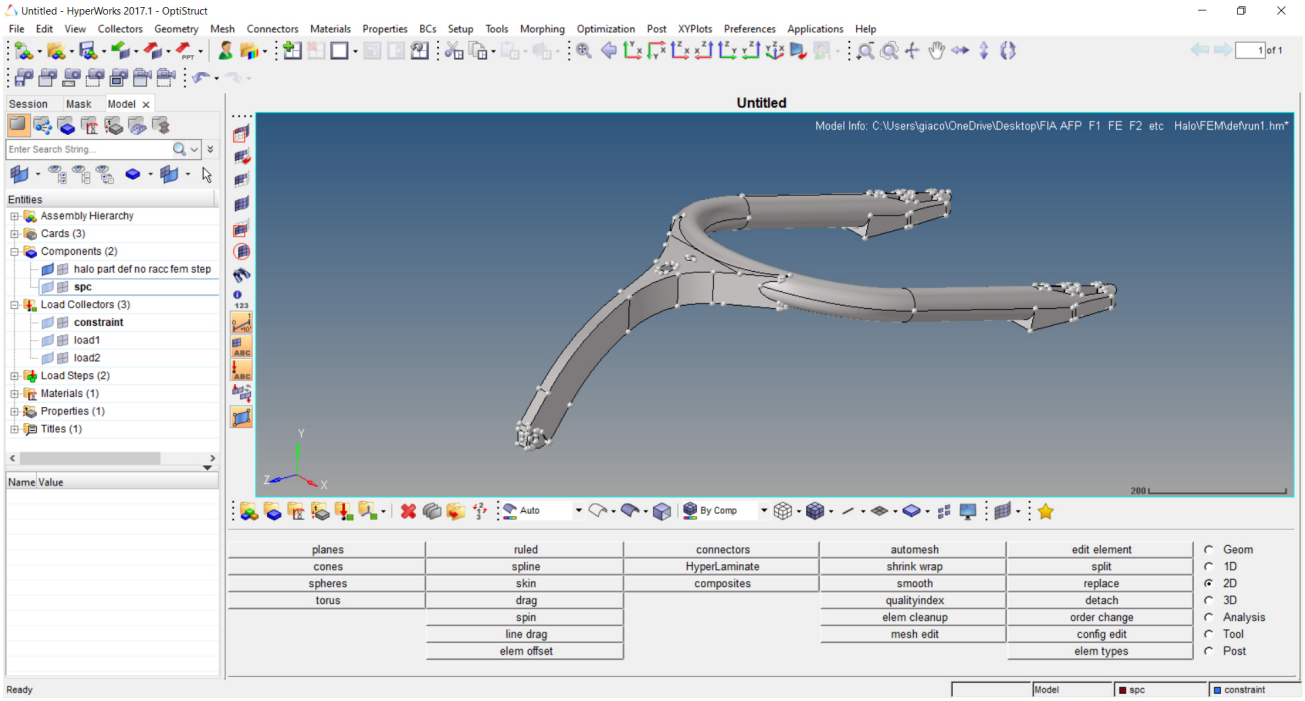


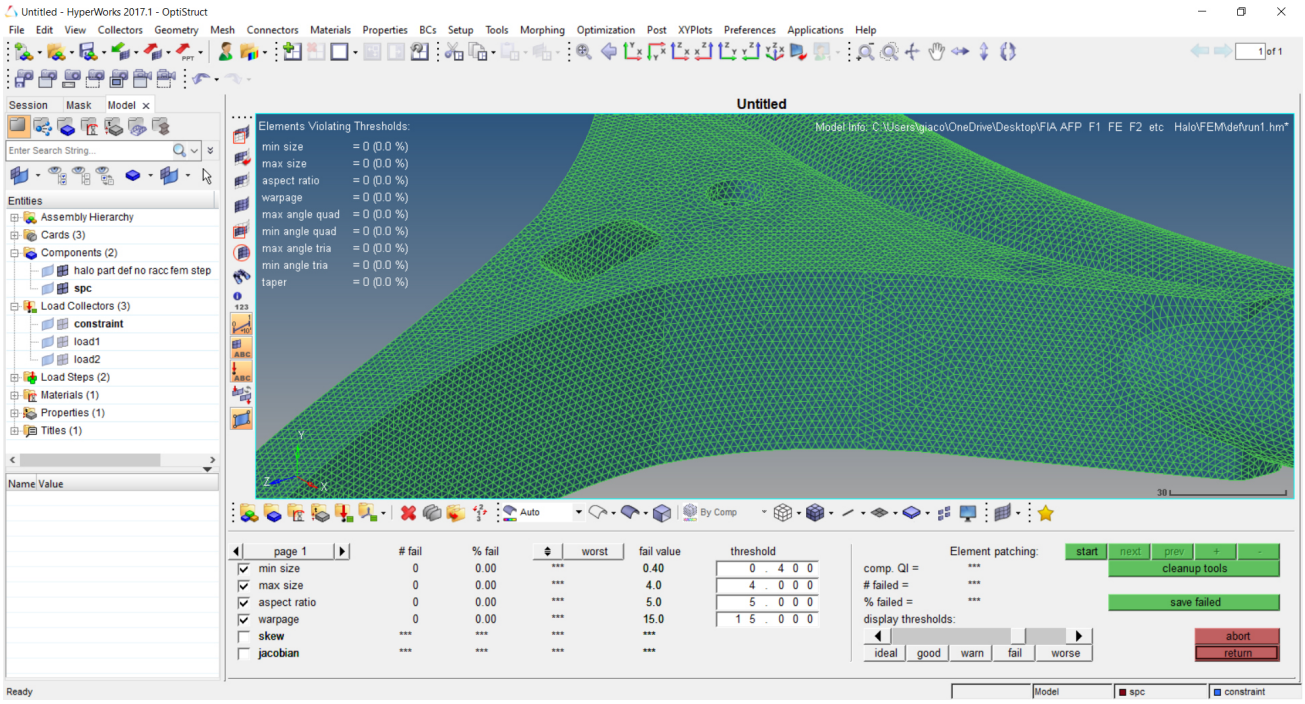
Appendix 2.2 - Technical drawing

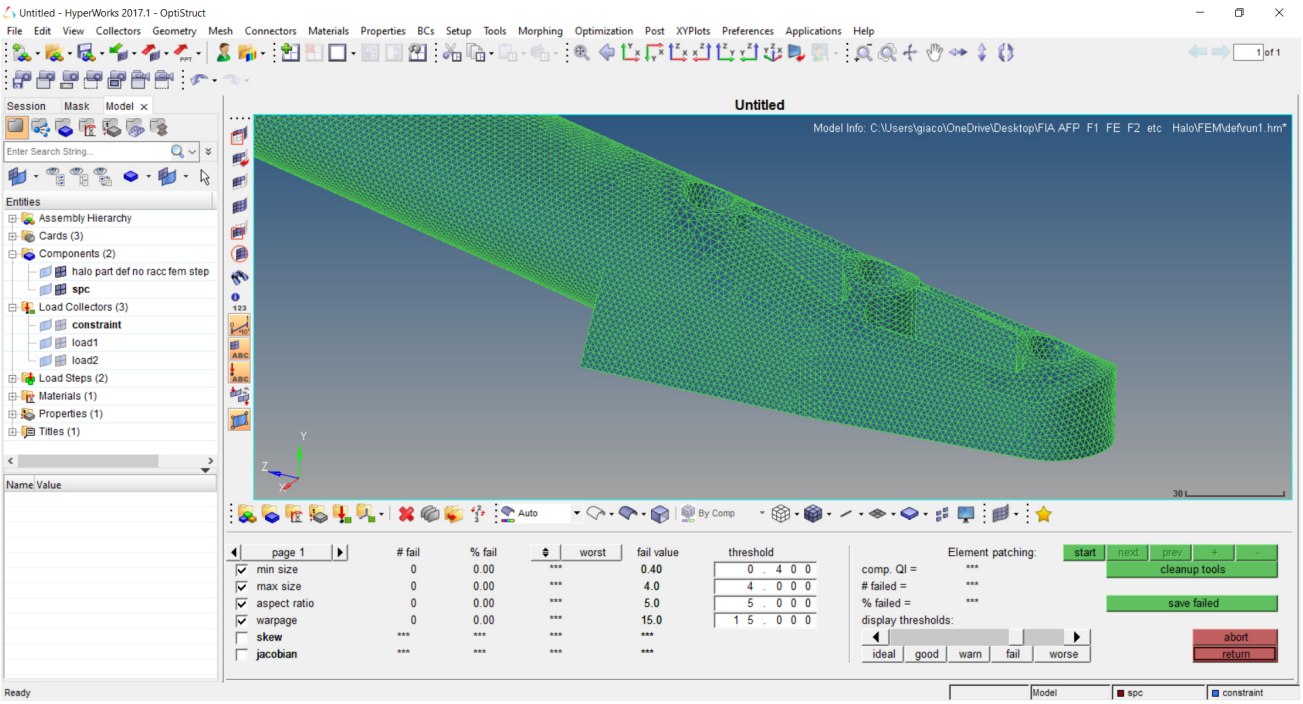


Appendix 2.3 - FEM analysis

FEM analysis was performed by using Altair HyperMesh software. If you need to ask for FEM project files, please feel free to contact Giacomo Andrighetto via the following e-mail: giacomoa@stud.ntnu.no.



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Assembly Hierarchy
Cards (3)
Components (2)
halo part def no racc fem step
spc
Load Collectors (3)
constraint
load1
load2
Load Steps (2)
Materials (1)
Properties (1)
Titles (1)
Name Value
Untitled
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worst
fail value
threshold
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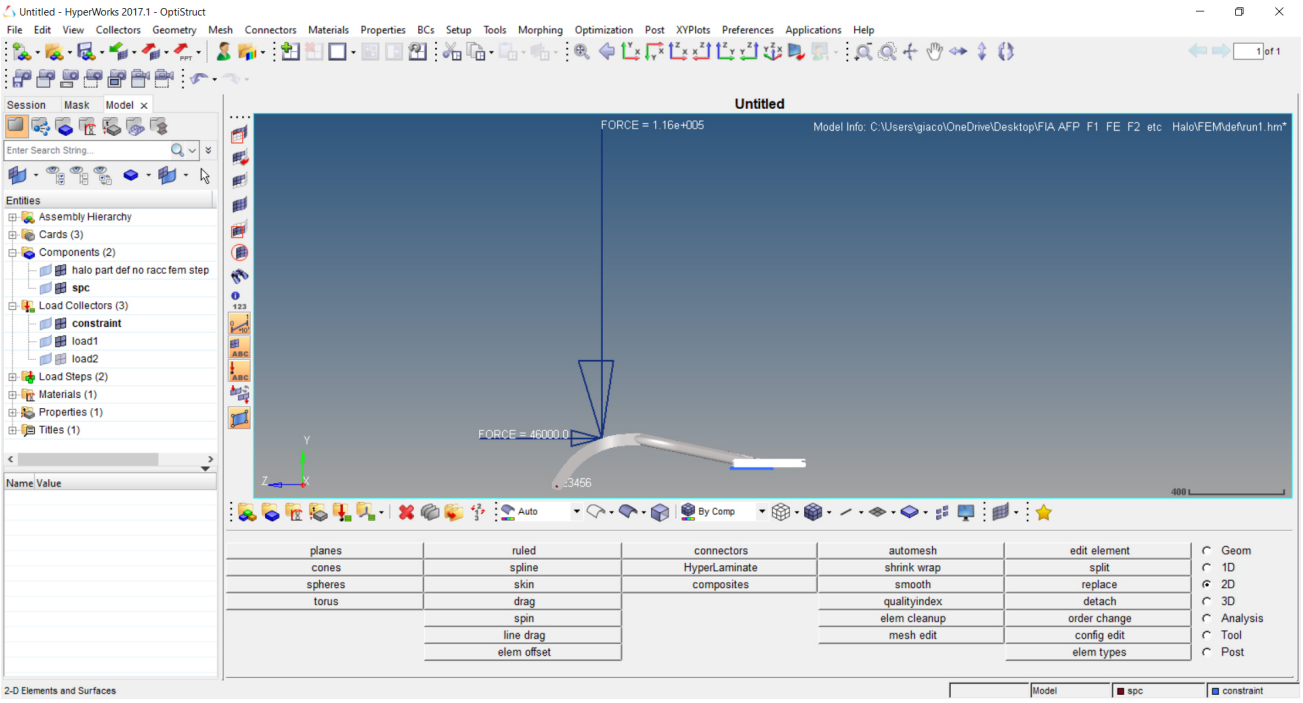
max size 0 0.00 *** 4.0 4.000
aspect ratio 0 0.00 *** 5.0 5.000
warpage 0 0.00 *** 15.0 15.000
skew *** *** *** ***
jacobian *** *** *** ***
Element patching:
start
next
prev
cleanup tools
comp. QI = ***
failed = ***
% failed = ***
save failed
display thresholds:
ideal good warn fail worse
abort
return
Ready
Model
spc
constraint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HyperLaminate
shrink wrap
split
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spheres
skin
composites
smooth
replace
2D
torus
drag
qualityindex
detach
3D
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config edit
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elem types
Post
2-D Elements and Surfaces
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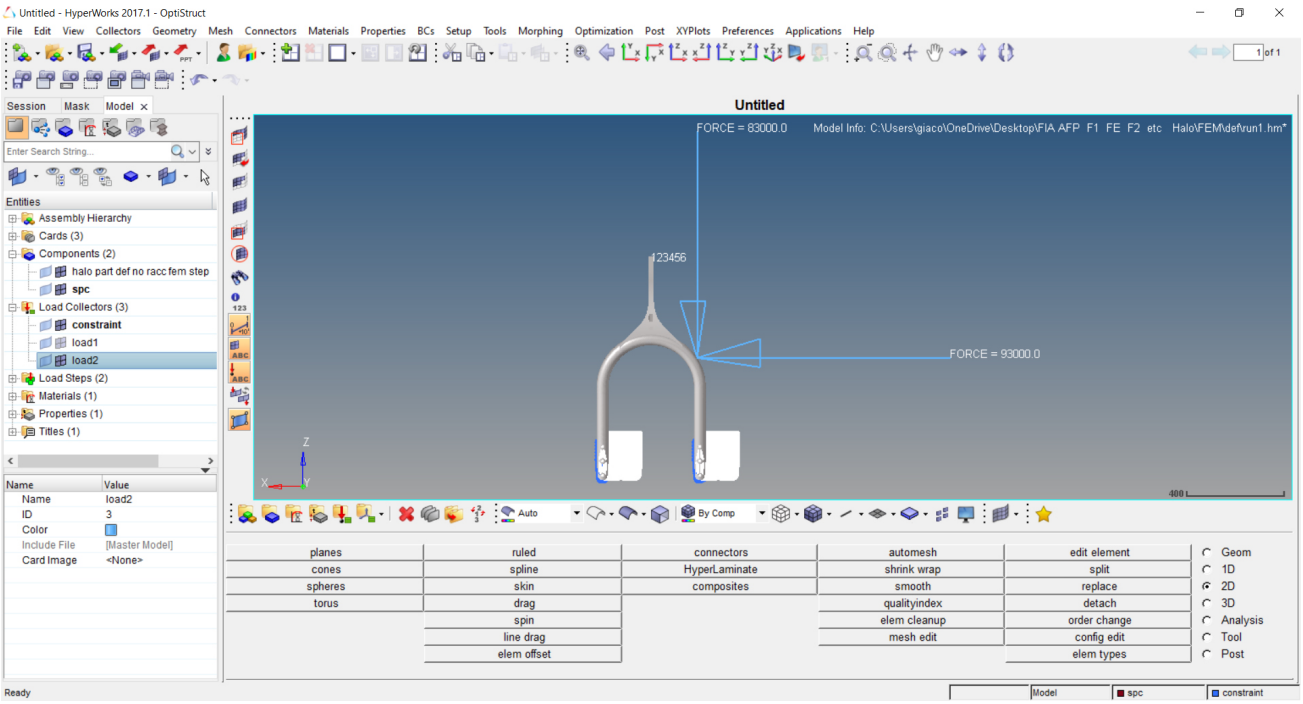
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Session Mask Model
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Assembly Hierarchy
Cards (3)
Components (2)
halo part def no racc fem step
spc
Load Collectors (3)
constraint
load1
load2
Load Steps (2)
Materials (1)
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Titles (1)
Name Value
Name load2
ID 3
Color
Include File [Master Model]
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cones spline HyperLaminate shrink wrap split 1D
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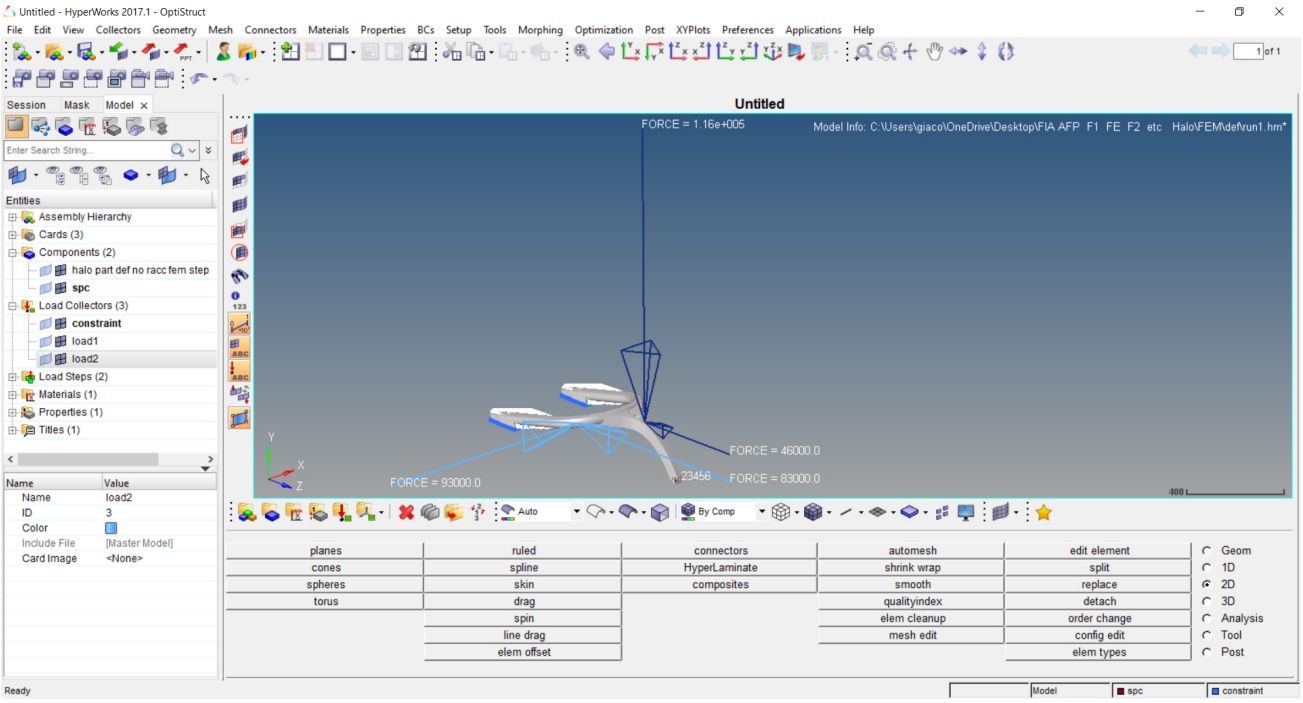
line drag mesh edit config edit Tool
elem offset elem types Post
Ready
Model
spc
constraint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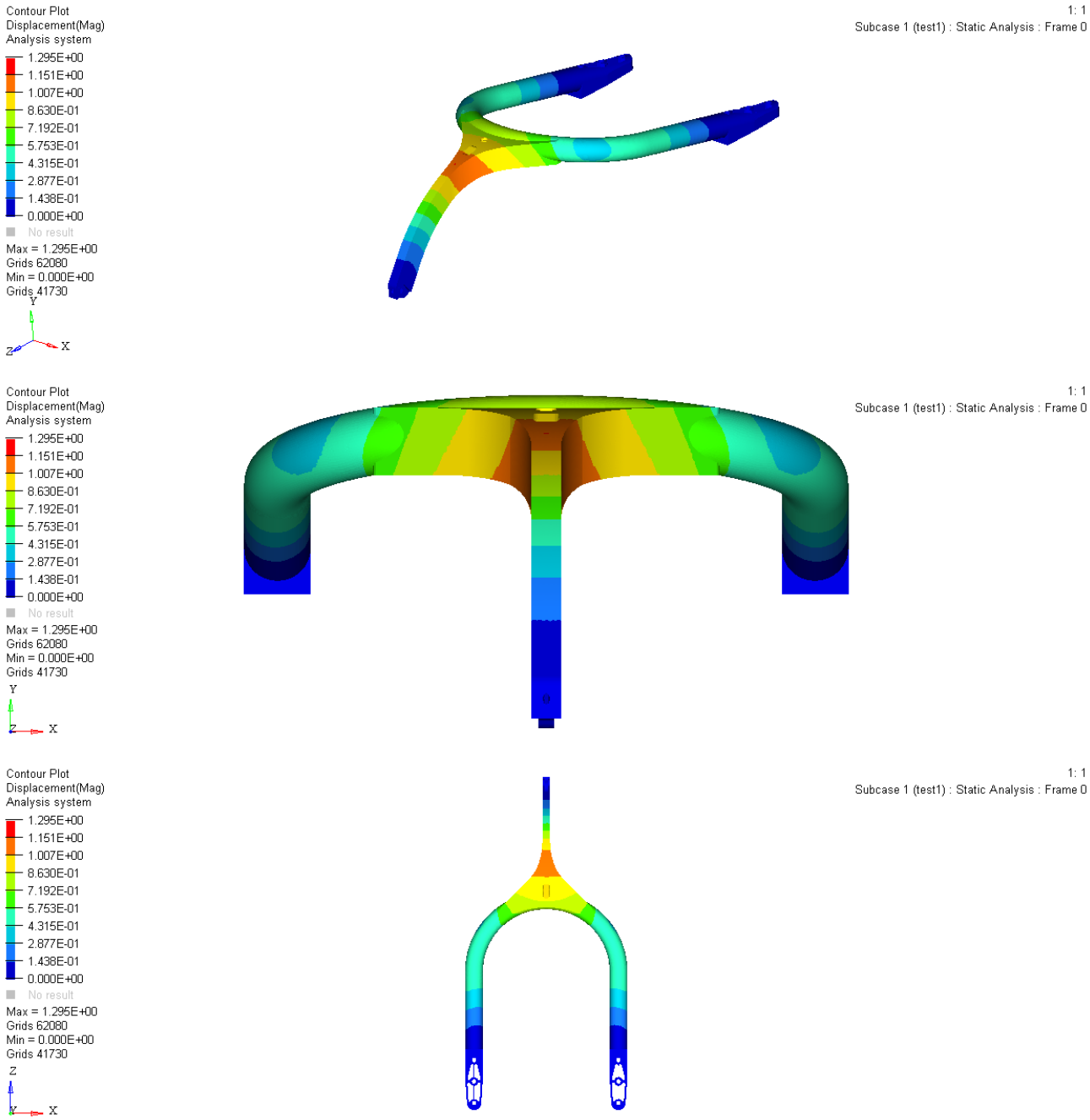
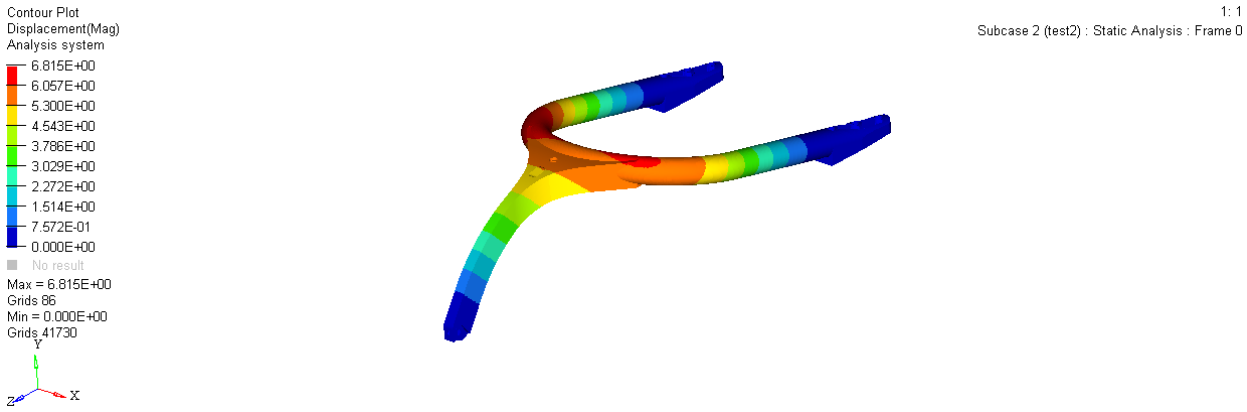
spheres skin composites smooth replace 2D
torus drag qualityindex detach 3D
spin elem cleanup order change Analysis
line drag mesh edit config edit Tool
elem offset elem types Post
Ready
Model
spc
constraint

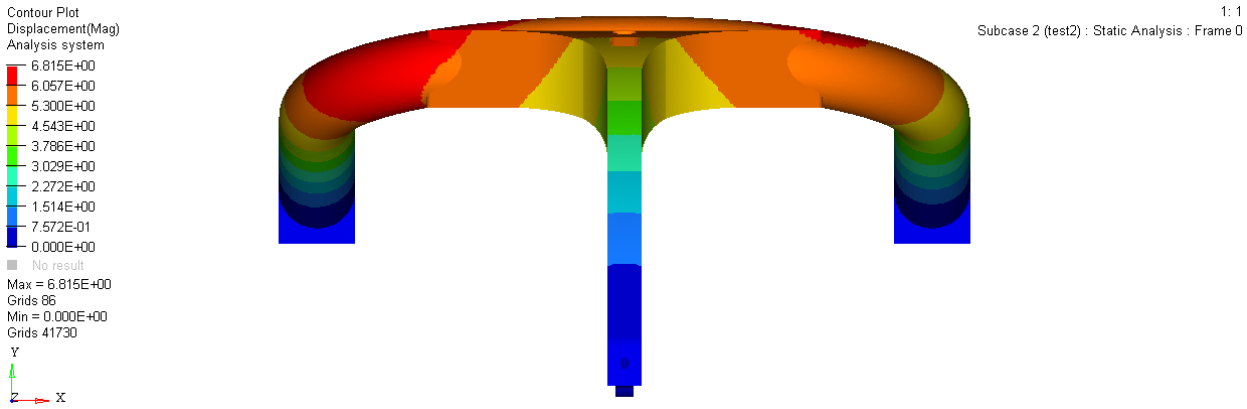
The results of the structural FEM simulations, in terms of maximum displacement on the structure, are given below.

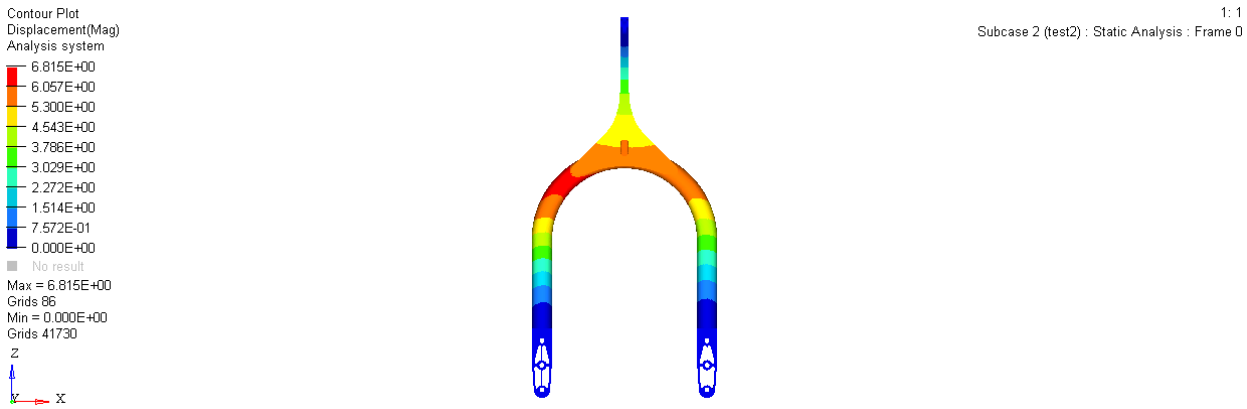
Subcase 1 (frontal impact simulation): the maximum displacement of the structure is equal to 1.3 mm, the maximum allowed value is equal to 17.5 mm.



Subcase 2 (lateral impact simulation): the maximum displacement of the structure is equal to 6.8 mm, the maximum allowed value is equal to 17.5 mm.







Appendix 3 - Link to video presentation

Video presentation