PARTS:

1. About the competiton
2. Preparations
3. MS1 part processing
4. Manufacturing the prototype
5. Motorland Aragón competition report

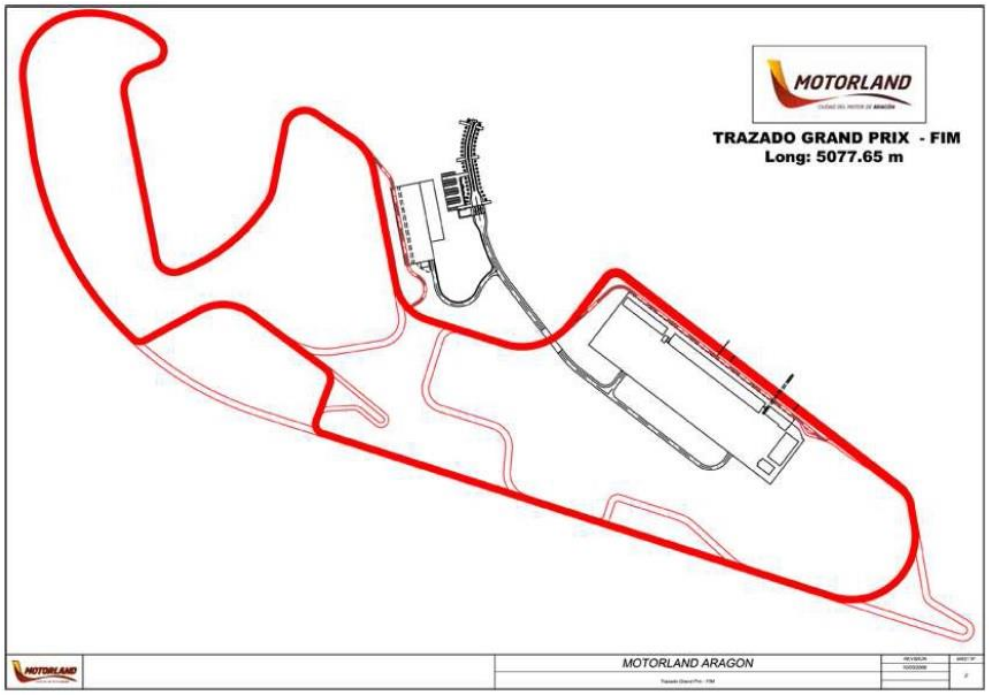
1. Moto Student competition

Moto Student is an international competition, where universities from all over the world can take a part. Many universities are from technical ground, because they could use their theoretical skills in real project. The competition is organised by MEF – Moto Engineering Foundation in cooperation with Technopark Motorland. There are 2 categories, Petrol (Moto3, combustion engine) and Electric. More information could be found at www.motostudent.com

The competition of each class is divided into 2 parts – MS1 and MS2. The first one is about designing the motorcycle and about the ways of manufacturing the motorcycle in serial production. The evaluating aspects are costs, design, innovation, industrialization and presentation.

1: Prezentace MS1

The second one is about manufacturing the prototype and testing it afterwards. There are many aspects being evaluated during the competition, such as acceleration, braking, manipulation and durability. The organisation are also checking, if the motorcycle is built accordingly to the competition rules and safeness and if the motorcycle works correctly in static and dynamic tests. This second part will culminate with the race on the circuit, which could be seen on the very next picture.

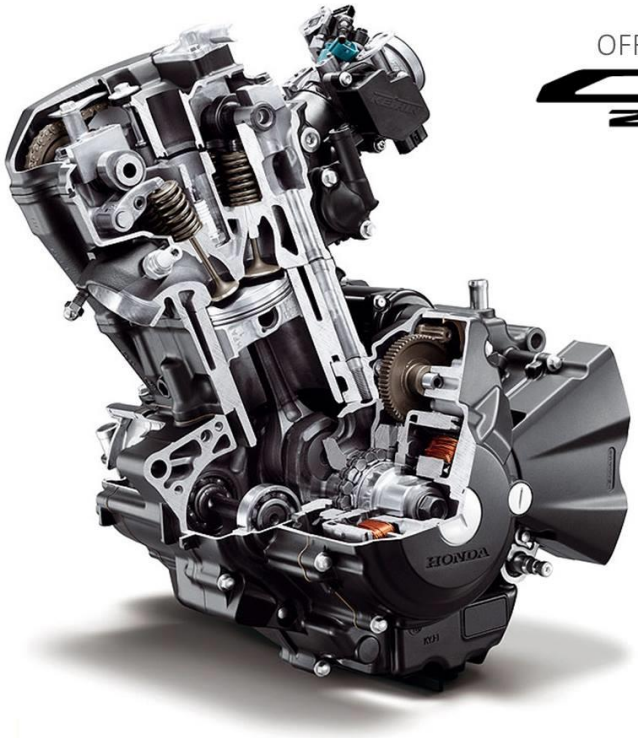


Each of these parts will be evaluated with some points, which summation will show the overall winner of Moto Student 2015/2016 competition. The whole competition has started at the beginning of 2015, the presentation and racing was from 5th to 9th October 2016 in Motorland Aragón, close to Alcañiz, Spain.

All the teams had to make their motorcycles according to the 150 pages document of restrictions and generally well-known safety principles. Restrictions made by organizers includes for example ways of manufacturing some parts, limitations of dimensions, weight, ride height and many others. We also had to use some components delivered by the organization, such as rims, tires, engine with gearbox (serial Honda CBR250R) and brakes.

OFFICIAL ENGINE

CBR 25R



moto student

POWERED by HONDA™

moto student

marchesini

OFFICIAL RIMS SUPPLIER

M10R Kompe Moto 3

V2MOTORSPORT.com

Students participating in Moto Student competition should gain skills in creating the whole project, communicating with dealers and sponsors, designing parts and their subsequent testing and manufacturing, working with limited budget... And last but not least, team cooperation.

2. Preparations

At first we had to make a team of students. We named ourselves CTU Lions, registered ourselves into IV. edition of Moto Student and got number 5 from the organisers. The registration started 1.2.2015 and ended 31.5.2015.

Nábor studentů do projektu

The team of CTU Transportation Faculty students has registered in the first category – Moto Student Petrol. The registration fee includes 7 memberships, entrance and insurance on the Motorland Aragón for all the 7 members, CAD software for development and all the components, which has to be used on the prototype. For 2015/2016 MotoStudent it was (as previously said) Honda CBR250R engine and gearbox, brakes, rims and tires.

Jan Štěrba had to take care about management and some calculations made by simulation software, Michal Růžička's field was design, especially development, drawings and innovation. Veronika Hegerová was one of the 2 girls in our team and her task was to publicate and propagate our project. Michal Nehasil had to think about the manufacturing and industrialization processes. Šárka Jozová was the 2nd girl in our team and she had to care about the economical analysis and finances of our project. Then there were 2 guys, Vojtěch Ludvík and Ondřej Paprčka, who had to make some static and dynamic simulations of the frame and motorcycle.

The first deadline was at the end of March and it was about the design of the motorcycle. By the end of April we had to finish our innovation part and by the end of May the financial analysis.

Document, which had to be delivered by the middle of July 2016, included these parts :

- vehicle design
- analysis and technical calculations
- technological innovation project
- definition of the manufacturing and industrialisation system
- analysis of the development costs and the industrial process for mass production

The whole team could be seen on this picture:

Tým CTU Lions

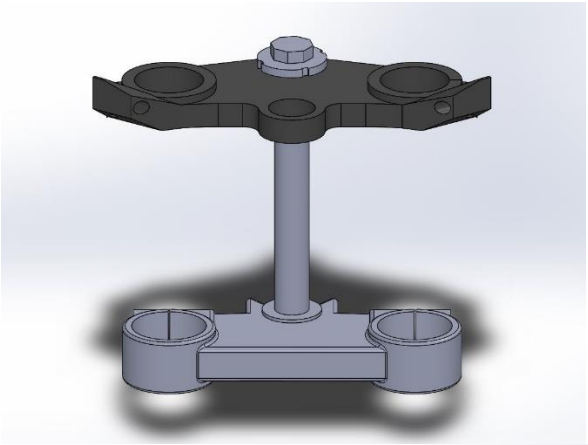
But we needed one more thing – place where to build our prototype. The problem of our faculty is, that there aren't any halls with all the needed equipment, so we had to search outside the university ground. Here we were really lucky, because our project supervisor Ing. Jiří First had very well equipped workroom. With his very kind permission we finally could start to build our prototype. At that's autumn 2015.

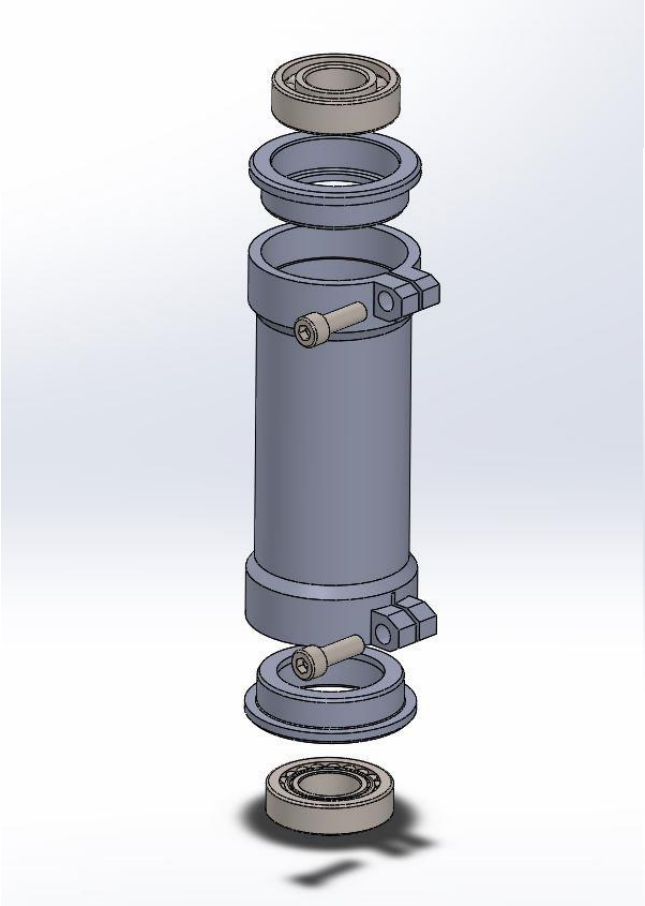
Our project supervisor is Ing. Jiří First, worker of the Department of Vehicle Technology, which is being led by doc. Ing. Petr Bouchner, Ph.D

3. MS1 part processing

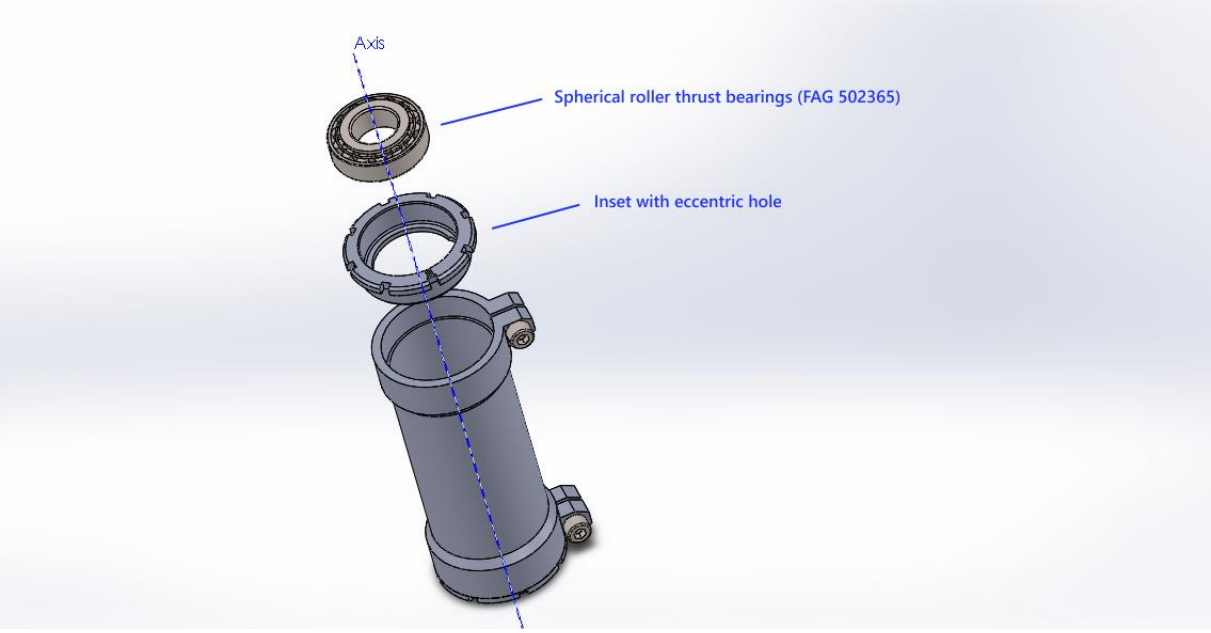
Before we started anything, we decided to gather some knowledge. So we arranged a meeting with many TOP czech motorcycle constructors. You may know Oldřich Kreuz, Jíří Strloukal or Ing. Martin Molcar. We've also visited Jawa factory (with kindly permission of Ing. Miloslav Vacek) in Týnec nad Sázavou. The spring Motosalon exposition was also very heplful, because we managed the cooperation of our team and Moto Forza, the czech motorcycle fairing producer. Last but not least we had to search on the web, in the books and in the magazines.

Our team has splitted the project parts quite equally. As it was said previously, designing the frame was Michal Růžička's responsibility. He decided to use Solidworks for all his drawings. Very important decision was to use some parts of Aprilia RS 125 motorcycle. Therefore we had to decide, which parts to use in our prototype and precisely draw them in Solidworks. These parts were fork brackets, forks and bearings. Few weeks later our prototype parts are created in Solidworks and we can move on.





One part of our project is innovation. There we decided to use an eccentric bearing mounting, so we have 4 different positions of front wheel trail and fork angle.



Few weeks later our model finally start to look like a motorcycle.

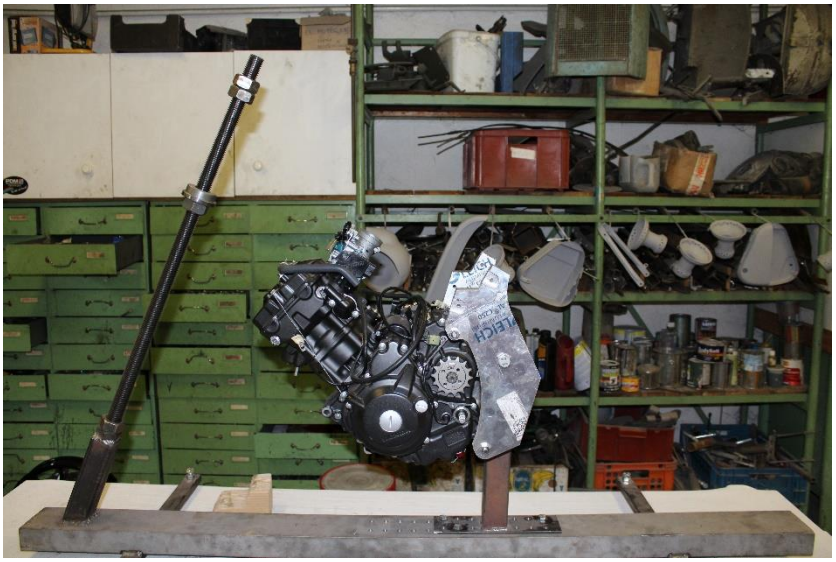
By the time we're also working on static and dynamic models, mathematical calculations for top speed and rear sprocket teeth number. Šárka and Michal N. are working on plans for industrialization. We're going to have many subcontractors.

4. Manufacturing the prototype

While Michal R. was designing the motorcycle, the package with parts from the organisers has come. That was that important moment, when everybody stopped and thought a bit – that's it, it's happening! We're building a motorcycle! So we made the very important thing – mountain jig.

At the same time we've bought Aprilia RS 125 without the engine. That was the source of many parts for our prototype. We also started to manufacture the front wheel spacers.

We decided to make aluminium front brake holder and 2 sidewalls. These parts were waterjet cut outside our workroom. So we had all the parts needed and we could start assembling the mountain jig.

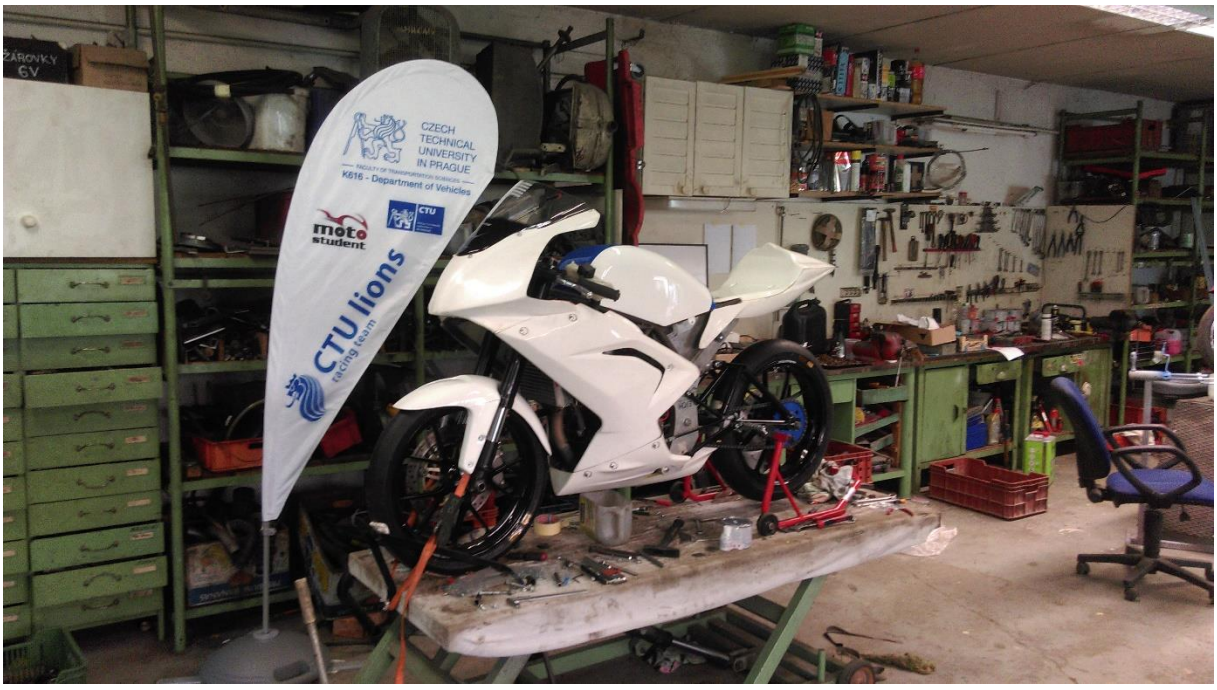


As it usually happens, we didn't have time during the school time, so we bought all the steel tubes needed for frame by the end of school year. We were bending our steel tubes on workroom bender of small diameter, just hydraulic press and holding system.

After we made the frame and swingarm, we had to buy some shock absorber. We chose Öhlins KA037. Then we put it all together and it finally looked like something quite similar to a single-track vehicle. In the summer we were continuing our work on the prototype, we were buying all the parts, like, chain sprockets, chains, braking disk, battery and many more.

Next one was the production of many small, but very important parts, like brake holders, foot rest holders, spacers and so on. By the end of August / beginning of September was the fuel tank manufactured, out of steel plates. By this time we were also connecting all the electrical part needed to start the engine. And that really happened.

Approximately in the middle of September, when all the dimensions of the prototype was almost final, we contacted Moto Forza and with their huge effort and willingness we end up with awesome and fitting fairings. Great thanks to Moto Forza for such a help!



At the same time we were consulting the final dimensions of our custom made cooler by family company called BS Coolers (BS Chladiče). Another thing needed to be done was exhaust pipe and airbox. We made these in our workroom with bigger amount of approximations. We wanted to make it much better, but at that while we were in real time pressure.

We really wanted to tune our prototype, but in cause of lack of time we couldn‘t do that. We thought that this might be a huge struggle in Spain, but we still decided to pack everything and get on the road with clear destination – Motorland Aragón.

5. Motorland Aragón competiton report

Our journey to Motorland Aragón has started on Monday 3rd October. We were divided into 2 groups. One went with transporter (prototype, project supervisor, 2 team members) and the other one went with rented camping van (the rest of the team). We arrived in early morning on Wednesday and built our base between other camping vans.

In Wednesday’s afternoon we had to register ourselves, then we went to our pit. We had a shared pit with Greeks. We were finishing few details and putting the stickers on our white and blue motorcycle (photo 1). We were also solving some issues which came out after the journey, or which weren’t solved at home in cause of time delay. (photo 2,3,4,5)

On Thursday morning we were finishing some last things and the motorcycle goes on technical control. The organizations found few smaller mistakes, which we had removed in the afternoon (photo 6,7,8,9). One part of our team has also presented our MS1 project – parts about the definition of the manufacturing and industrialisation system and analysis of the development costs and the industrial process for mass production. Later that afternoon we went on the technical control again and our motorcycle was honoured with sticker „Motostudent verified static“. Therefore we could take part in testing rides, which went quite smoothly (photo 12,13,14,15,16,17). We’ve also presented the second part of out MS1 project – design, innovation and dynamic simulations. (photo 10,11)

On Friday morning (after few efforts of tuning our ECU) we gave our motorcycle to the professional rider (who will try the bike and the goes on one round on the track) and were waiting what will he say. The reaction wasn’t the best possible. The motorcycle isn’t in a competing condition – the engine runs inconsistently. We knew the problem was the ECU. We went back to our pit and something really awesome happened. The Greeks offered us their original Honda ECU! So we had like

one hour to change it, with most of our wiring. And we were lucky, everything went fine and on the second try the test rider said, that the motorbike ride really well. And we got the most important sticker – „Motostudent verified dynamic“. (photo 18,19,20) But that’s not the end of our Friday rhapsody. On the afternoon’s plan there was a dynamic test, with our rider. It contains 3 parts – braking, gymkhana and top speed. But our motorcycle decided not to start. So the last chance of successful dynamic test finishing will be on the very next day – in the morning.

So, Sunday morning, the second and last chance. (photo 21) Everything goes fine, but by the third part of the tests, there are again some complications about the run of the engine. We were searching the whole mid of the day for the mistake – pump, cooling, wirings... Then we went testing on the open field and everything works. On the afternoon training we were going with working motorcycle. We were the slowest ones with time 3:13:81, but the motorbike keeps working and that was the most important! At night there was a session, where the teams with good results in MS1 were honoured. On the podium of our category (Petrol) there were 3 teams from Spain, 1,3 and 7.

Sunday 9th October. The day we all were waiting for. In the forenoon there was a 40minute testing, where our rider made his best result yet – 2:59:048 (photo 22). But on the start there were some complications again and our rider went on track of 40‘ testing ride after 20 minutes. But he was able to make few laps and qualify himself for the afternoon final race. At 14:30 was our motorcycle standing on the last position (but it was there!) with Michal on the saddle. And they went on track. (photo 23). He completed 3 laps and the engine stopped working again. That took him out of the race. On the result list we were on 25th position.

The winners of the race were italians – team PoliTO.