Having an interest in Russia for a long time, I wanted to work in the Russian space industry. Since the cooperation between Roscosmos and ESA is increasing, I hoped that it might even be possible. To learn what was possible, I mailed Professor Malenkov who chaired the space robotics chair at the St. Petersburg polytechnic university. He answered that it would not be possible at his own university but that he would ask around among his colleagues in Moscow for me. A number of weeks later I got the great news that I could work at the Space Research Institute of the Russian Academy of Sciences. After e-mail contact and a dinner in Noordwijk, Netherlands (ESA ESTEC location), I found myself at the Russian consulate with my visa in hand. My Russian adventure had begun.

IKI
The Space Research Institute of the Russian Academy of Science (Институт космических исследований Российской Академии Наук) is the leading organization on space exploration within Russia. They are responsible for the design and construction of most scientific instruments on Russian spacecraft. Furthermore they have a leading role in formulating the the science goals of the Russian Space Program. Currently they employ around three hundred scientists and engineers. Apart from the Russian space program, they are also responsible for a large number of instruments on the joint ESA/Roscosmos Exomars program.

LUNA PROGRAM
In recent years, Russia formulated the ambition of lunar exploration. As a first step in this endeavor a number of robotic exploration missions are to be conducted. One of these missions is Luna Resurs (Luna 27), which, amongst others has the objective to identify the water content in the lunar regolith. The mission will consist of a lunar lander vehicle and a micro rover that is deployed from the lander. The mission is set for launch in 2019.

MY WORK
I was placed in the department of Dr. Oleg Kozlov, specialized in manipulators and robotic arms for spacecraft. My main task was to design the breadboard model of a lunar rover to be part of the Luna Resurs (Luna 27) mission.

The breadboard model is used to develop and debug the navigation and control software for the micro rover. The breadboard model has all of the mechanical features of the flight model. The main differences are in the weight optimization and the thermal isolation.

The rover features four metallic elastic wheels, separate drives for each wheel, a robotic arm with a shovel and a drill and a pair of cameras for stereovision based navigation. The breadboard model is used to test all these features both singled out as well as in combination with each other.

The majority of my work consisted of the mechanical design of this rover. The initial weight and volume requirements were to be translated into a complete Solid Works assembly and a set of production drawings of each part. On top of that, limitations in terms of tolerances, precision and...
architecture and bustling nightlife, it provides the visiting student with more than enough to do. And the super efficient metro system (the stations of which are a architectural highlight by itself) makes every corner of this huge metropolis quickly accessible. Personally, I enjoyed many afternoons at Gorki Park. Sitting next an engineering model of the Buran while drinking a beer and watching the sun set over the Kremlin is quite a unique experience. For aerospace enthusiasts in particular, Moscow features two of the most amazing museums in the world. The Cosmonauts museum is a shrine to all Space lovers with its titanium monument to spaceflight on top and its beautiful positions underground. Furthermore the Monino Air force museum features almost every single aircraft ever used by the Soviet military, including the worlds' largest helicopter, the first super sonic passenger jet and a number experimental lifting body aircraft) and is unique by its sheer size and exposition. Even Caspian sea monsters (ekranoplan) are close by as a small version is on display in the suburb of Khimki.

Since there were three holidays during my stay (Labor day, Victory day and Russia day) I had the opportunity to explore a bit of the rest of Russia. Russia is most conveniently traversed by train. Trains are leaving Moscow in all directions and are mostly conveniently scheduled to drive overnight. Furthermore, Platzkart tickets (3rd class sleeping wagon with 54 beds per wagon) are quite cheap and offer a unique opportunity to meet the real Russians. Most travellers are very interested in foreigners and despite the language barrier are often in for a talk and a toast. The main downside would be the beds, as they are not really designed for a two meters tall Dutch person. Despite the minor induced back pains, I greatly enjoyed my trips to Tartarstan, Karelia and St. Petersburg during the holiday weekends.

CONCLUSIONS
My twelve weeks in Moscow turned out to be an extremely rewarding experience. Being able to contribute to an actual space mission on its own is already a great feeling. But the fact that it was in Russia made it extra special to me. Despite what the current media incidents might suggest, the Russians are really gently people and in general very helpful to foreigners.

As a conclusion, I would encourage everyone to pursue the opportunities that you have as an Aerospace Engineering student to go abroad. If you take the chance to it turns out to be quite easy to go to some unexpected places. A year ago I would have never tough it would be possible for a European student to work in the Russian space sector, but it turned out to be a smooth process and a great experience.