This year, the 28th Space Department has the honor of organizing the Annual Symposium of the VSV ‘Leonardo da Vinci’. On March 4, 2014, a total of 564 engineering students and Aerospace professionals visited the symposium and enjoyed seven extremely inspiring talks and interactive discussions. This day, themed ‘Planetary Exploration’ focused on future and planned robotic and manned missions to Mars and Jupiter.

Humankind was once drawn into unknown lands and across vast oceans. Now is the time to set our sights on the heavens, to discover, explore and seek answers to the many questions we have about our solar system. The innovations needed to one day set foot on Mars are the challenges that today’s students, the future generation of Aerospace engineers, will develop on. Man has always been driven to discover new worlds and explore the unknown whilst pushing the boundaries of modern day scientific and technological limits as far as possible. Space exploration is one of the Faculty of Aerospace Engineering’s main goals for the future and our contributions to these missions are growing. Furthermore, delivering value to the public is essential in maintaining a sustainable and lasting human presence in space exploration endeavors. Robotic and manned exploration of Mars and Jupiter will bring the world together by sharing the excitement that was once achieved by the Apollo program. It is in our nature to explore the unknown, to question the known and to expand our human presence across the next frontier.

EXPLORATION OF JUPITER, EUROPA AND OTHER ICY MOONS

Opening the day was Prof. Roger-Maurice Bonnet, former Director of Science at the European Space Agency. Currently, he is the president of the Committee on Space Research (COSPAR) and executive director of the International Space Science Institute (ISSI) in Bern. Professor Bonnet gave the audience a very informative and interesting introduction to the discovery of Jupiter, the scientific revelations already made about this planet and the finding of the icy moons Ganymede, Callisto, Europa and Io. As a conclusion, he noted the scientific value of exploration of the icy moons and the importance of the upcoming Jupiter mission JUICE. The chairman of the day Prof. Heinz Stoewer, VSV ‘Leonardo da Vinci’ member of honor, seamlessly introduced our next speaker Dr. Bert Vermeersen, co-investigator of the GALA and PRIDE instruments on the JUICE mission. Dr. Vermeersen is an associate professor at our own faculty here in Delft and following the introduction by Prof. Bonnet continued to dive into the JUICE mission. He gave a very clear summary of the habitability of the four icy moons concluding that Europa had the four crucial aspects required: liquid water, stable environment, essential elements and chemical energy. He then continued to discuss the two JUICE instruments, of which he is co-investigator. These are the Ganymede Laser Altimeter (GALA) and the Planetary Radio Interferometer & Doppler Experiment (PRIDE). Finally he concluded by showing a slide of the current JUICE team and emphasizing the need for young engineers to join as “[Bert Vermeersen and his team] will be retired by the time the JUICE mission arrives in

TEXT: Nout van Zon, BSc Student Aerospace Engineering, Symposium Affairs of the 28th Space Department
LONG DURATION MANNED FLIGHTS

Together with the Jovian system, Mars is also one of the most exciting and interesting targets for planetary exploration in our solar system. The Dutch ESA Astronaut André Kuipers was the next speaker and combined his medical background and space flight experience to discuss the human aspects of flying a long duration mission to Mars. Kuipers strongly believes that one day, we will eventually set foot on the red planet, however that many technical hurdles will first need to be overcome. By comparing the human aspects of space flight on the International Space Station and on a long mission to Mars, he was able to make some very convincing conclusions.

First and foremost, André Kuipers mentioned the psychological aspects of a manned mission to Mars. During his six months stay on the ISS he was always able to look at the Earth, our home. Furthermore, the presence of the Soyuz spacecraft ready to evacuate the entire crew and bring them safely back to our planet within a matter of hours was reassuring. On a mission to Mars, home is just a pale blue dot in the vastness of the universe and there’s no turning around en route. This brought him to his next conclusion being the risk of an inflight failure of a subsystem or a medical emergency of one of the crewmembers. Once again, there is no turning around or Soyuz to bring the crew safely back to Earth. Furthermore, the ESA astronaut mentioned the issue of consumables including food and drinking water. The ISS has proven technology in recycling water however; it is also continuously visited by resupply vehicles with fresh food. On a mission to Mars, all food must be taken with or it must be grown onboard. Finally, Kuipers believes the biggest technical hurdle to overcome for a manned flight to Mars is protecting the crew against the extremely strong radiation experienced once outside of the protective radiation belt surrounding the Earth.

MARS, A MOST EXCITING DESTINY

In the afternoon, the Symposium continued to look at Mars. Th next speaker was Prof. Jean-Pierre Bibring from the Institut d’Astrophysique Spatiale. Prof. Bibring has an extensive experience with missions exploring the solar system, in particular Mars, including being responsible for the OMEGA instrument that was launched as part of the Mars Express mission. He gave a very clear and intriguing introduction to what is already known scientifically about the red planet. He discussed the origin of the planet’s red color and its very interesting surface features. Following was Richard Cook from the NASA Jet Propulsion Laboratory in the United States. As deputy program director of the Curiosity mission, he is an excellent expert on this operation and shared the very exciting engineering story of the rover. From the design hurdles to the spectacular landing of the Curiosity on the Mars, he guided us through the entire engineering process. Concluding the Mars segment was Vincenzo Giorgio, Vice President Domain Exploration and Science for Thales Alenia Space from Torino, Italy. He gave the audience insight into the status of the ExoMars 2016 and 2018 missions. His focus was on the 2018 landing mission that will deploy a European rover on the red planet.

GLOBAL EXPLORATION ROADMAP

Concluding the symposium was Prof. Johann-Dietrich Wörner, chair of the Executive Board of DLR and chair of the ESA Council. Heading the ESA Council Professor Wörner discussed the future global exploration roadmap of the world’s space agencies and the politics involved in the space industry. “Space is not just about science, it is also about politics. Whatever we do in space has to be legitimate, since everything we do is funded by tax money. Therefore, the first and most important question we always ask is the ‘why-question’ as Wörner explained during his presentation. In the end, if we are unable to generate public interest for going to Mars the answer to this question will be ‘no’.”
It will be difficult to achieve this goal, "you have to convince people to such an extent that they come to you and ask you to please go to Mars to look for water," in his talk and discussion of the 'why-question,' he addressed the current top-down approach in the space industry: looking at what the agency wants and convincing the public it is important. "That has to change, in the future we should ask what the end users want and need, whether it be the general public or scientists, and the executives should make a strategy around that." Jokingly Wörner continues to discuss the political role in the space industry by referring to the Apollo program "I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth," President Kennedy stated on May 25, 1961. "Politically this is no longer correct, nowadays we would have definitely included 'and a woman.' So why was it possible to put a man on the moon in under a decade and have we not already set foot on Mars? Politics have changed according to Wörner, "in the past we often did something and explained only after the mission why we did it, we go to space to understand the past, the present and the future of the universe. This is a motivation that politicians don't share, because within the four years of an election period, the change in the universe won't be that big." Ultimately, the ESA Chairman is confident we will one day set foot on Mars, but not for another 30 years and not without a global cooperation of which the International Space Station is a great example.

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Figure 3. Richard Cook discusses the NASA missions to Mars, focusing on Curiosity

Figure 4. Dr. Bert Vermeersen discusses the habitability of Jupiter’s icy Moons

SPACE DEPARTMENT

The Space Department promotes astronautics among the students and employees of the faculty of Aerospace Engineering at Delft University of Technology by organizing lectures and excursions.