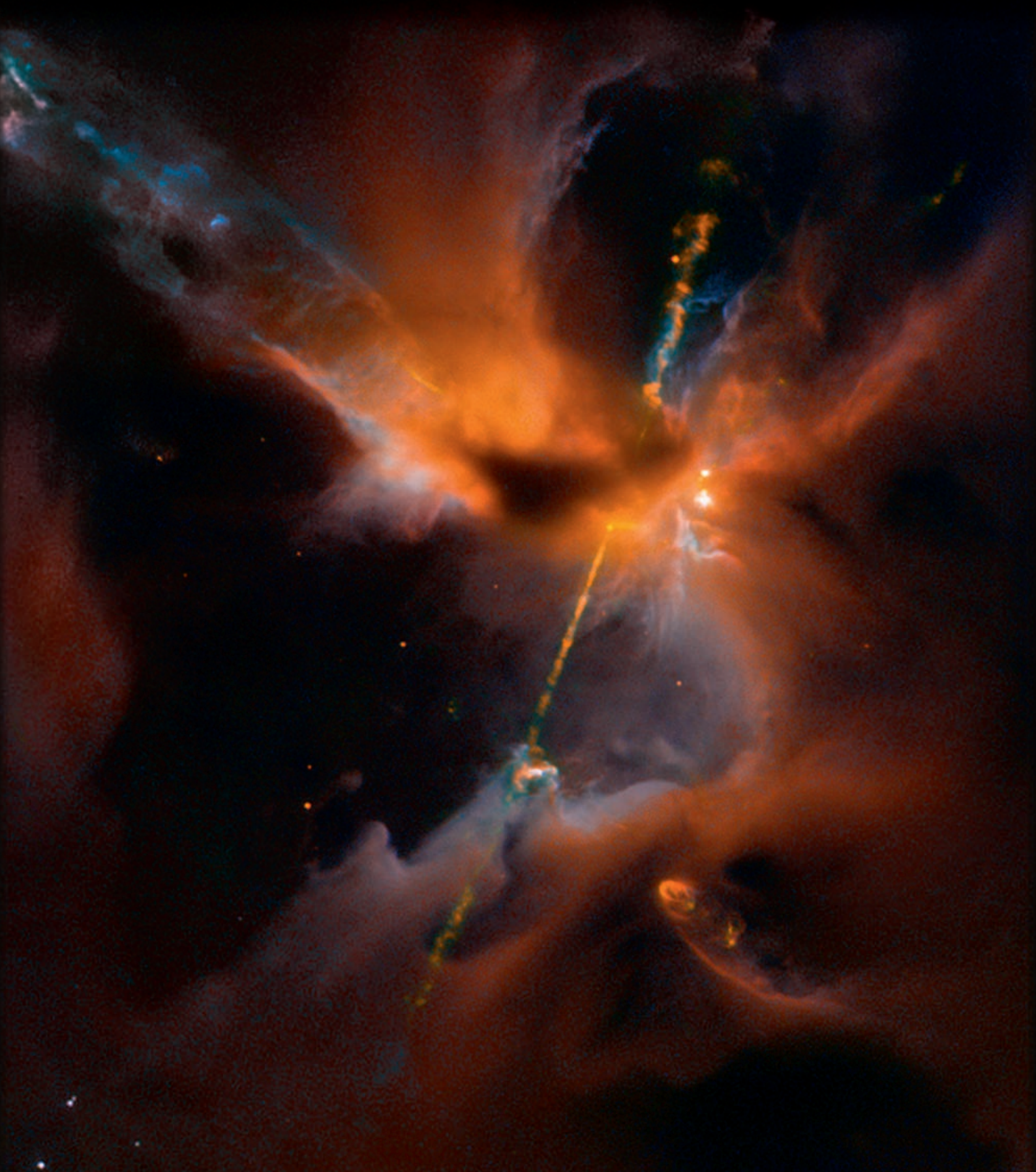




swiss  
space center

Executive summary

2015



**Cover Illustration :**

Herbig-Haro Jet HH 24

NASA and ESA • Hubble Space Telescope



swiss  
**space** center

Executive summary  
2015



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## Introduction

**Dear members, partners and friends of the Swiss Space Center,**

The year 2015 was marked by the firm establishment of our hub, hosted by our member, the Eidgenössische Technische Hochschule in Zurich (ETHZ), strengthening the support to space actors in the German-speaking regions of Switzerland. We are satisfied to report that membership is increasing to the point that additional representatives had to be elected to the steering committee. The working groups have started to produce concrete results such as specific technology workshops for the whole space community.

A special emphasis was started on high school education, as in this phase of their lives, young people tend to decide whether or not to pursue technical studies. Space examples and applications in this arena have a high level of acceptance and visibility.

The first Call for Ideas in Small Missions had a positive and interesting response from the Swiss community and we look forward eagerly to the implementation of the best concepts. Our National Trainee Program is well received at the European Space Agency and this also helps us to build a stronger future based on an extended experts' network.

We thank our members for their support and will also in the future endeavor to meet the needs of the space community in Switzerland.





President of the Board  
of Directors (center)  
**Daniel Neuenschwander**

Chairman of the Steering  
Committee (right)  
**Nico de Rooij**

Director (left)  
**Volker Gass**



## Mission

### A link between institutions, academia and industry

A new version of the Swiss Space Center “Terms of Reference” (ToR) was issued on October 3, 2015 by the Board of Directors composed by the SERI/SSO Director, Daniel Neuenschwander, the EPFL Vice-President, Philippe Gillet and the ETHZ Vice-President, Detlef Günther. The mission remains:

“ To provide a service supporting institutions,  
academia and industry to access space missions and related applications,  
and promote interaction between these stakeholders. ”

### Role

- To network Swiss research institutions and industries on national and international levels. in order to establish focused areas of excellence, internationally recognized for both space R&D and applications;
- To facilitate access to and implementation of space projects for Swiss research institutions and industries;
- To provide education and training;
- To promote public awareness of space.

### Steering Committee

One of the major changes endorsed with the new issue of the SSC ToR was the enlargement of the Steering Committee up to seven members. A new category “Research & Technology Organisation” (RTO) was created with one representative and it was decided to increase the industrial representation to two members.

Mr. Fabien Droz, elected in 2014 as industry representative, resigned due to new professional activities. Therefore, partial elections were organized during the summer and the new composition was presented during the annual assembly:

- Prof. Nico de Rooij (EPFL), Chairman
- Prof. Markus Rothacher (ETHZ)
- Dr. Urs Frei (SSO)
- Prof. Samuel Krucker (Academy representative)
- Dr. Ana Maria Madrigal (RTO representative)
- Mr. Urs Meier (Industry representative)
- Mr. Christian Schori (Industry representative)

## Members

### A network in expansion

During the year 2015, the Swiss Space Center welcomed nine new Swiss entities among its members: seven companies (Bcomp, Else, Exelen, Lah Tiss, Noveltis, Swissto 12, ViaSat), one university (USI) and one research & technology organization (EMPA).

Therefore, at the end of 2015, the Swiss Space Center consists of 32 members from every region of Switzerland and representing all types of companies (large size, medium and start-up), academies (Swiss federal institutes, universities, and universities of applied sciences), research and technology organizations and institutions. Discussions are ongoing with other entities from the Swiss space community to include more members in 2016.

The three working groups established in 2014 pursued their activities in 2015 by giving members the opportunity to discuss matters of common interest, to present their activities and express their opinions. These working groups were defined in the strategic plan elaborated by the steering committee and approved by the Board of Directors in September. They addressed the following domains: education, miniaturization & mini- or micro-systems, high precision mechanisms and structures.

A new working group on Earth observation & remote sensing was proposed by the members and accepted by the steering committee in June 2015. The first meeting was held at EPFL on December 3, 2015.

### Board of directors

### Members



## SSC Hub at ETH Zürich

Swiss Space Center's new office in Zürich is now operational. It was inaugurated on Thursday September 3<sup>rd</sup>, in the presence of the major players of the Swiss space sector. Located at ETH Zürich, this new hub aims to provide more efficient services and information to the Swiss space community and in particular to the growing number of SSC members coming from the German and Italian parts of the country.

"The Swiss Space Center is truly a national entity, and this new antenna is a way to make it more concrete," says Tobias Bandi, coordinator of the SSC's hub in Zurich. "It will allow us to meet and discuss more directly with the members. We will also work to make links between them and ETHZ's laboratories. Events such as Space Career Days for students, conferences and continuing education have been organized in Zürich and these activities will be continued and expanded in the future." In 2016, the hub activities will be extended with three permanent positions.



## Working groups

At the FHNW Olten, a 'Working-Group Day' was held with the participation of over 30 representatives of the Swiss space sector. They worked on topics of common interest including education, miniaturization and high-precision mechanisms and structures. The day was completed by a new member's presentation: scientists from Swiss Federal Laboratories for Materials Science and Technology (Empa) gave an overview of their numerous space-related activities.

A workshop inspired by the working group on Miniaturization and Mini- or Micro-Systems (M3S) was hosted by the Time and Frequency Laboratory of the University of Neuchâtel. In this first Swiss workshop on "LASER for Space Applications", experts from over ten Swiss organizations (academia, Research and Technology Organizations (RTOs) and industry) came together to present and discuss the development and use of lasers for space applications. Lasers are key components for many scientific instruments and technologies, such as next generation atomic clocks, spectrometers and laser telecommunication systems. Novel developments in laser technology will push the boundaries of science and technology.



## Characterization of Structures Produced by Additive Manufacturing

For a few years now additive manufacturing (AM) has become more and more attractive, not only for rapid prototyping, but also for real applications. The emergence of techniques allowing the manufacturing of parts done in metal (aluminium, titanium, bronze, stainless steel) have given to AM a broad field of applications and the interest for this technology is growing drastically.

Obviously, the use of AM shall be limited to metal parts where the complexity does not allow any other traditional techniques or where the production cost can be decreased. In this sense, several space applications can benefit from the advantages given by AM. Indeed, the actual trend toward miniaturization of satellites and their sub-systems induces a higher complexity of some parts and the necessity to have customized solutions with a cost as limited as possible. However, no AM standard exists yet, and therefore process control rules, as well as material characteristics, are still under investigation. Moreover, aluminium remains a material which the AM process has not yet fully mastered in the production of parts for demanding applications, such as space applications.

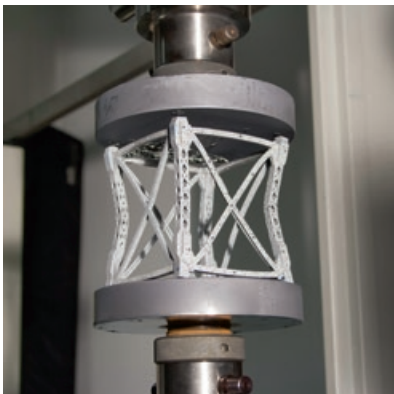
Swiss Space Center and EPFL, including Inspire AG for the manufacturing expertise, have investigated for ESA the mechanical behavior of CubeSat structures done by AM technique.



### The study consists of a set of tasks:

- 1) Identification of lessons learned from a previous AM CubeSat structure manufactured and tested by EPFL.
- 2) Definition of the hardware requirements and design of an AM CubeSat structure.
- 3) Edition and approval of manufacturing and test procedures.
- 4) Manufacturing of CubeSat test structures, test campaign and design guidelines for future AM CubeSat structures.

A detailed and documented manufacturing process has been followed during the study, leading to the production by Inspire AG of a total of 7 CubeSat aluminium structures, with two different designs; one optimizing the mechanical properties while the other one optimizes the manufacturing process. Various test samples have also been manufactured in the same processing batch-



es as the CubeSat structures. Tests of the manufactured structures have been performed at EPFL, at ESTEC and at Inspire AG, giving data related to the material, as well as to the dimensions, surfaces and mechanical properties of AM parts for CubeSats.

Several recommendations have been issued related to the product assurance (design iteration, process control, parts control and inspection), to the selection of the material and to the design, including the adaptation of the dimensional and geometrical tolerances to the AM process.

## National Activities

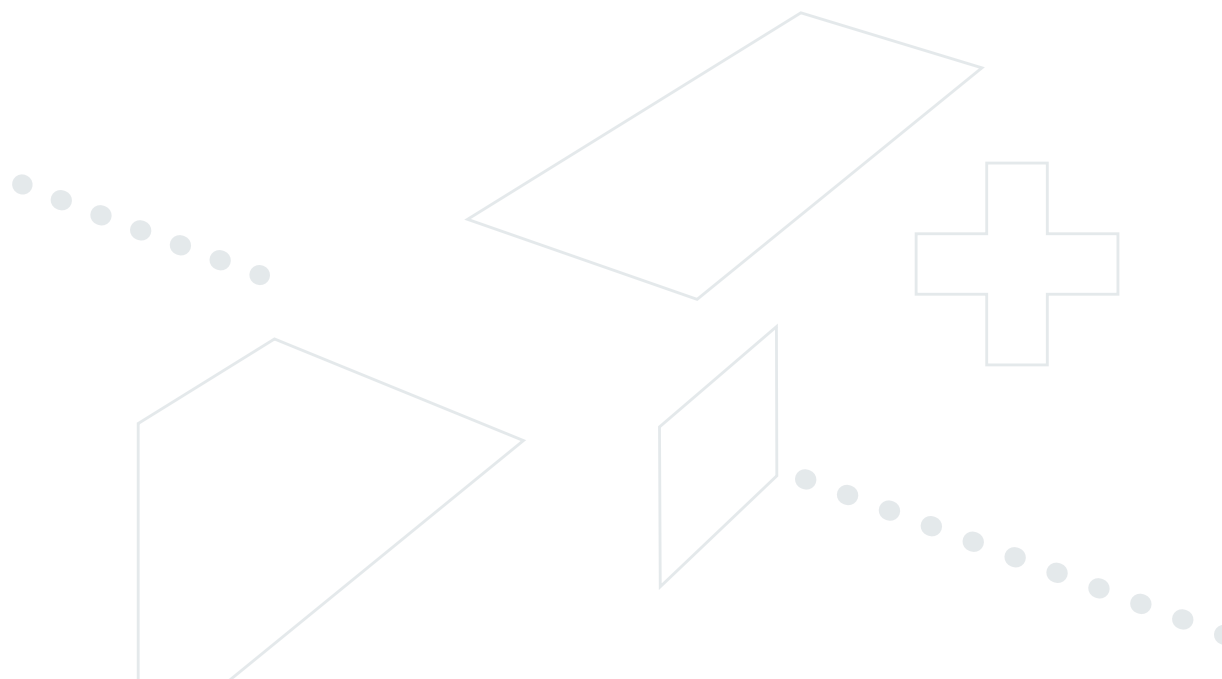


According to the Swiss Space Implementation Plan (SSIP), “Small satellites” is one of the emerging themes that deserves particular attention. Small satellites, considered to be those weighing less than 300 kg with less than 250 W power consumption, are increasing in number and relevance at a worldwide level. They have the potential to perform high quality missions at low cost. While they allow top-level science to be conducted, small satellites present challenges at different levels in terms of miniaturisation and cost pressure. At the same time, the range of overall mission costs are affordable for a broader community of institutional and private actors, allowing new forms of partnerships and shorter development times of approximately five years from selection to launch.

The SERI/SSO has initiated a special Call for Ideas in order to identify concepts from the Swiss space community for a future small mission. Three proposals were selected in March to carry out an eight-month feasibility study which ended in December. Final reviews were held with the presence of ESA experts. One of these studies could lead to a funded Phase A in 2016.



In parallel, and for the second time after 2013, a Call for Ideas to foster low Technology Readiness Level (typically TRL 1-2) research and development studies related to space activities was launched in March. Out of nearly 20 high-quality proposals, 5 projects were short-listed in a very competitive selection process. The studies were funded with 20'000 CHF for a duration of 6 months. During this time the project teams studied their concepts from a space perspective and advanced on the maturity of the concepts for space applications. All projects were successfully concluded and follow-up activities have been identified. With the second successful implementation of this project opportunity, the Call for Ideas has been consolidated and strengthened as an instrument to identify and boost space innovations in Switzerland.



## International Collaborations

Started in November 2014 with a visit in the UK, this activity was further developed in 2015 with the organisation of a bilateral workshop on “Laser Technologies for Space Applications”. This event was held at the UK ambassador residence in Bern on October 27<sup>th</sup> with four British participants and twelve representatives of Switzerland. It was decided to pursue this collaboration in 2016 with another specific workshop in the UK. Four different themes were addressed: LASER fundamentals, future LASER developments, applications for High-Power LASERs and space applications.



During the year, Prof. Claude Nicollier visited different universities and institutes active in the space domain. In August, he was invited by Prof. Zhaokui from the Organization Committee, Chinese Aerospace Safety Symposium (CASS) in Yantai, China. He gave the opening session, entitled “Space Shuttle and Space Station Safety”. He took also the opportunity to visit the Shandong Institute of Aerospace Electronics in Yantai. This institute is responsible for delivery of most of the electronic components for Chinese spacecraft, manned and unmanned.

In September, Prof. Nicollier visited the Indian Institute of Technology (IIT) in Guwahati in North-East India for three days during an event entitled “Techniche 2015”. He had the opportunity to give two lectures (one on Hubble Space Telescope and one, more general, on human space-flight challenges, achievements and goals). There was also occasion to attend other presentations and meet students.

## Space Careers Days

The first Space Career Day was held at ETHZ, Hönggerberg Campus on March 17<sup>th</sup>. More than 60 students attended the presentations given by industry representatives (RUAG Space, Micos, Sarmap), representatives from ETHZ and EPFL and Mr. Stefan Frey, who is on the first National Trainee Programme (NTP) and works in the Space Debris Office at ESOC in Darmstadt. This was the occasion to announce the second NTP call open in April.



More than 50 students from EPFL attended this Space Career Day, where professionals from the European Space Agency, the Swiss Space Office, EPFL-eSpace, CSEM, Almatech, ViaSat and APCO Technologies presented their activities and shared their experience. The presentations were followed by a networking luncheon where the students could interact directly with the speakers.

## National Trainee Programme

After the first call in 2014 and the selection of three young graduates within the National Trainee Programme (NTP) initiated by the SERI/SSO, 2015 constituted the real implementation phase, with the first days of work for Stefan Frey within the Space Debris Office at ESOC in Darmstadt, Eléonie Van Schreven within the RF equipment and technology section, and Marco Pagnamenta with the Space automation and robotic section, both at ESTEC in Noordwijk (NL).

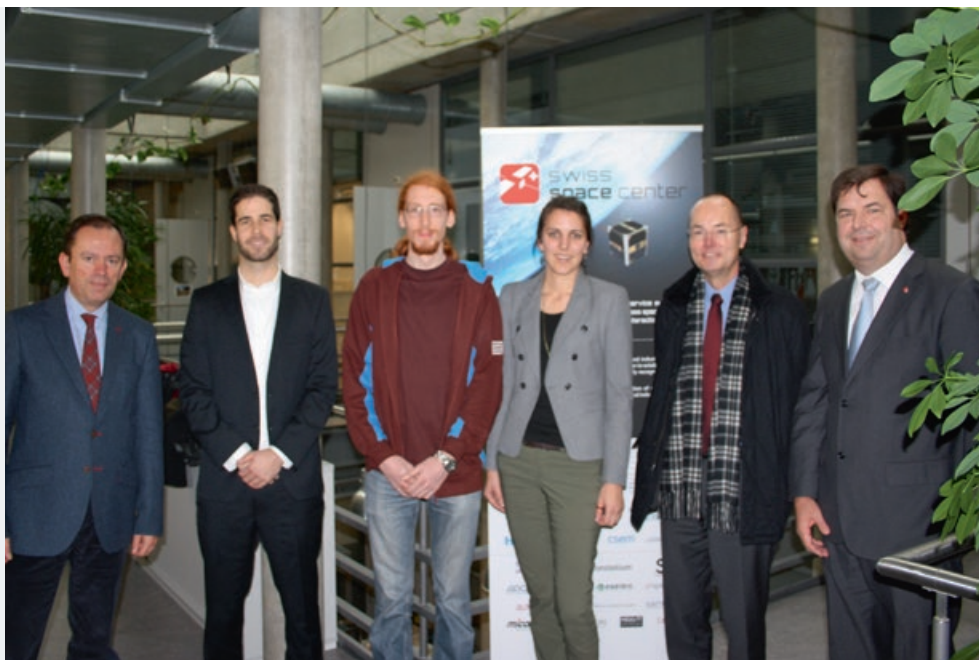
### **“I definitely want to continue working in the space sector.”**

Scientific Assistant at the Swiss Space Center and specialized in robotics, Marco Pagnamenta is currently based at the ESTEC, the ESA facility in the Netherlands. He explains what his tasks are...

I work in the Automation and Robotics section at ESTEC. Its task is to provide support for ESA missions and to demonstrate new concepts in space robotics. The tasks are numerous and very different: building a rover to take measurements with specific sensors, performing simulations of a rover operation on Mars or reviewing technical documents coming from industry studies.

### **• What are the most interesting tasks or events you participated in?**

The most interesting task so far was a field test with one of our rovers that was performed on a nearby beach. We built the rover, integrating all the desired instruments on a preexisting platform and writing the software for it. When the rover was reliable we placed representative rocks over



First selection of NTP

a 1 km distance and drove through them, acquiring images using several types of cameras. This huge dataset will be used to develop new algorithms to navigate on Mars. It was not an easy task, but the team was amazing and everything worked out perfectly.

• **How will this experience be useful to your career?**

Working here allows me to understand how the space industry operates. I am learning how to properly write technical documents for an industry contract and at the same time I have to review the documents that the contractor provides. This is something I did not learn at university! Another thing is that I came to meet a lot of people working in the space sector, and this represents a great networking opportunity. Moreover, I am at the right place to see the next trends in robotic space exploration appearing.

• **What are your projects for the future?**

I definitely want to continue working in the space sector. I still have more than one year to spend here, so I have not yet a clear idea of what to do afterward. I hope to get involved either in the operations of a real rover on Mars or the Moon or in the design and testing of a new rover.

A second call was open in April and three new candidates were selected and started in December: Andreas Baumann works on Earth Observation for disaster risk management at ESRIN in Frascati (IT), Tobias Häfner on space mechanisms and Luc Voruz on nano-sensors for in-situ contamination measurements, both at ESTEC in Noordwijk (NL).



New trainee starting  
in December 2015

## ESA – Networking/Partnering Initiative

“This experience is priceless for my career.”



**Doctoral assistant at the Swiss Space Center, Florian Gallien is currently spending one year at ESA at the ESTEC facilities in the Netherlands. He describes his job there.**

I'm at ESA thanks to the Networking/Partnering Initiative (NPI) program. It consists in collaboration between ESA and universities or research institutes to strengthen the links with space institutions and industry. In my case, this program co-founded my PhD on “aluminum periodic structure for space applications produced by direct/indirect additive layer manufacturing”. One of the terms is to spend one year – not necessarily in a row – at the ESTEC facilities over the four-year duration period of the PhD. During my several stays at ESTEC, I'm trying to take as much advantage as possible of the lab's extremely high-level equipment. For an experimental scientist like me, it's like being a kid in a candy shop!

### • What are the most interesting tasks or events you participated in?

I would say meeting with different astronauts, latest being Samantha Cristoforetti, the Italian astronaut, who spent 199 days on board the International Space Station between November 2014 and June 2015.

### • How will this experience be useful to your career?

It will be fruitful in many ways. First of all, it gives me the opportunity to learn how a big space agency like ESA works and to see the interactions between experts in a wide range of fields and applications: materials, structures, mission design... Secondly, it allows me to create strong links with the experts involved in my field of study, that is materials science. This will certainly be priceless for my future career.

### • What are your projects for the future?

The first and obvious one is to finish my PhD. Then I will take some deserved holidays and after that, I will go more on the industry side, not well-defined yet, but for sure in the space domain.

## Education

### Continuing Education

The head of the Materials Technology Section at the European Space Agency (ESA) Dr. Tommaso Ghidini was invited by the Swiss Space Center (SSC) on the 9<sup>th</sup> of February to hold a course on “The Role of Failure Investigation in the Space Systems Safety” at the Swiss Federal Institute of Technology in Lausanne (EPFL). The event convened a total of 24 participants including the lecturer. These participants represented several Swiss industries: micro technology, electronics, aerospace, nuclear, materials science and electromechanical industries, as well as a few academic institutions.

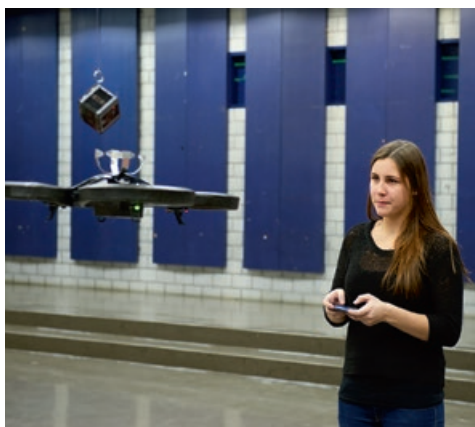


The director in charge of Technology and Innovation and acting COO of the SanaElias Group, Dr. Laurent Balmelli was invited by the Swiss Space Center from September 2-4 to hold a course on “Model-driven Systems Engineering” at the Swiss Federal Institute of Technology in Lausanne (EPFL). The event was attended by nine participants from Swiss industry, academia, research and technology organisms (RTO) and institutions.



## SATW TecDays

The Swiss Space Center was involved in the SATW TecDays organised in different high schools of Switzerland. In 2015, ten presentations were given in five different schools (Basel, Thun, Carouge, Neuchâtel and Lugano) and in three different languages (French, German and Italian). The theme was "Space Debris", with a general presentation of the topic, followed by a competition with quadcopters. These modules of 1h30 were very well received by the over 150 students who participated this year.



## "School to Mars"

The Swiss Space Center aims at contributing to the increase in appreciation of the scientific world by young generations. To this aim the Center postulated and obtained a federal grant (SNF) under the Agora funding scheme: the title of the project is "School to Mars" and is a partnership with the International School of Geneva and the group of educational robotics directed by Prof. Mondada at EPFL. The goal is to collaborate with partners on developing teaching material that can integrate space and robotics into the curriculum.

The prototype of the existing efforts is represented by a simulated Mission to Mars, where educational robots are used as an interactive tool to learn science, mathematics and programming in a concrete, engaging way. The picture reproduces the mock-up of a space station on Mars that had to be accessed, explored and maintained by robots: it was up to students to instruct the rovers remotely, by collaboratively conceiving programs that would provide the robots with the best artificial intelligence for the task at hand.



The pedagogical value of this type of activities resides in their embodied approach to learning and solving authentic problems, where a robot can only comply with the received instructions, which have to be based on a deep, meaningful understanding of multiple technical disciplines at once.

## Space Development: Theory and Practice International Workshop

For the eighth time since 2008, the Swiss Space Center has selected ten motivated students and young professionals to participate to a summer camp at Baumann Moscow State University (BMSTU) in Russia. Based on the same principles of previous years, a group of seven from EPFL, one student from HEPIA, one from ETHZ and one from the University of Bern went to Moscow from July 4-18, where they had the opportunity to carry out interesting space projects in international teams and visit some famous sites of the Russian space activity.

The students were divided into small groups of 5-6 participants and worked on different aspects of a space mission: reach 300 AU and studying the bow shock of the solar system. Each group specialized in one topic: ballistic, spacecraft design, etc. The students also had the opportunity to meet and discuss with the cosmonaut, Sergey Krikalev, follow a rocket modelling class which gave them a good introduction to aerodynamics and control theory, which was followed by a launch.

Many visits to science museums and space companies were organized. The most popular ones were the visit to Zvezda R&D Enterprise, where Russian space suits are produced, the mission control center and the visit to BMSTU Research and Educational facility in Orevo.



Rocket launch at SDTP



Swiss delegation at SDTP



SDTP in Moscow

## International Graduate Summer School (IGSS)

For the third time, the Swiss Space Center organized an exchange summer school with Beihang University (BUAA) in Beijing.

From July 14 - 22, four students from EPFL, ETHZ and HES, accompanied by two staff members from the SSC, took part in the IGSS organised in Beijing, where more than 130 students and young engineers coming from 27 countries were involved. This was a great opportunity to reinforce the already existing link between Beihang University and the Swiss Space Center.



Beihang University  
Summer camp – One of  
the many group pictures

The students were divided into 5 groups of 20 to 25 participants, half of them being Chinese students from Beihang University. Their role was to guide foreign students in the university and in the city in general. Each group had a different timetable including experts presentations, workshops where each student was asked to present one of his research projects in relation with the group topic to the others, and laboratory visits. A competition was also organized: each group had to select a team of 5 students to work together during the week and present their week during the last day.

A strong emphasis was made in discovering the Chinese culture with multiple cultural visits organized to the Forbidden City, the Temple of Heaven, the Museum of Aviation, the Great Wall and different social aspects such as the organization of a party where each group of students had to demonstrate their artistic skills by singing, dancing, playing music and participating in games.

## First International Space Summer Camp at EPFL

Usually based on bilateral agreements with BUAA and BMSTU, the Swiss Space Center welcomed each delegation of students separately in the past years. The concept was improved in 2015 with the idea to have a fully international summer camp open to all universities around the world in 2016. For this first attempt, Russian and Chinese students were together with European students during one week between August 23<sup>rd</sup> and August 30<sup>th</sup>.

The main purpose is to increase attractiveness and give the opportunity to participants to create a network of students from different backgrounds and origins, discovering the Swiss culture, but also the culture of all participants.

The dense program included lectures from Prof Pierre-Alain Mäusli, on the application of ball bearings in space, Dr Anton Ivanov on English presentation, Prof Claude Nicollier on the Hubble Space Telescope, practical activities related to space mechanisms, as well as space manufacturing at the Swiss Welding Institute, team work and social activities.

The Swiss delegation  
at IGSS



ISSC: Space  
manufacturing  
workshop

ISSC participants and staff



ISSC social activities:  
hiking in Swiss Alps  
organised by  
Claude Nicollier





### University Competition for Space – EuRock participation

For 2015, the SSC proposed to launch a competition open to all the academic entities in Switzerland. This competition was announced on February 17<sup>th</sup>, and unfortunately, at the deadline for registration on May 10<sup>th</sup>, only one team of two students expressed an interest. Therefore, it was decided to offer them the prize (participation in the European Student Sounding Rocket exchange program, EuRock in Norway) to recognize their commitment to propose an experience to be tested in a sounding rocket. Once accepted, the two students worked over the summer on an instrument for the measurement of humidity at different altitudes of the atmosphere on the path of the rocket. The payload was eventually selected by the EuRock organizing team as the payload for the 2015 sounding rocket. The instrument was successfully operated and collected valuable data during the flight.

## Public activities

### Claude Nicollier Leçon d'honneur

More than 1500 people accepted the public invitation to the “Leçon d'honneur” of Claude Nicollier, the only Swiss astronaut, who has been professor at EPFL since 1994. His Lesson on Gravity, which took place on Tuesday March 10, delighted the audience. Claude Nicollier explained the progress of our understanding of gravity since Galileo, Newton and Einstein, but also illustrated gravitational effects with pictures and videos of his own experiences in the sky and in space, to explain different concepts linked to gravity.

Patrick Aebischer, President of EPFL, paid tribute to Claude Nicollier for his extraordinary career. He particularly applauded the fact that, having ceased his activities as an astronaut, Claude Nicollier continued to teach at EPFL with passion, transmitting his enthusiasm and knowledge to the students.

Claude Nicollier received his “Diplôme d'honneur” from Demetri Psaltis, the Dean of the School of Engineering (STI). To end the proceedings, his colleagues gave him a sculpture by artist Etienne Volery, which contains a levitated fragment of a meteorite of Martian origin.

Claude Nicollier is currently preparing a massive open online course on “Space Mission Design and Operations”. The MOOC, available to all space fans will be start on 24 February for 8 weeks on the edX platform (free registration).

### Visit Ellen Stofan, NASA Chief Scientist

On February 24, 2015 Dr. Ellen Stofan, NASA Chief Scientist, visited the Swiss Space Center. Prof. Volker Gass, Swiss Space Center Director, Grégoire Bourban, Swiss Space Center Deputy Director, Lise-Loup Antoniadis, Swiss Space Center National Affairs Coordinator and Gaby Bloem, Senior Public Affairs Specialist at the Embassy of the United States, attended the first meeting where EPFL and the Swiss Space Center were presented. Prof. Philippe Gillet and Harold Clenet introduced the Earth and Planetary Science Laboratory and its activities.



Dr. Stofan gave her well-attended lecture “NASA Science: Looking Outward, Inward and Homeward” in Polydome.

She spoke about different NASA science missions such as the James Webb Telescope or the Flyby of Pluto, the journey to Mars with robotics exploration, the future ISS missions with the one-year experiment and the Kelly twins. She mentioned the issues of human exploration on Mars; NASA is currently focusing on human Mars exploration and is planning a mission for 2030 in cooperation with 14 space agencies. Dr. Stofan warned us of the environmental changes with the planet going warmer. Those changes are more intense in the Arctic, but are also observed in other regions of the world with the raise of the sea level. Changes are monitored by different Earth observation missions, and last year five new satellite missions for Earth climate were launched. Finally, Dr. Stofan evoked the challenges that NASA is facing, the need to improve science communication, increase diversity in teams in gender, origins, background and the rising importance of the private sector.



### Public awareness at ETH Zürich

To reach the public and raise the awareness for space, the Swiss Space Center was represented during the two major public events of ETH Zürich in 2015: Treffpunkt Science City (on March 22nd) and Scientifica (September 4-6). The second one, also called “Zurich Science Days”, which are organized together by ETH Zurich and the University of Zurich, gives a glance at research carried out in the laboratories of these two organizations. As the year 2015 has been proclaimed the “International Year of Light and Light-based Technologies”, the motto of this Scientifica was “Light”. Scientifica was a big success, with over 25,000 visitors attended during the two days of exhibitions which were open to the public (Figure 5).

### Book “Our space environment”

Tackling a wide range of topics, this book aims to give a comprehensive overview of the opportunities and hazards in our immediate space environment. It also exposes the challenges that governments, space agencies, private companies, and human communities face in order to manage space together and to create long-term, safe access to it, while protecting life on Earth.



## Future of Space & entrepreneurship

### Reinventing Space Conference



The 13<sup>th</sup> Reinventing Space Conference was held on November 9-12, 2015 in Oxford, UK. The focus of the 2015 conference was the commercialisation of space, and addressed a range of topics including low cost launch opportunities, the rebirth of constellations, beyond LEO activities and novel technologies.

A presentation entitled *"Fostering Technology Innovation in Space Through National Activities: The Swiss Example"* (G. Bourban, V. Gass, J. Richard) was accepted by the committee and was given during the conference.

### "Giant Leap into the Future" – Innovation and Business Opportunities in Space

On November 19<sup>th</sup>, this event was organised by the Swiss Space Center, the EPFL Innovation Park and AP-Swiss, at the Swiss Tech Convention Center during the Global Entrepreneurship Week. In the first portion of this evening event, more than 100 participants attended the presentations given by CEOs of Start-ups, introduced as newcomers in the space business through the national activities implemented by the SERI/SSO with the SSC in the last five years. An example of a Swiss SME success story was given by Spectratime with their atomic clocks flying on-board Galileo satellites, just before an inspiring talk on the ESA Rosetta Mission given by the University of Bern. The second part, led by AP-Swiss, was dedicated to examples of applications developed from space technologies with talks from the companies ELSE and ViaSat Antenna Systems. Finally a challenge, "Design your own application", was launched by AP-Swiss, with prizes for the best ideas.



### Space & Entrepreneurship in Geneva

On Thursday, November 12, the launching event of the Women-in-Aerospace Geneva Group took place, co-organized by the University of Geneva EMBA Alumni and sponsored by the International Telecommunication Union (ITU) and the Swiss Space Office.

Ntorina Antoni, Lawyer at Swiss Space Systems Holding SA, Patricia Cooper, Vice President of Satellite Government Affairs at SpaceX, Volker Gass, Director of the Swiss Space Center (EPFL), Julian Harris, Self-Entrepreneur and CTO of ELSE SA, Whitney Lohmeyer, Communications Systems and Regulatory Engineer at OneWeb and Daria Lopez-Alegria, Founder of SpaceBridges participated in the round table.

The six speakers discussed various aspects of the space environment, including the legal considerations and governmental regulations adding a complexity to the already complicated technical aspects. They gave the following advice to space entrepreneurs: "Don't be afraid to dream big, it is natural to feel scared, be smart and prepared and surround yourself with other driven people".

More than 100 participants attended this first event and gathered at cocktails to meet and discuss with the panelists.

Women in AerospaceEurope (WIA-E) is an international association created in June 2009 by Simonetta di Pippo, Director of the United Nations Office for Outer Space Affairs, and Claudia Kessler, CEO of HeSpace. The purpose of this association through its regional groups is to increase the visibility of women in the aerospace community by creating a network in Europe and across the globe.



## Members' word



**Dr. Christian Fischer**  
Managing Director, Bcomp

Since Bcomp's foundation at the beginning of 2011, we have been focusing on the Sports & Leisure industry followed by the Automotive industry in 2014. In parallel, we took the opportunity of the SSC's Call for Ideas 2013 to run our first space-related development, followed by several space projects ever since. In 2014 we had the opportunity to characterize our novel lightweight material up to TRL 4, financed through the EPFL-ESA framework agreement, and the ongoing MdP 2014 project, which allows us to further improve our technology and deepen our understanding of our material's performance.

Intimidating at first glance, the Swiss Space Center plays a crucial role in opening access to this very particular industry to SMEs and Start-up companies operating in non-space environments. Thanks to the SSC's various funding schemes and outstanding network, newcomers can rapidly understand the needs of the space industry, and get access to the key individuals at ESA. The combination of these elements has allowed us to quickly evaluate the potential of our technology and services within this new industry, and identify relevant ESA activities and potential partners for future development projects. Last but not least, "We do rocket science" is a strong statement which helps open many doors to us as a start-up company.

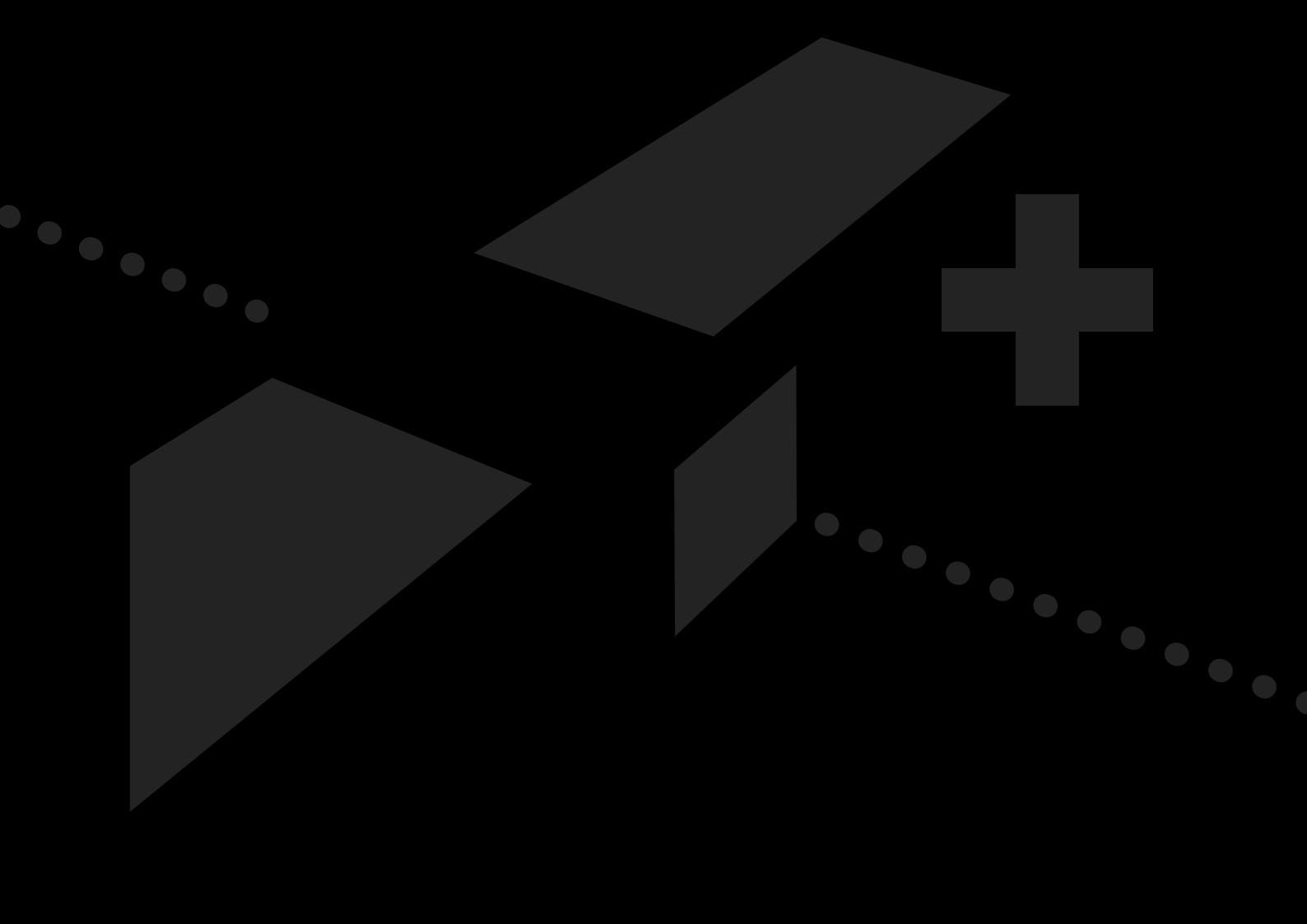


**Prof. Werner Schmutz**  
Director, PMOD/WRC

The Swiss Space Center – if it would not exist – one had to create it. The SSC is an essential organization for bringing together the Swiss Space community. The important point to emphasize is that it is not only linking the science community. Two commissions of SCNAT are linking the academic Swiss space stakeholders. The strength of the SSC is to bringing in the technological side. Here the interests of PMOD/WRC come in: Sometime in the future, we would like to be part of a Swiss nano-satellite project to fly one of our science experiments. We are proud to see our science space experiments flying with ESA missions or on other national satellites, like our next upcoming experiment CLARA on Norwegian's NORSAT-1.

However, we are also convinced that eventually, our experiments, aiming at monitoring the solar irradiance impacting Earth's climate, could be done smaller, cheaper, and faster, given today's fast evolving technology. And to eventually reach our goal, there is another most valuable activity of the SSC, namely the SSC's calls for and funding of technology studies. On the day-to-day side we should not forget that even the most experienced technicians do not know everything. Thus, the fact that SSC is offering specialized training in aspects of space technology is of very high practical value for keeping in touch with the newest developments. I compliment the Swiss Space Center for its multitudes of activities.





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