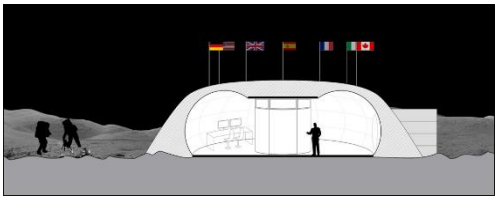
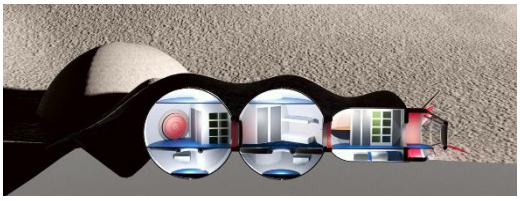
Overview of past workshops and results

2018 IRS, Universität Stuttgart, Germany





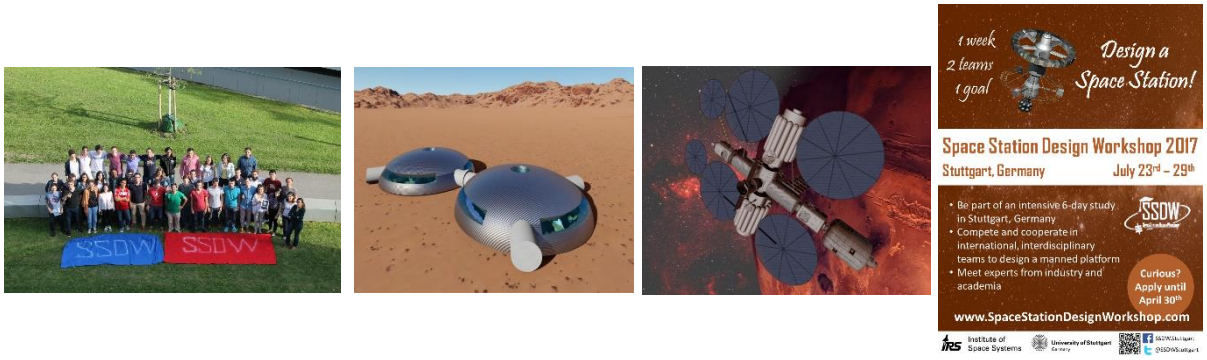
Topp: SSDW18 participants, SSDW18 poster
Bottom: design results (left: Team BLUE, right: Team RED)

From 22nd to 28th of July 2018, 40 students and young professionals followed the invitation of the Institute of Space Systems of the University of Stuttgart to the Space Station Design Workshop (SSDW) 2018. Within one week, the two interdisciplinary teams composed of 20 international participants, supported by experts from industries and universities, tackled the challenge of performing a conceptual design of a permanently manned habitat in the South Pole area of the Moon. Primary objectives of the design were the provision of infrastructure for future Lunar surface exploration and the conduction of scientific operations. Furthermore, In-Situ resource utilization was integrated as much as possible.

The workshop and the SpaceUp would not have been possible without the commitment of individuals and the support from sponsors. Therefore, the Institute of Space Systems would like to thank Astos Solutions, Christian Bürkert Stiftung, TESAT Spacecom and Valispace.

The technical program was accompanied by team building events and social activities such as the Design Thinking session on Sunday or visits of the local Planetarium and the city center on Monday and Tuesday.

2017 IRS, Universität Stuttgart, Germany



SSDW 2017 participants, design results (left: Team BLUE, right: Team RED), SSDW17 Poster

For the first time in its history, the SSDW 2017 challenged its participants with a mission statement aiming for Mars: As employees of the fictive private company called Exploration and Development Enterprise (EDEN) both teams formed two individual Mars-Task-Forces with the assignment to survey and investigate different options to establish an international human tended platform in the vicinity of Mars. After performing a trade-off study of different mission scenarios, a comprehensive study of the selected scenario was carried out.

After 2016, the SSDW started with a very successful SpaceUp unconference with over 100 participants from industry, academia and agencies. The SpaceUp ended in the late afternoon with the launch of water bottle rockets, constructed within one hour by the SSDW participants.

The workshop and the SpaceUp would not have been possible without the commitment of individuals and the support from sponsors. Therefore, the Institute of Space Systems would like to thank Airbus Defense and Space, Association of Space Explorers, Astos Solutions, HE Space, and TESAT Spacecom.

The technical program was accompanied by team building events and social activities such as the spaghetti-marshmellow challenge or night outs in Stuttgart. These activities supported both the motivation of the particpants and the teamwork.

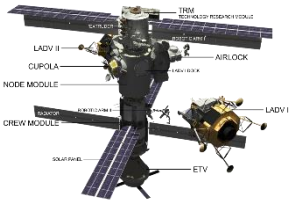
▲2016 IRS, Universität Stuttgart, Germany

It's the year 2025 – the ISS is coming to the end of science operations. No successor station has been established so far. The journey to Mars is a vision of the future. To make it happen, the technology of in-situ resource utilization must be addressed primarily. In addition to enabling sustainable deep space missions, ISRU on the Moon shall be used to re-supply current spacecraft and demonstrate new technology for upcoming Mars missions. Hence the SSDW 2016 investigated the opportunities of on-orbit manufacturing and ressource processing on board a space station in cis-lunar space.

The SSDW started with a SpaceUp unconference at the IRS. Amongst the 100 participants were leading experts from ESA and DLR, SSDW candidates, local students and professionals from Stuttgart and visitors from all over Germany. The workshop and the SpaceUp would not have been possible without the commitment of individuals and the support from sponsors. Therefore, the Institute of Space Systems would like to thank Airbus Defense and Space, Astos Solutions, OHB, the ISS Crew, HE Space, TESAT Spacecom and ThalesAlenia Space.

Again, two competing teams developed concepts for the next space station. The international and interdisciplinary aspect of the workshop was adressed again with 40 participating students and young professionals from all over the world with diverse backgrounds in engineering, biology and economics. For the first time in the history of the SSDW, two inner architecture students enriched the concepts with a new perspective on the design of a human-rated platform in space.





SSDW 2016 + SpaceUp participants & staff, design results (left: Team RED, right: Team BLUE), SSDW16 Poster

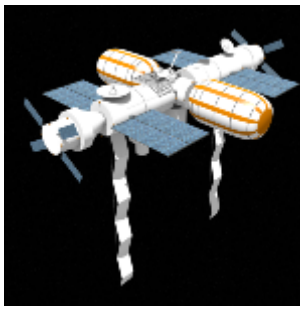
The technical program was accompanied by team building events and social activities such as the spaghetti-marshmellow challenge or night outs in Stuttgart. These activities supported both the motivation of the particpants and the teamwork.

▲2015 IRS, Universität Stuttgart, Germany

Operations concerning the moon, libration points, asteroids, and near planets such as Mars are all considered significant objectives towards the expansion of human space exploration. As an important step in this process, manned platforms in Earth's proximity may be used to support exploration missions as well as long-duration microgravity research. Hence, the SSDW 2015 looked at the cis-lunar space in order to establish a long term human presence in the Earth-Moon vicinity, while leaving the decision about the specific purpose of the space station up to the two teams.

After a five-years break, the SSDW was held again at the Institute of Space Systems and challenged the participants with a wide-ranging task in an interdisciplinary setting. The workshop would not have been possible without the commitment of individuals and the support from sponsors: the German Aerospace Center (DLR), Astos Solutions, TESAT Spacecom, ThalesAlenia Space, OHB and the Federal ministry for Economic Affairs and Energy.

32 students and young professionals from all over the world with diverse backgrounds in engineering, physics and economics were selected to take part in the Space Station Design Workshop 2015. Two competing teams developed concepts for a multi-purpose platform with a modular design and public-private-partnership engagements.

SSDW 2015 participants & staff, design results (left: Team RED, right: Team BLUE), SSDW15 Poster

The technical program was accompanied by team building events and social activities such as an egg-dropp challenge from the IRS roof or night outs in Stuttgart. These activities supported both the motivation of the particpants and the teamwork.

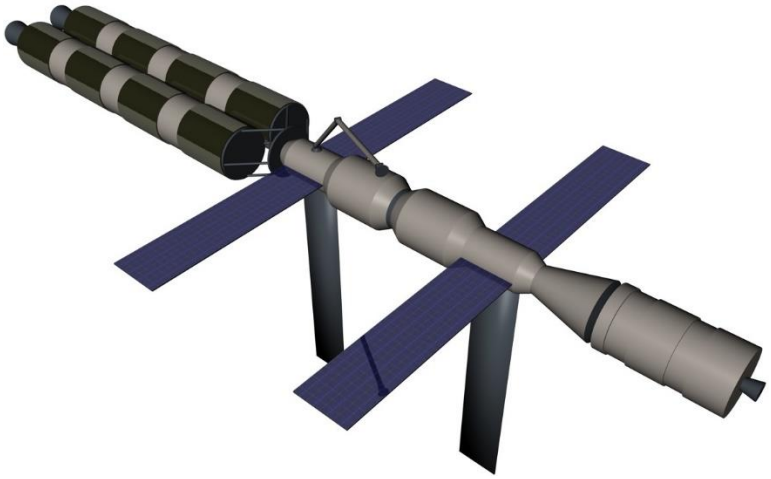
Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag

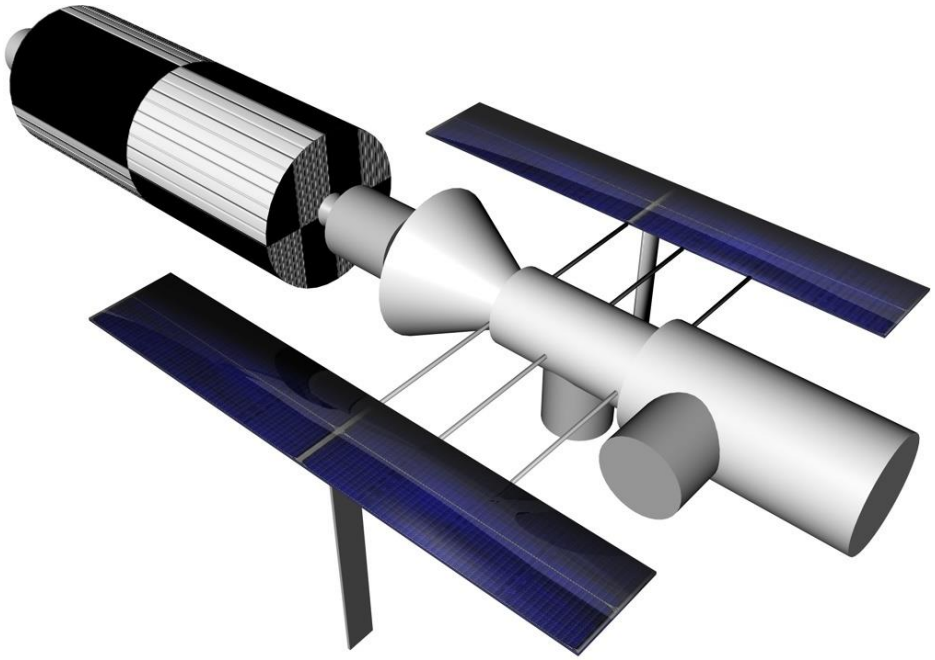
▲2010 IRS, Universität Stuttgart, Germany

Near-Earth Asteroids (NEA) have become a subject of major interest over the past years. Studies have dealt with deflection and mitigation strategies for asteroids with a possible impact on Earth. But also from a scientific point of view, asteroids are very attractive objects as they may contain a lot of information on our solar system. The constant evolution of the Space Station Design Workshop made it possible of going one step further and providing the necessary environment for students to design an interplanetary mission.

Once again, the SSDW was held at the Institute of Space Systems and confronted the participants with a challenging task in an interdisciplinary and intercultural setting. The workshop was enabled by the contribution of individuals and the support from sponsors: the European Space Agency ESA, the "Stiftungen Landesbank Baden Württemberg", EADS Astrium and the Planetarium Stuttgart.

32 students and young professionals from 12 nationalities with diverse backgrounds in engineering, physics and economics were selected to take part in the Space Station Design Workshop 2010. Two competing teams developed distinct concepts for the human exploration of asteroids. Both teams presented a concept with very distinct designs for the propulsion system to address the mission statement.





SSDW 2010 participants & staff, design results (left: Team RED, right: Team BLUE), SSDW10 Poster

The technical program was accompanied by team building events and social activities such as a visit to the Stuttgart Planetarium or nights out in Stuttgart. These activities supported both the motivation of the particpants and the teamwork.

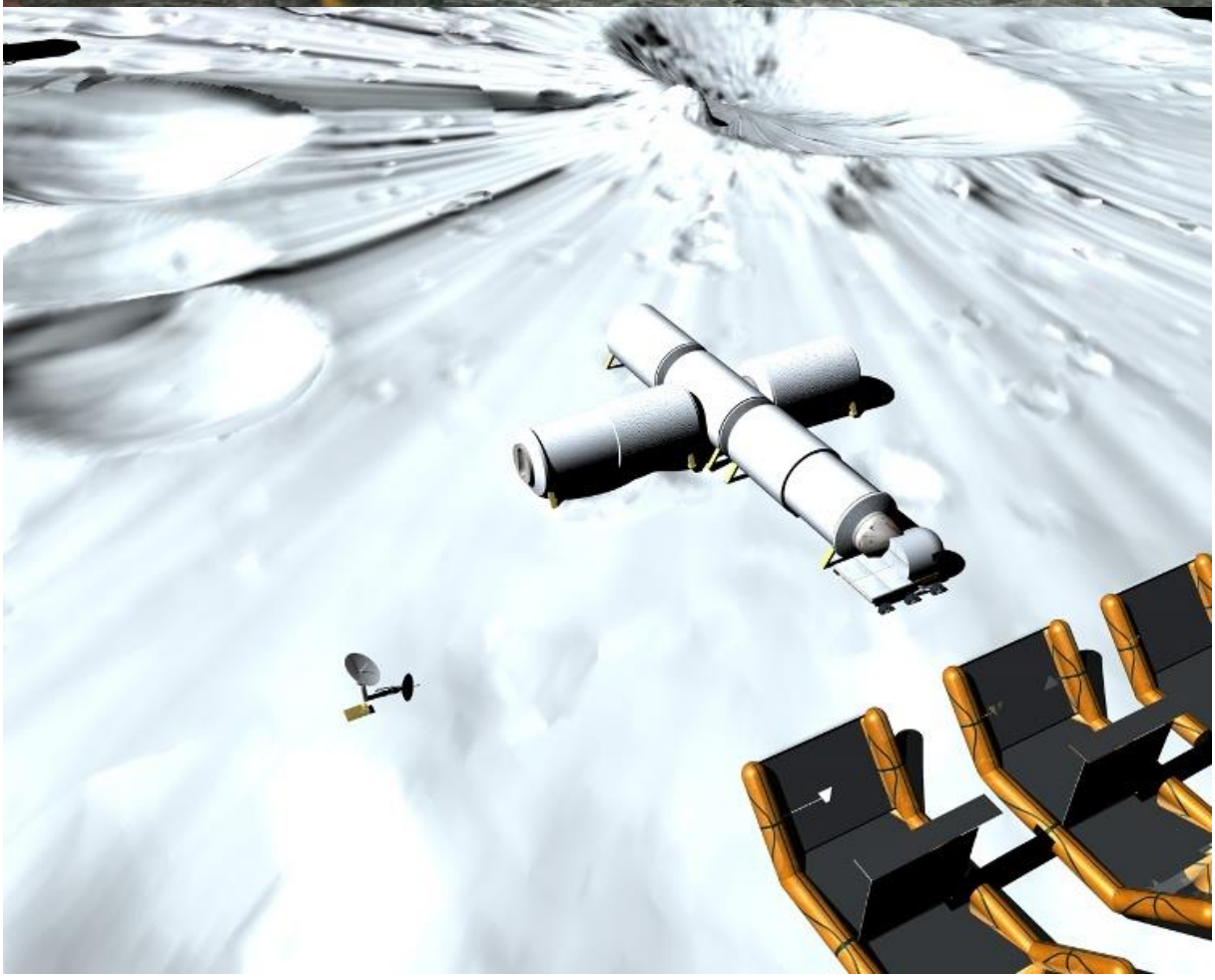
The SSDW has experienced an increasing international and professional response and interest in the workshop. Especially the systems engineering aspect in the education of engineers has been found not to be represented sufficiently in academic programs. One of the purposes of this workshop is to provide a practical approach to systems engineering and contribute to the training in this field. The results of the workshop are valuable input for studies at IRS as well as ongoing work at ESA and international groups.

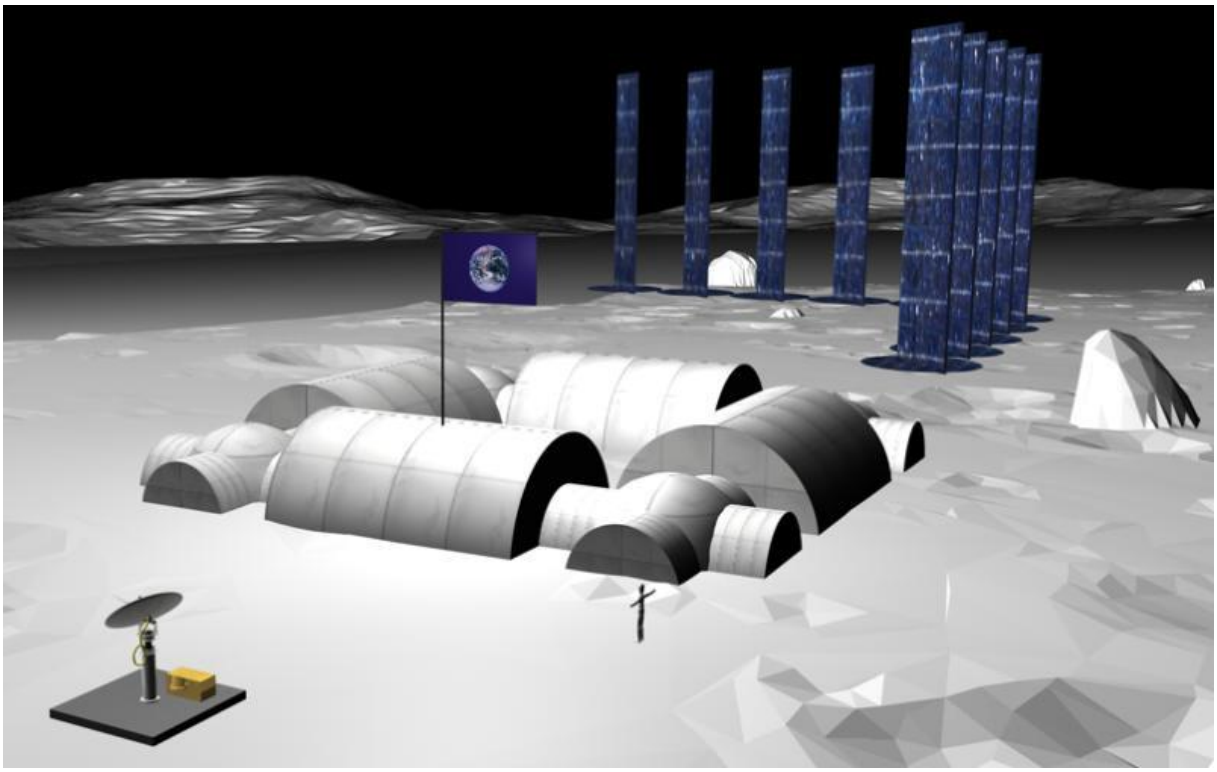
▲2009 IRS, Universität Stuttgart, Germany

When following the development and evolution of the Space Station Design Workshop in the last few years, you should have noticed the emergence of the design tasks beyond low Earth orbit and typical space station activities, but involving many aspects of human space exploration like transportation and staging to new destinations. Likewise, the methodology and tools involved have been extended and updated, allowing the SSDW 2009 for the first time to investigate human presence on another planetary body, our Moon.

Returning to our home campus at Stuttgart University, the SSDW team introduced an even more challenging task to the interdisciplinary and international participants. However, all of this would not have been possible without the support from sponsors and contributing individuals, namely the Concurrent Design Facility (CDF) of the Faculty for Aerospace Engineering, the European Space Agency ESA, the "Stiftungen Landesbank Baden Württemberg", the "Robert-Bosch-Stiftung", Habitats for Extreme Environements (HE-Squared), Ms. Irene Lia Schlacht (TU Berlin), Smart Technologies, and the Planetarium Stuttgart.

Out of a significantly larger pool of applications, 31 students and young professionals were invited to the SSDW 2009, coming from 11 nationalities worldwide and with backgrounds not only in aerospace engineering, but also architecture, psychology, physics, and other engineering disciplines. In two competing teams the participants were tasked with the development of an international lunar base concept to be completed until 2025 for extended human presence of up to 180 days. Both teams developed very different solutions, placing their base infrastructure at polar (Team BLUE) and equatorial (Team RED) locations, and involving diverse subsystem technologies to cope with the specifics of each environment.





SSDW 2009 participants & staff (left), lunar base design results (left: Team RED, right: Team BLUE), SSDW sponsors and supporters

The SSDW 2009 took advantage of the newly aquired infrastructure of the Concurrent Design Facility of the Faculty for Aerospace Engineering of Stuttgart University, supervised by Johannes Gross, providing excellent working environment for both teams in their local design

team rooms. Outside of the technical program, social events like a welcome dinner, a visit to the Stuttgart Planetarium, and evening excursions into the Stuttgart nightlife contributed to the constant motivation of all participants.

The international and professional response to and interest in the SSDW 2009 results, both of value for the IRS as well as ongoing ESA and international design work, confirmed once again the value of the SSDW approach. Work on the technical results will continue in the future, while staff is already working on the preparation for SSDW 2010.

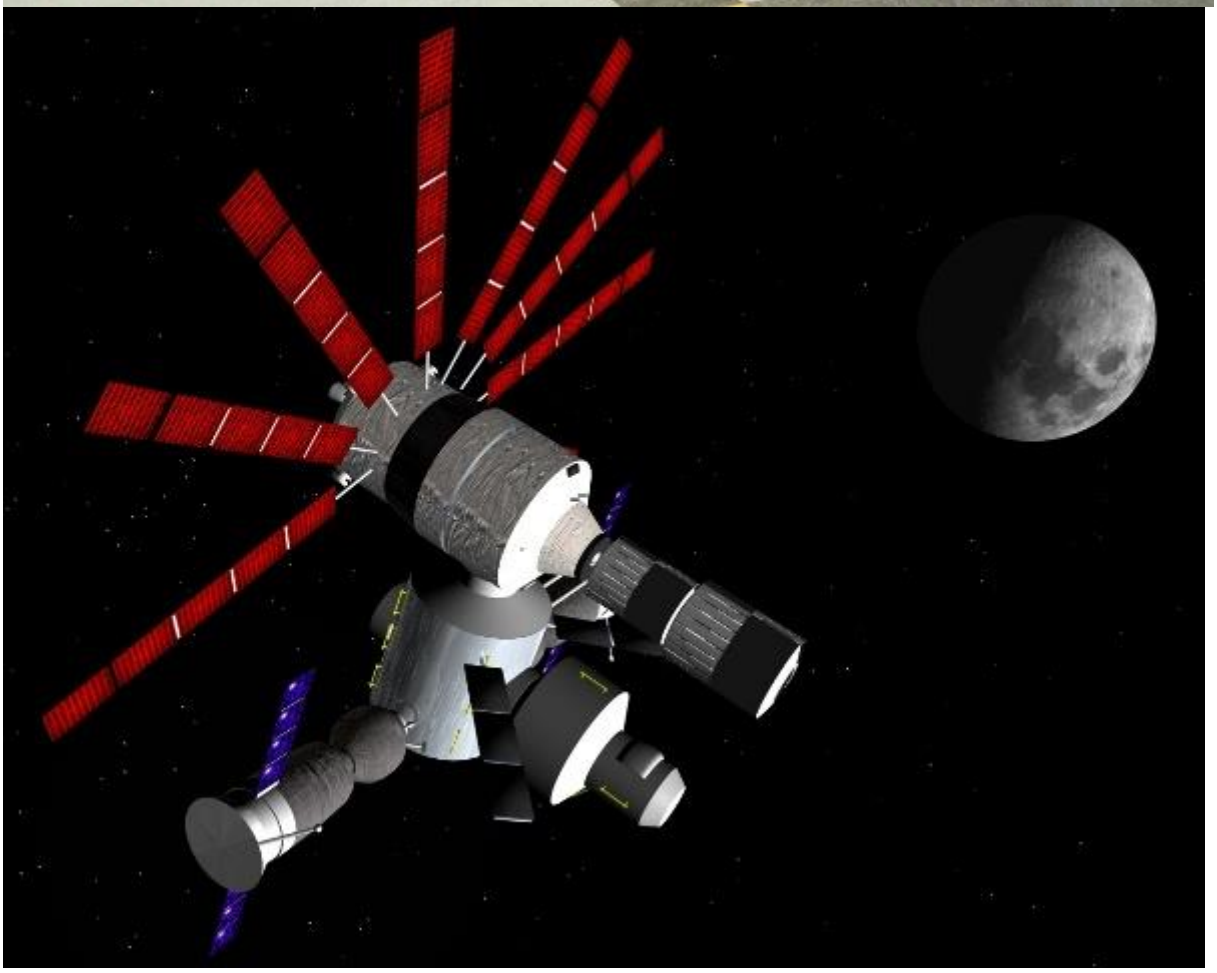
▲2008 ESTEC, Noordwijk, The Netherlands

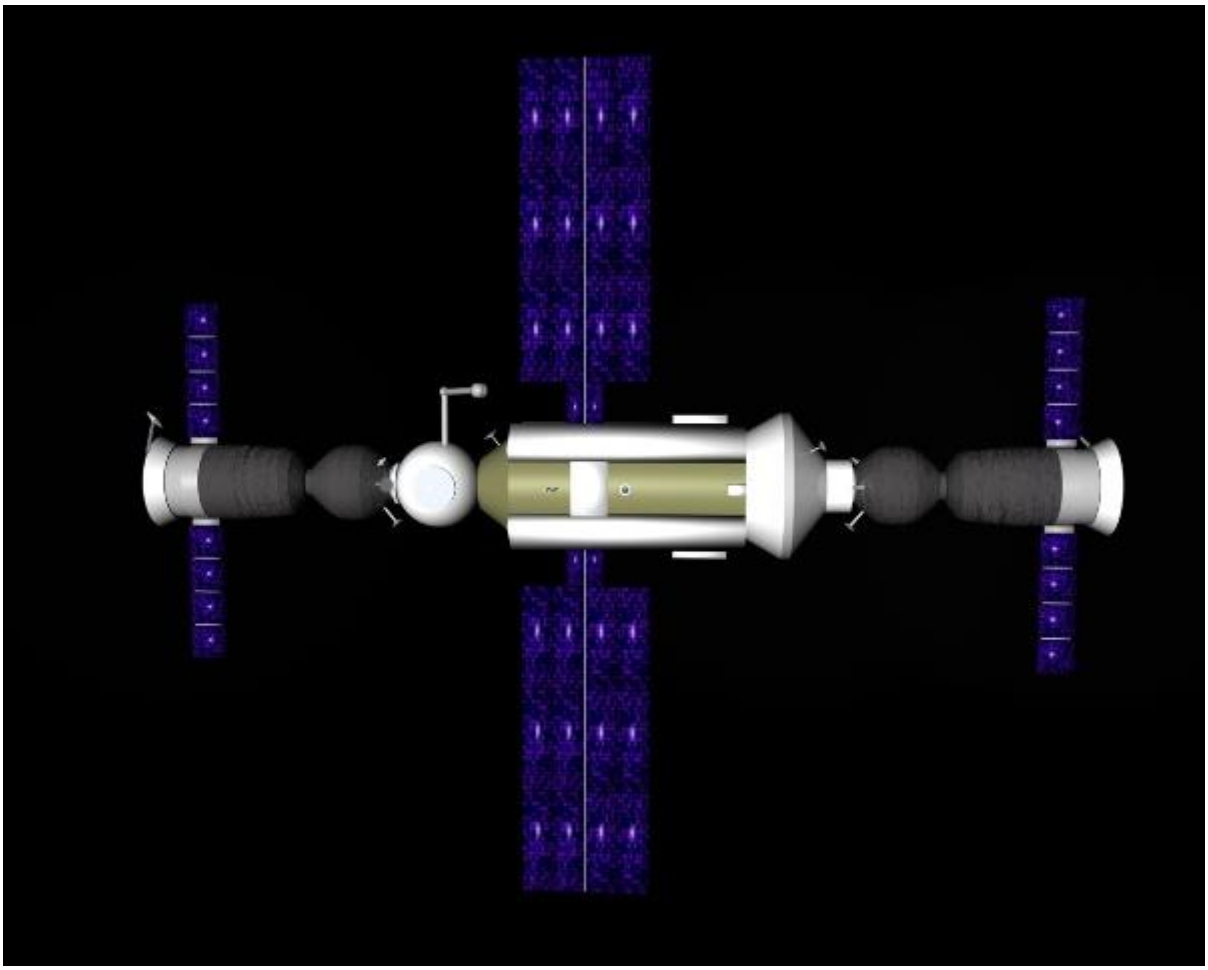
([European Space Research and Technology Centre)

The Space Station Design Workshop 2008 was a very special event, hosted for the second time together with the European Space Agency at their European Space Research and Technology Centre (ESTEC) in Noordwijk, the Netherlands. Organised jointly between the Institute of Space Systems and the Human Exploration Promotion Division of the Directorate of Human Spaceflight, the workshop featured a close interaction of the students with experts at ESA.

One specific noteworthiness of the SSDW 2008 was its internationality and interdisciplinarity, which was partially enabled through the support of the ESA division as well as through the growing network and visibility of the workshop approach in Europe. 32 participants from 12 European nationalities and various disciplines including not only aerospace engineers, but also other engineering disciplines, architecture, cybernetics, medicine, psychology and physics, worked together and brought their expertise and enthusiasm into the design work.

In two competing teams the participants were tasked with the development of a human space transportation system, dubbed Geospace Exploration Vehicle or GEV, but not necessarily involving only a single vehicle. In fact, both teams came up with very modular solutions, with a main staging point in an orbit about the Earth-Moon libration point 2 (EML2), and very versatile utilisation potential towards LLO access, SEL2 telescope servicing and human exploration preparation towards NEOs and Mars.





SSDW 2008 participants & staff (left), space transportation design results (middle: Team RED, right: Team BLUE)

The SSDW 2008 program also included work within the newly inaugurated Concurrent Design Facility (CDF), a tour of the ESTEC test facilities, a reception in the Erasmus High-Bay as well as various joint social evening activities with participants and staff in Noordwijk. These events led to increasing team spirit and intercultural communication and networking between the young space enthusiasts in addition to the technical design challenges.

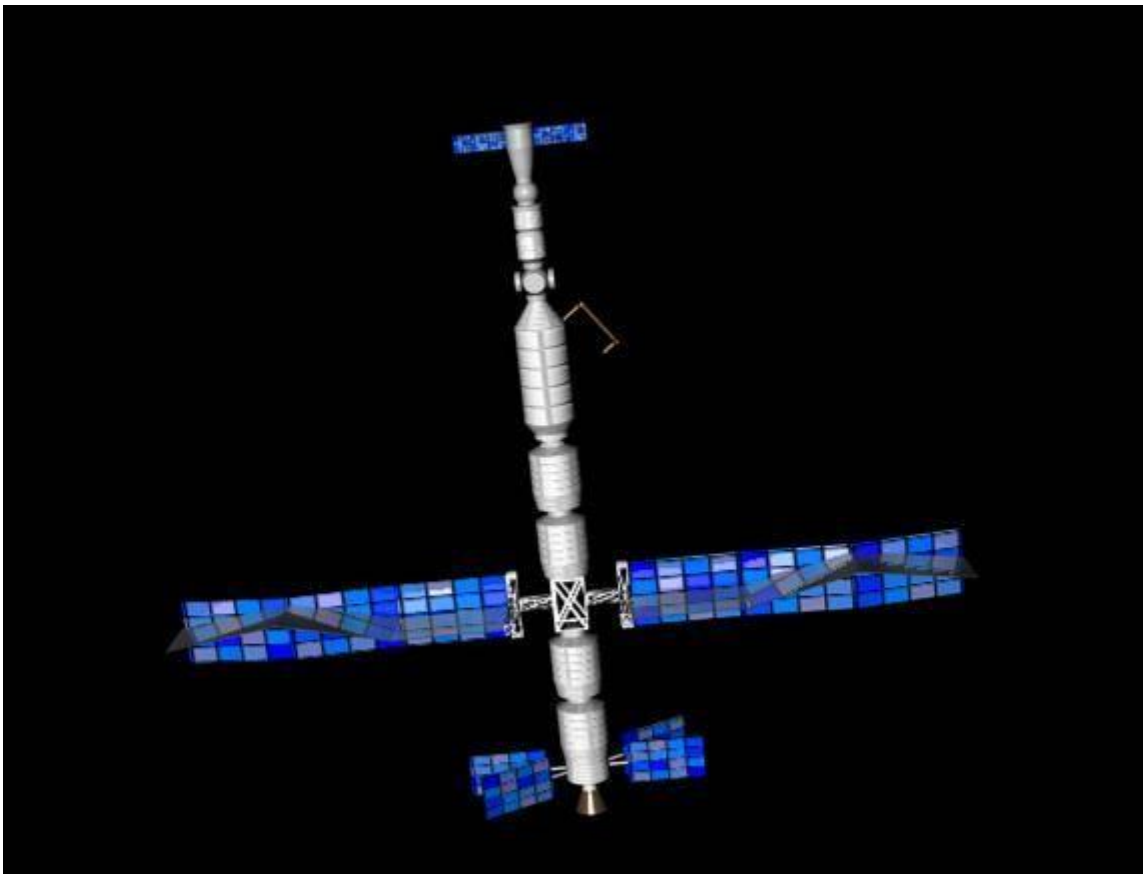
The international and professional response to and interest in the SSDW 2008 results, both of value for the IRS as well as ongoing ESA work, confirmed once again the value of the SSDW approach.

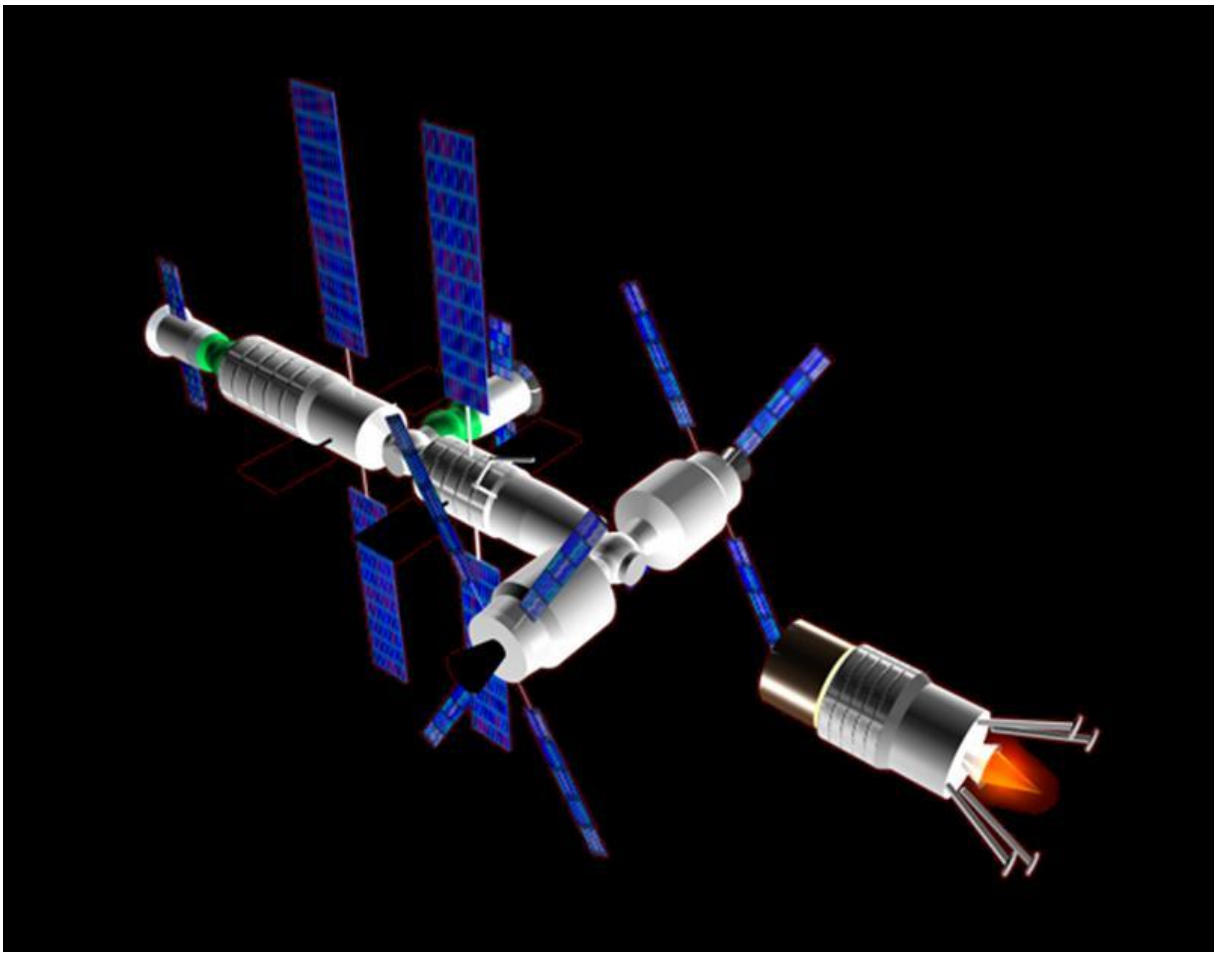
▲2007 Aeromech, The University of Sydney, Australia

The Space Station Design Workshop 2007 was the first event to be held outside of Europe at the University of Sydney, Australia, between 16 and 21 July 2007. Due to the unique location and internationality of the workshop, it was conducted again as a one week full-time workshop, with 28 participants from Australia, Canada, France, Germany, India, Italy and Russia.

In two competing teams the participants were tasked with the development of a lunar space station, i.e. a man-tended staging and refueling platform in low lunar orbit to support exploration missions towards the Moon while also providing capabilities for microgravity research and preparation of future missions beyond cis-lunar space. Both teams showed

outstanding dedication and motivation to the taks and came up with very elaborate results including top-level system budget data, configuration drawings and models, and simulation data. A public presentation and graduation on 21 July 2007 presented the SSDW and the team designs.





SSDW 2007 lunar space station design results (left: Team Green, right: Team Blue)

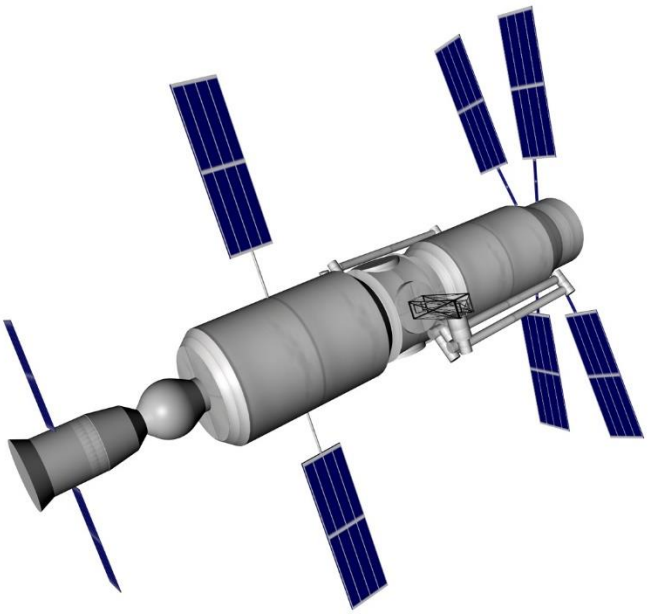
The SSDW 2007 program was rounded up by some joint social activities with participants and staff in Sydney. These events included an Aussie barbecue and a evening talk by Dr. Miriam Baltuck, NASA representative and director of the Canberra Deep Space Communication Complex in Australia, on the global space exploration strategy, but also collective excursions into the Sydney nightlife, thus making it not only a technical event, but also increasing intercultural communication and networking between the young engineers interested in human spaceflight. The SSDW 2007 was supported by:

▲2006 IRS, Universität Stuttgart, Germany

This year saw a renewal of the international and interdisciplinary approach with a Space Station Design Workshop at the Institute of Space Systems at the Universitaet Stuttgart between 23 and 29 July 2006. Although prepared and supported for the Stuttgart students by the Astronautics and Space Station Design lecture series, the original one week full-time workshop character was emphasized to foster and to improve the possibilites of international participants from various backgrounds. 27 students and young professionals from nine nations studying

aerospace and mechanical engineering, cybernetics, information science and architecture came to Stuttgart to work on a future human space exploration system.

In two competing teams the participants were tasked with the development of a "Geospace Exploration Vehicle" (GEV), a manned transfer vehicle capable of shuttling between Earth orbits, libration points in the Sun-Earth-Moon system and low lunar orbit. This partly reusable vehicle, as also envisaged in the IAA Cosmic Study "Next Steps in Exploring Deep Space", provides excellent opportunity for maintenance and servicing of the sophisticated telescope systems that will be placed in orbit around the Sun-Earth libration point 2 (SEL2) within the next years, but it also is a first step in a sustained infrastructure for human exploration of the Earth-Moon system and interplanetary space. Both teams came up with very good results including top-level system budget data, configuration drawings and models, and simulation data. A public presentation and graduation on 28 July 2006 presented the SSDW and the team designs to an audience of university staff and press.



SSDW 2006 Participants and Staff (left) and GEV Design Results (top: Team Blue, bottom: Team Green)

The SSDW 2006 program was rounded up by a number of pre-planned and spontaneous social activities with participants and staff in Stuttgart. These events included a Swabian dinner and a visit of the Stuttgart planetarium, but also collective excursions into the Stuttgart nightlife, thus making it not only a technical event, but also increasing intercultural communication and networking between the young engineers interested in human spaceflight. The SSDW 2006 was supported by:

▲2005 IRS, Universitaet Stuttgart, Germany

With the return of Prof. Ernst Messerschmid to the University of Stuttgart, the Space Station Design Workshop was re-organised, integrated into the summer semester 2005 and supported by a lecture series on Astronautics and Space Station Design. The true SSDW 2005 therefore took place in Stuttgart from 16 June to 7 July 2005.

Two competing teams of students of Aerospace Engineering and Architecture were tasked with the development of a "Geostationary Workshop", a manned space station in geostationary orbit allowing for satellite servicing as well as for testing of systems and subsystems and long-duration space missions with respect to future exploration in cis-lunar space and on the Moon.

The results include top-level system budget data, configuration drawings and models, and simulation data. A public presentation on 7 July 2005 concluded the workshop.

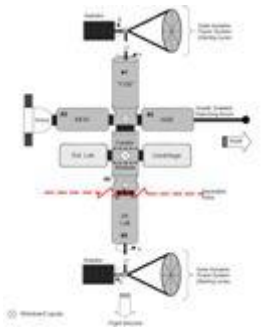
SSDW 2005 Participants and Staff

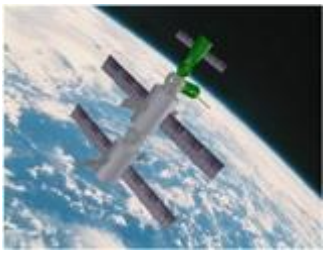
The SSDW 2005 was unique in its approach of a semester-integrated design workshop for the students in Stuttgart, giving them long teamwork phases to fully exploit the capabilities of the SSDW software tools with support from SSDW staff when needed. However, it has to be considered that the students participated to the workshop in "extra" time while still visiting their other lectures and obligations in their respective study fields.
It has therefore been decided that the upcoming SSDW 2006 will be a full-time one week event as in earlier years. The advantages of this approach are obvious in the full commitment of the participants to the workshop task and human spaceflight in general during the workshop week. It also enables the possibilities of international participation since arrangements with other European institutions and for accomodation of external participants is much less complicated.

▲2003 ISU, Strasbourg, France

A shortened version of a Space Station Design Workshop was held again at the International Space University in Strasbourg, France, on 15/16 January 2003. The students worked in four teams and were tasked with the development of minimum baseline for a European-Russian space platform in low Earth orbit to complement the existing International Space Station. This small autonomous station shall focus on commercial utilization of microgravity as well as on a first 'space hotel' to accomodate two guests at a time. Below are a picture of participants and staff as well as two of the four designs that were developed during that workshop.

Participants and staff of the SSDW@ISU 2003





Design results of Team Blue (left) and Team Yellow (right)

▲2002 ESTEC, Noordwijk, The Netherlands

(European Space Research and Technology Centre)

Based on the demonstrated success of the SSDW team in educating students and young professionals in space systems engineering, the European Space Agency hosted the Space Station Design Workshop 2002 at ESA's European Space Technology and Research Centre, ESTEC, in Noordwijk, The Netherlands, from 17 to 22 February 2002. The workshop was supported by ESA's Directorate of Manned Spaceflight and Microgravity, as well as by ESA's Education Office. Project management was performed by Steinbeis Transferzentrum Raumfahrt.

This SSDW gave 30 graduate students of Aerospace Engineering and related fields from 12 European nations - selected from over 180 applicants - a unique opportunity to work on a realistic, relevant space station-related design task chosen by the Directorate of Manned Spaceflight and Microgravity. They gained invaluable first-hand experience with the conceptual design process and its associated activities in a competitive, multinational, interactive, team-centred environment.

SSDW 2002 Participants and Staff

The system design results include top-level system budget data, configuration drawings, simulations, and scale models. A public presentation of the design results and their evaluation in ESTEC's ISS User Centre facility concluded this workshop. The SSDW 2002 also generated widespread public and media interest, thus furthering the cause of manned spaceflight.

▲2001 IRS, Universität Stuttgart, Germany

The IRS 2001 Space Station Design Workshop took place at the IRS from 05 to 09 March 2001. Students from the French aerospace schools ENSAE and ENSICA in Toulouse, from the University of Munich, the University of Dresden, as well as from the aerospace and architecture departments of the University of Stuttgart participated. Please consult the press release (PDF, in German) for more detailed information about this workshop. And be sure to have a look at the design results of that year!

SSDW 2001 Participants and Staff