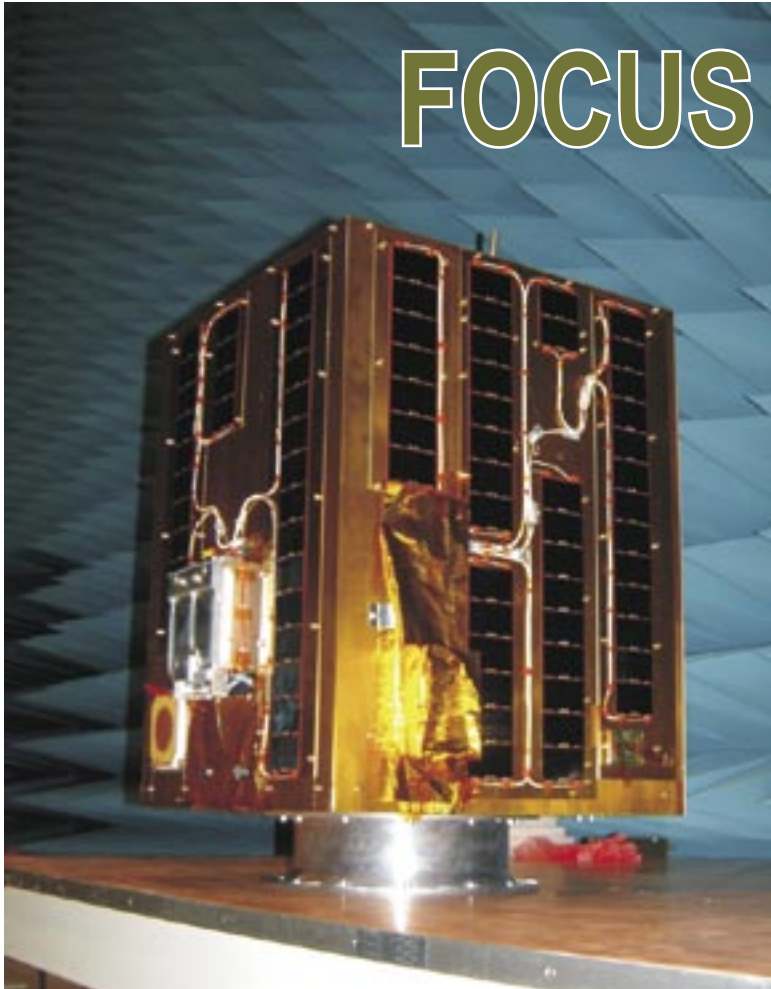


FOCUS - Student satellites and space related education



What is SSETI?

A short introduction to the Student Space Exploration and Technology Initiative

SSETI is short for “Student Space Exploration and Technology Initiative”. It was founded in 2000 by the ESA Education Office – to help create a “talented workforce for the 21st century”. The Education Office wanted to do this through a micro-satellite programme, where a distributed network of students throughout Europe was to design and build the different subsystems for the satellites.

*Association President
Trond Dagfinn Krøvel*

Three micro-satellite projects were outlined by a group of enthusiastic students at the SSETI kick-off meeting in October 2000. It is a series of projects where each project should be the foundation for the next. The lofty goal is to build a moon rover and operate it on the surface of the moon.



SETI Goals

- To involve and educate young students about space and to develop and to promote interest in space technology and space-related subjects.
- To promote autonomy of young people for the development of an educational project by exchange of ideas between students from Europe and therefore to promote cross-border cooperation.
- To develop a network among the students in order to allow communication of students all over the European countries.

SSETI structure

Since the structure of SSETI is highly decentralised, each of the projects needs a management to maintain continuity and to ensure stable progress. And due to their complexity, satellite projects also need someone with complete system overview. ESA's Education Department has therefore hired Young Graduate Trainees (YGT) to fill the positions as project managers and system engineers ever since the SSETI programme was initiated.

To meet the challenges that SSETI encounter, it was decided that SSETI should become a legal entity of its own, and the SSETI Association was created. This has separated SSETI from ESA in a legal point of view, and has made cooperation with for example supporting companies easier. A legal framework was set up to ensure that all teams have the same rights and duties. The framework set up also ensures a proper handling of intellectual property rights etc. The day to day management of the Association is handled by the Executive Committee, and major decisions are taken by the General Assembly.

Each subsystem is designed and built by a team of students. These teams are endorsed by a professor at the respective university. The different teams around Europe all have a coordinator that is responsible for the contact with the ESA project manager and the SSETI Association. All communication goes through dedicated communication channels set up by the Association and ESA.

Why get access to space through SSETI?

Today it is technologically feasible for any of the big universities in Europe to build and launch a satellite. The problem is that almost none of them can afford it, since so much sophisticated equipment and expertise is needed - especially when they have to design and build *all* the different subsystems in the satellite themselves. Even the construction of a pico-satellite can be difficult to defend economically in such a case. And then the price for a launch comes on top of everything – making hands-on space education impossible for most universities. Through a participation in SSETI these problems are omitted, and the only cost for the university is the design and building cost for their own subsystem. This way, SSETI give universities that otherwise could not afford it, a possibility to access space. And on the same time the university can give their students motivating, hands-on experience in real satellite projects.

Communication in a distributed organization

One of the greatest challenges for a distributed organisation is communication. In SSETI this has been solved by actively using modern means of communication, such as chat services and news servers. Every week the ESA staff, the Executive Committee and the coordinators gathers for a general chat and a project chat. Here, messages are given and all kind of information is shared. On the news server, discussions, recent decisions and important messages are posted so that all SSETI members can read them. All documents are shared on a FTP server, where the teams can store their work.

A major drawback for electronic communication channels is that the team members never get to meet their colleagues around Europe. This is solved by arranging project workshops two times a year. Here one or two members from each team gather at ESA's facilities at ESTEC to discuss and solve their problems with other teams and ESA experts. This also ensures progress, as this acts as a deadline for the teams.

The Projects

The first project, called European Student Earth Orbiter (ESEO), quickly gained more than a hundred interested student participants – wanting to be a part of the first pan-European student satellite project. The students divided themselves in to sub-system teams, each with the responsibility to design and build a specific sub-system. Today

Trond Dagfinn Krøvel is the President of the SSETI Association. SSETI has three ongoing projects at the moment, namely the SSETI Express, the European Student Earth Orbiter (ESEO) and the European Student Moon Orbiter (ESMO).

He has just received his MSc degree in Engineering Cybernetics from NTNU and has been given a 10 000 € scholarship from ESA to carry out a Master of Space Management education at the International Space University (ISU) in Strasbourg, France, this autumn

there are 25 different teams working on ESEO. The satellite is scheduled for launch in 2007/2008, and will be a secondary payload on an Ariane 5 launcher which will insert it into a geostationary transfer orbit (GTO).

As the work on ESEO progressed, it became apparent that some of the most talented and dedicated students of SSETI were nearing graduation without getting to see their hardware fly in space. At the same time SSETI was struggling with gradually declining motivation among many of the participants. This was considered most unfortunate by both ESA and the SSETI students, so a decision to initiate a new satellite project was made – and SSETI Express was born. SSETI Express is truly one of the most amazing student satellite projects to date. In less than six months the design was ready, and after a total of 62 weeks of work the Express teams have finished the integration of the satellite at ESTEC. It is now in Plesetsk, Russia, awaiting the launch scheduled to the end of August. SSETI Express will be launched as a secondary payload on a Cosmos-3M rocket.

In 2004, the work on the European Student Moon Orbiter (ESMO) started. ESMO is surely the most ambitious student satellite project ever initiated. As the name indicates, this is a moon orbiter project – due to be launched in 2010. As ESA currently is focusing their support for SSETI towards SSETI Express and ESEO, ESMO is completely run by students. Even the project manager is a student – from Narvik University College. ESMO is a project which obviously has great appeal to the European student community, and it already has more than 50 participants from around Europe. The teams are currently exploring the possibilities of ESMO. They have come up with many good ideas for its use, and it is expected that feasibility studies will start in the near future.

The work has not yet started on the final SSETI project, European Student Moon Orbiter (ESMR). This will be the final spacecraft in the SSETI moon programme. It shall consist of a spacecraft orbiting the moon, and a moon rover that will land and operate on the moon surface. This is an immense challenge for SSETI, but with the experience gained from previous missions and with the support from the European space industry we are certain that we will succeed.

SSETI will not end with the completion of the moon programme. There is a strong desire to continue to build on the experience gained through the SSETI projects. Cooperation with universities that have their own satellite projects is a possibility. Stronger emphasis on pico-satellites is also a possibility. The future of SSETI is not yet clarified, but one thing is certain: SSETI will continue to give students that have strong interests in space the possibility to participate in real satellite projects!



Express

The SSETI Express mission is an educational mission that shall deploy CUBESAT pico-satellites developed by universities, take pictures of Earth, act as a test-bed and technology demonstration for hardware of the complementary project: the European Student Earth Orbiter, and function as a radio transponder for the rest of its mission duration. SSETI Express will be launched to a sun-synchronous, low earth orbit from Plesetsk, Russia during the end of August of 2005.

ESEO

The European Student Earth Orbiter is the second satellite project of SSETI. Design started in October 2000 and is now well advanced. The spacecraft will be a test bed for advanced technology units for future SSETI missions; it will measure radiation levels and their effects and take pictures of the Earth, Moon and possibly other celestial bodies.

ESEO will be launched into a geo-stationary transfer orbit from Kourou, French Guiana in late 2007, early 2008.

ESMO

The European Student Moon Orbiter is the third SSETI project. It is undergoing a feasibility study and is at the moment entirely run by students. ESMO will prove SSETI's capability to send a satellite in orbit around the moon, perform scientific experiment in orbit around the moon and possibly on its way to the moon and search the lunar surface for possible landing sites for future moon lander projects.

ESMO is planned to be launched in 2010. It will most likely be launched into a geo-stationary transfer orbit and from there it will reach an orbit around the moon with its own propulsion system.