

NAROM

-Norwegian centre for space related education

The organisation NAROM – partly supported by the Norwegian Government – was formed in 2000 and organises a lot of space education activities to ensure recruiting, promote appreciation for the benefits of space activities, and to stimulate the interest for science in general.



NAROM is co-located with Andøya Rocket Range (ARR) in Northern-Norway, an independent branch of the governmental Norwegian Space Centre. ARR has more than 40 years of experience with scientific sounding rockets and balloons. The ALOMAR (Arctic Lidar Observatory for Middle Atmosphere Research) facility is also close by. In addition, the range has several other instruments that are used for ground based geophysical measurements. The close proximity to the facilities and personnel at ARR provides important advantages with respect to educational activities. ARR has its own hotel and good educational facilities as well.

NAROM offers students to attend lectures and perform experiments using the unique laboratories and instruments at the range during one or two week courses. Thus, NAROM efficiently uses the investments which have been partly covered by ESA during recent years. The level of NAROM's educating program span from high school to graduate university students, and more than 1300 students attends per year.

NAROM concentrates also on being an important contributor in the provision of electronic educational resources within space-related education, and on being an important link between the Norwegian space-related industry and the educational system.

Student Rocket Project at NAROM and ARR

NAROM and ARR have since 1997 developed and launched more than 20 student rockets. Hundreds of students have had theoretical introductory and hands-on work preparing for the launch of a student rocket at the Rocket Range. The main goal of the Student Rocket is to give the students a comprehensive introduction to an ordinary scientific sounding rocket launch.

During the Student Rocket Project the students are involved in many different tasks. They have to build and mount the rocket payload, as well as performing simulation of rocket trajectory, stability test and spin test. Working on the payload, students are set to etch the circuit pattern and solder all the electrical components of the power control card. They also have the opportunity to design, etch and solder up to six different analogue sensors to mount on the payload. Other tasks on the payload include building the antenna, prepare the umbilical plug, mounting all parts together and run tests of the system as whole. The student rockets use a MK40

Annonse: Norsk Romsenter

rocket motor and usually reach an altitude of 4500 meters. The payload telemetry system of the student rocket is R-DAS, a shelf ware flight-computer unit. R-DAS log rocket acceleration, height, velocity and up to six analogue sensors. One of the advantages with this system is that the student telemetry station only consists of a small antenna on a receiver card and a laptop.



On the campaign day the students participate in several stations on the rocket range. These stations are in launch control, the launch area, balloon release, experimenters room and telemetry stations. At each station different students are assigned to different tasks under supervision of the qualified staff at ARR. The Student Rocket Campaign follows standard procedures for an ordinary rocket campaign at ARR. This involves pre-flight meeting, countdown procedures, rocket launch, receiving telemetry data and post-flight meeting. In the pre-flight meeting the students report the status of their respective stations, and the countdown procedure are discussed. In the post-flight meeting the students present their contribution to the campaign, analysis of rocket data and summarize the results of the whole operation.

The Student Rocket Project gives the participants space-related experience at the world's northernmost permanent launch facility for sounding rockets and scientific balloons. It is also a contribution to one of NAROM's main visions to stimulate the interest for science in general.

Balloons in education at NAROM

Balloons have been released from ARR for many years. They were primarily used to make scientific experiments. NAROM has used balloons as instrument carriers as a part of the education programme. The students are thereby able to study chosen meteorological parameters in the atmosphere, as well as to learn about technical principals. All balloons can carry the following three different types of radiosondes: PTU-, Ozone- and Radac-sonde.

The most common sonde is the PTU-sonde. It measures pressure, temperature and humidity during the balloon flight. The following data are also presented: wind direction, wind speed, range, altitude, longitude, latitude and fly time. The geographical

position is found by use of a navigation system.

The participants have to accurately calibrate the radio-sonde, make the telemetry station ready, prepare and fill the balloon. They learn to receive live data from the airborne instruments at the ground telemetry station. This hands-on activity makes the learning process more interesting. The data will be plotted graphically and also used for different atmospheric calculations.

In the different categories of courses, the participants will have exercises fitted to their own level.

European Space Camp

Every summer 24 young students from all over the world has the opportunity to spend one week at the European Space Camp at ARR. The camp gathers young participants to learn about rockets and space. The preferred background for the participants: Youths 17-20 years old and students at a high school with emphasis on mathematics and physics. The participants are living together at the ARR-hotel with some of the best lecturers from all over Europe for a week at campus.

The main co-operators are the Norwegian Association of Young Scientists, the Norwegian Space Centre and ESA. During their stay at Space Camp, the students are involved

in different space related activities. Lectures, group work and experiments make the student gain new knowledge during the camp. Guided by professionals, the students construct four rocket payloads and prepare one of these payloads for launch. The students also develop specialized payload experiments for the rocket payload. Experiments such as an accelerometer, a magnetometer, an altitude meter, humidity sensor or a spin sensor are all examples of instrumentation the payload may contain.

Students who come to Andøya are not only offered a chance to learn about research activities and technology. ARR is surrounded by breathtaking and powerful natural beauty that many visitors appreciate on their spare time or on organized outings. The Northern lights is perhaps the most well known and advertised phenomenon. This close connection with nature is perhaps an important motivator for science students. In summertime the midnight sun is a fantastic attraction. During Space Camp the participants also attend excursions to a few local museums and a whale safari.



*European Space Camp is international space-related gatherings, with element of social development across the national borders.
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Nordic Teacher Space Camp

Last year in the beginning of August the first Teacher Space Camp ever took place at ARR. The arrangement lasted for a short week (5 days), and 15 teachers participated. The aim of the teacher space camp is to make practical use of physics, mathematics and technology and to inspire the teachers to bring in space related topics and technology into their school. Thereby more pupils will be curious and probably go for space related studies.

At the teacher space camp the participants designed, tested and assembled electronic instruments which was used as payload in their own rocket. During group work learnt to calculate and simulate the trajectory of the rockets. The rocket will be launched according to existing security regulations. The preparation and release of a scientific balloon was also on the agenda. Both the rocket- and balloon group work will be run almost as for the European Space Camp. The teachers also learnt how to use a handheld GPS.

From 2005 this camp is offered to teachers from all the Nordic countries, and this year's Nordic Teacher Space Camp takes place in the period of August 4 – 9.

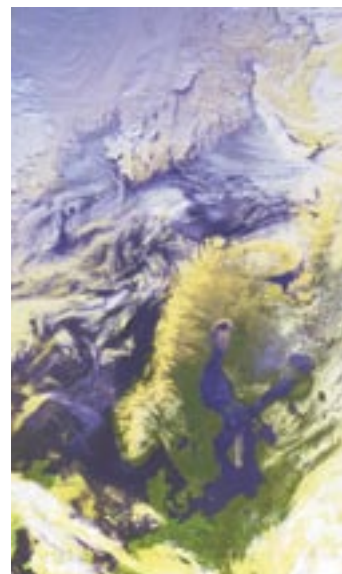
SAREPTA, a space resource for the classroom

SAREPTA, www.sarepta.org is a unique source and electronic meeting place for students and teachers at upper primary and secondary school level for use in geography and science lessons. The website combines teaching and learning material with background information and exercises to put the student in centre of the learning process.

Both to inspire the youth in Science and Technology and to meet the recruitment requirement, the Norwegian Space Centre (NSC) in co-operation with ESA, established the Space web-resource SAREPTA

in 1997. The last three years the website is considerably extended. There is both an English and Norwegian version of the website.

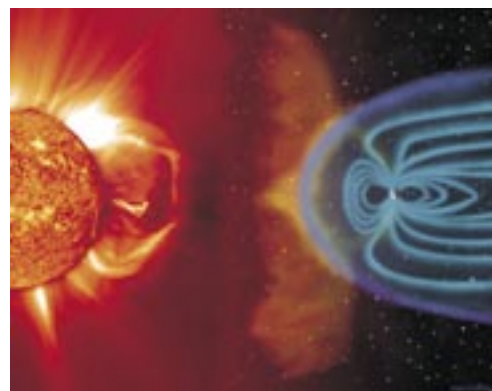
Since 2003, NAROM has operated and further developed the website under contract with NSC.



SAREPTA offers fresh satellite images, Space applications and technique put together in a pedagogical context. SAREPTA has resources for project tasks on weather and climate, ice in the Arctic and the study of ocean currents. Other topics are concerning the Sun, the electrical interaction between the Sun and the Earth, Satellite navigation and communication. Facts and activities about Rockets, Space Station and Space shuttle are parts of these.

The satellite images in the SAREPTA Image Bank are freely available for education purposes, but users need to register. In April 2005, there were about 4.300 registered schools in SAREPTA.

Example of topics: The Sun



SAREPTA offers opportunities of studying Sun storms when they occur, and of exploring how Sun storms affect the Earth. The satellites transmit thousands of images of the Sun every day. SAREPTA offers facts, animation and exercises. The mystery and activity of the Northern lights are parts of these.