

Annual Report 2010



Norsk Romsenter
NORWEGIAN SPACE CENTRE

Management 2010



Øyvind Stene

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Edel Storelvmo, Vice Chairman
Marian Nymark Melle
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Paul Narum

Deputy members:

Kjetil Storaas Hansen
Kirsti Lovise Slotsvik



Bo Nyborg Andersen

Management

Bo Nyborg Andersen,
Managing Director

Facts about the Norwegian Space Centre

The Norwegian Space Centre (NSC) is a government agency under the Ministry of Trade and Industry. NSC was established in 1987, when Norway became a member of the European Space Agency (ESA).

NSC is responsible for organizing Norwegian space activities, particularly with respect to ESA and the EU, and for coordinating national space activities. See Objectives box below for further information.

NSC manages governmental interests in the Andøya Rocket Range (90%) and in Norwegian Space Centre Properties (100%), which in turn owns 50% of Kongsberg Satellite Services AS.

In 2010, the total budget was NOK 775 million (€99.2 million), and NSC had 32 employees.

Objectives

In accordance with governmental guidelines and in co-operation with and to benefit Norwegian industry, research, public-sector bodies and Norwegian interest in general, the objectives of the Norwegian Space Centre are to:

- promote the development and coordination of Norwegian space activities,
- co-ordinate the Ministerial interests and needs within space activities,
- prepare proposals for integrated long-term programmes for Norwegian space activities and submit these to the Ministry of Trade and Industry,
- manage Norwegian Space Centre resources and efficiently distribute funding from the Norwegian State and other sources,
- mind Norwegian interests in liaison with space sector organizations in other countries as well as international organizations and contribute to coordinating Norwegian space activities with those elsewhere,
- manage State holdings in space-related companies in the private sector,
- facilitate the meeting of user needs in the space sector.

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From the Director

For space activities in Norway and for the Norwegian Space Centre (NSC), the year 2010 was both usual and unusual. It was unusual because AISSat-1, Norway's first surveillance satellite, was launched on 12 July from the Satish Dhawan Space Centre in India. It was usual because as in previous years, the greater part of NSC's support effort entailed interaction with ESA/EU and other international partners and national actors.

The financing of AISSat-1 amounted to only a few percent of the NSC budget, yet its international and national significance cannot be underestimated. Internationally, Norway now is on the map and new possibilities for cooperation have arisen. Nationally, the launch is significant because clearly defined national information requirements will be met and because it has shown that a national initiative can meet a niche need not met through international cooperation.

On the other hand, the significance of AISSat-1 should not be overestimated. International cooperation will continue to be decisive in responding to Norway's space challenges, both for users and for industries. This is particularly the case for the ESA and EU Earth observation initiatives, in which Norway contributes about 2% of overall costs but uses 20% of all data.

In 2010, space cooperation in Europe was marked by the economic downturn and by ESA and EU having not yet clarified their respective roles. Norway participates actively in the European space arena and consequently is deeply involved in furthering the operation of the space station, in ensuring long-term launch services, and in the operational Galileo and GMES European space programmes.

Norway is regarded to be a significant partner in international space cooperation. Major space actors use the stations on Svalbard for data acquisi-

tion. Concerted effort throughout 2010 aimed to ensure Norway central infrastructure places in the Galileo programme for its stations on Svalbard, in the Antarctic and on Jan Mayen.

The Norwegian space industry continued to move forward. The year was highlighted by major contracts for Norspace and for KSAT. The support of NSC contributed to the awarding of these contracts. New and established telecommunications sector actors have grown and become globally competitive, which underscores the importance of the sector for Norway.

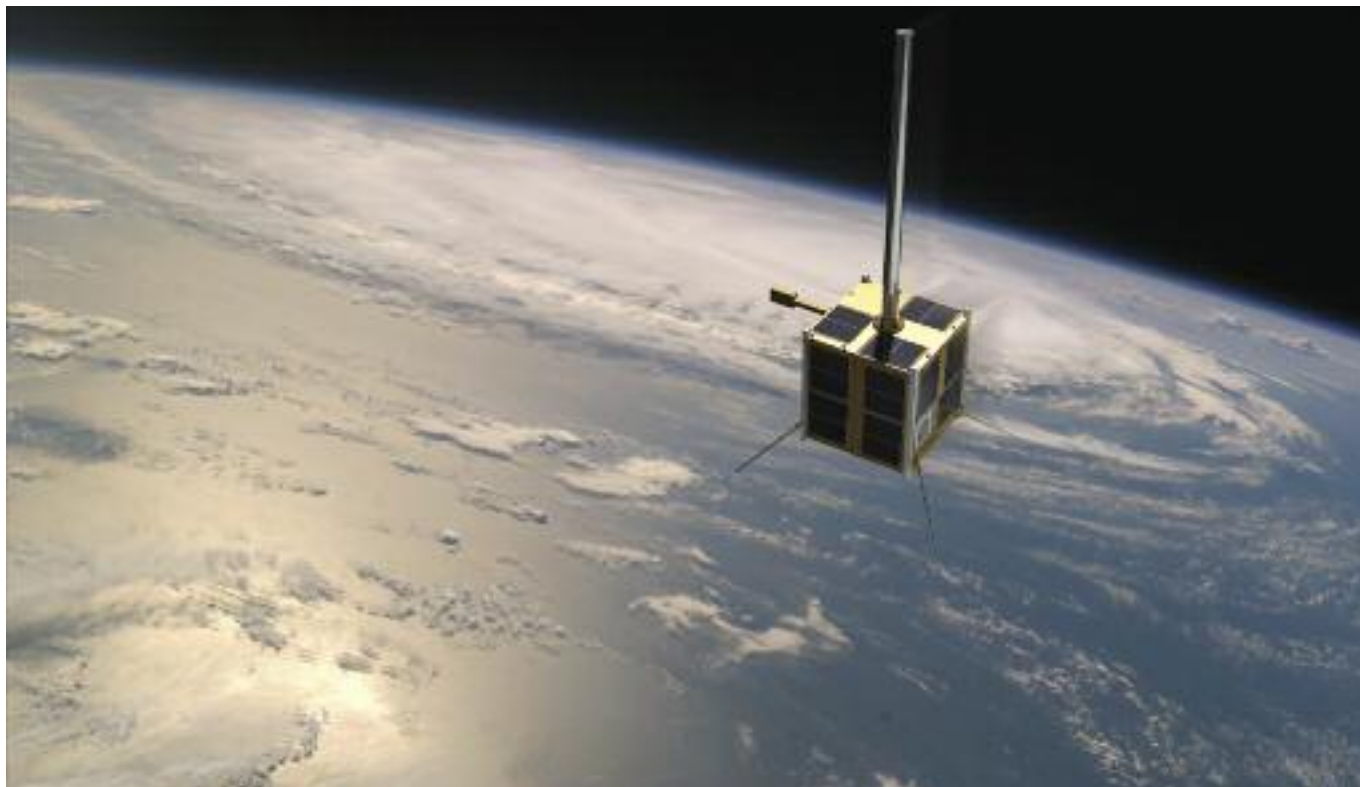
Norwegian scientists who use space in their research have proven their capabilities in projects that produced worthwhile results. It's particularly encouraging that public resources now are committed to revitalize the research activities of the Andøya Rocket Range.

Norwegian Space Centre, 22.02.2011

Bo Andersen

On 12 July 2010, the Norwegian AISSat-1 satellite was launched from India. It contributes to safety at sea because it extends the coverage area of the Automatic Identification System (AIS) to northern waters and to the surroundings of the Svalbard archipelago.

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Orbited 12 July 2010, the Norwegian AISSat-1 maritime surveillance satellite was in many ways sensational.

The satellite payload was produced in Norway and based on top competence developed over the years in the country's industries and research communities. The Norwegian Defence Research Establishment, Kongsberg Seatex, Kongsberg Satellite Services and the Norwegian Coastal Administration worked together to develop and build AISSat-1. The Ministry of Trade and Industry financed the project, and NSC was the project owner. With its Canadian satellite platform, Norwegian instruments and launch from India, AISSat-1 exemplifies how today space activities depend on international cooperation.

Media coverage of AISSat-1 has been considerable, and the space community outside Norway has shown credible interest in it. The rapid completion and low price of the project and the advantages of the satellite have drawn attention. With the AISSat-1, Norway has come forth as a leader in a sector that is vital for other maritime nations. A joint European solution for using satellites in maritime monitoring has been discussed. During the year, the AISSat-1 experimental satellite was presented at many conferences as an example of innovation.

One of the most important roles of the NSC Board is to encourage innovation in the uses of space to benefit users. One of the previous NSC Board's suggestions was for a small communications satellite that would benefit shipping in Norwegian sea areas. The present Board supported the completion of the project. We are proud to have contributed to Norway now having its first polar-orbiting national satellite that is delivering data useful in improving maritime safety.

From their start, Norwegian space activities have focused on industry efforts to exploit the advantages of space, as reflected in the NSC vision:

"In 2015 Norway shall be the country that benefits most from space."

International cooperation

Norway's membership in the European Space Agency (ESA) is one of the key means for attaining that vision. In 2010, NSC managed NOK 362.3 million (€46.4 million) in ESA optional programme funds. The scientific programme and ESA operations are included in the mandatory programmes that amount to NOK 123.9 million (€15.9 million).

The greater part of Norwegian ESA contributions are for the optional programmes that cover a broad spectrum, from technological developments to uses of satellite data. Norway has chosen to participate in programmes that strengthen Norwegian industry, afford access to data relevant to public management, and provide research challenges for universities and institutes.

Over the past few years, the EU has become an increasingly important partner in European and Norwegian

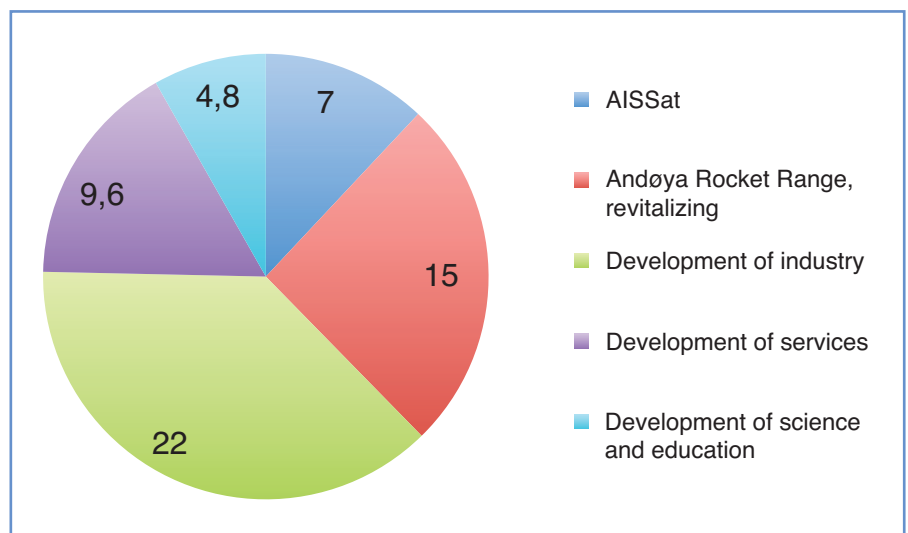
space activities. Norway is a full member of Galileo, EU's major commitment in satellite navigation. This leads to having more influence on the development of the system and enables Norwegian industry to compete for contracts equally with EU member countries.

In the past year, several industrial actors entered agreements for deliveries to Galileo. The largest of these, for NOK 170 million (€21.8 million), was entered by Norspace for the production of frequency generators and Search And Rescue Transponders (SART) for the first 14 Galileo satellites. The Board regards this as confirmation of the decision to enter Galileo as a full-paying member was wise, even though the total cost of complete development of the system apparently will be more than initially assumed. In 2010, the Norwegian financial support of Galileo amounted to NOK 124.2 million (€15.9 million).

Needs and potentials

After Norway and Russia reached an accord on division of the Barents Sea, Norway has a larger sea area to manage. There are many challenges in this part of the world, with its adverse climate, vulnerable nature and immense resources, aspects reflected in Norway's

Figure 1. In 2010, the Norwegian Space Centre support scheme amounted to NOK 58.4 million (€ 7.5 million). In all, 31 companies received support. The figure shows distribution of funding by activity sector.



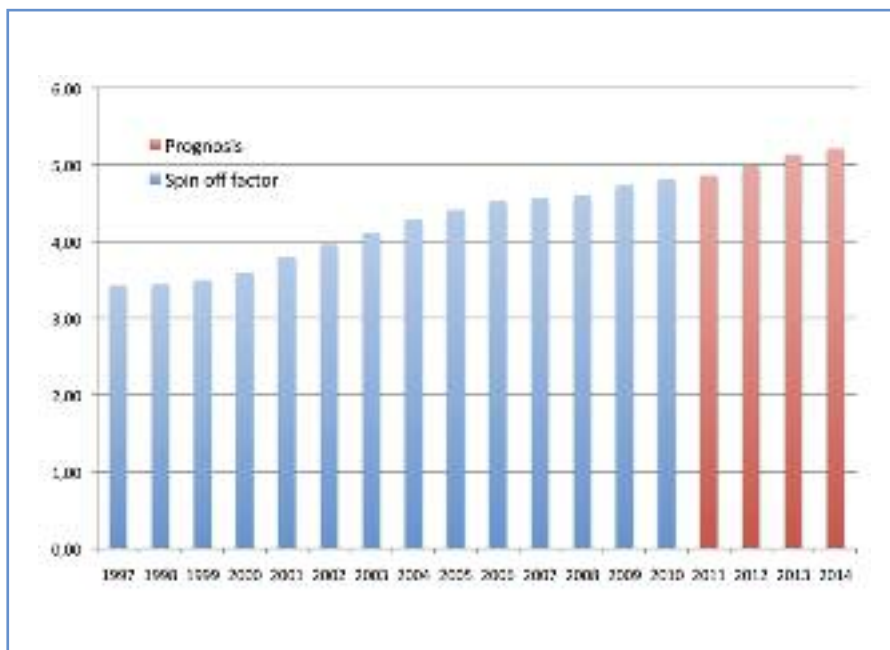


Figure 2. The spin-off factor is a measure of the effect of Norwegian space commitment through ESA and national support programme funding. The Figure is based on information provided by 26 companies and institutes in Norway.

High North Strategy. Success in the management task is contingent upon reliable, up-to-date basis of information of the sort that space applications can provide.

Earth-observation satellites, such as our AISSat-1, provide copious data on climate, environmental conditions, pollution, weather and other information that benefit Norwegian authorities and research institutions. Moreover, a fleet of satellites contribute to communications and navigation in the high north.

Consequently, the Norwegian position relative to the EU-supported Global Monitoring for Environment and Security (GMES) Earth observation initiative is a key question for Government decision in 2011. The Board regards participation in GMES as essential for domestic industries and management.

The Norwegian Space Centre support scheme

NSC manages this scheme in addition to its ESA commitments. The scheme is supporting developments of products and services by Norwegian companies or institutes in the space sector. The

scheme is also used to secure national vital infrastructure. NOK 58.4 million (€7.5 million) shared between 31 companies and organizations was included in the scheme in 2010 (Figure 1).

The scheme is vital because it enables Norwegian companies and research institutes to strengthen capabilities to be more competitive in bidding for contracts. In many cases, it has contributed to companies having been awarded outstanding contracts on the basis of technological developments. Notable cases include among others Norspace, Kongsberg Spacetec, the Jotron Satcom broadband maritime satellite terminals, and TSAT activities in the AV SatCom company.

Spinoff effects

Over the last 15 years, governmental commitments in space activities have been assessed in terms of a spin-off factor, which is the ratio of the additional turnover achieved by a space company to the amount of funding it received from support programmes or ESA contracts.

The spin-off factor rose from slightly less than 3.5 in 1997 to 4.8 in 2010 (Figure 2). This means that for each

NOK of governmental support through ESA or the national support programmes, space-sector companies have attained additional turnover of nearly 5 NOK. The Board believes that this is proof that governmental commitment in space activities is profitable and leads to industrial development and workplaces. The Board emphasizes that further growth depends on increased commitment, both public and private.

Space industry

Space industry is a vital business sector in the country. In 2010, the turnover of Norwegian-produced goods and services in the space sector (Figure 3) amounted to NOK 5.7 billion (€730 million), of which 68% went to export. Turnover in satellite communications accounted for a considerable part of the export income. Telenor Satellite Broadcasting accounted for the largest portion of it. In addition, companies making high-tech niche products delivered to the international space market. Moreover, through cooperation with partners in Asia and Africa, KSAT augmented its polar station network with a mid-latitude network of four stations to better serve the expanding market for ground station services.

The space industry is recognized for developing new technologies that have been put to use in other sectors. From the standpoint of the space industry, technology transfer should also go the other way, from other sectors to the space sector. Consequently, NSC and several space and energy companies took part in and had a stand at the biennial Offshore Northern Seas (ONS) exhibition and conference in Stavanger. Permanent technical cooperation between the oil and gas sector and the space sector is being worked out.

The international space station and space transport

The International Space Station (ISS) now is finished and ready for further research uses. The Norwegian AIS receiver on the Space Station has created a stir in the international maritime community. The data it provides will be used to evaluate AISSat-1 data

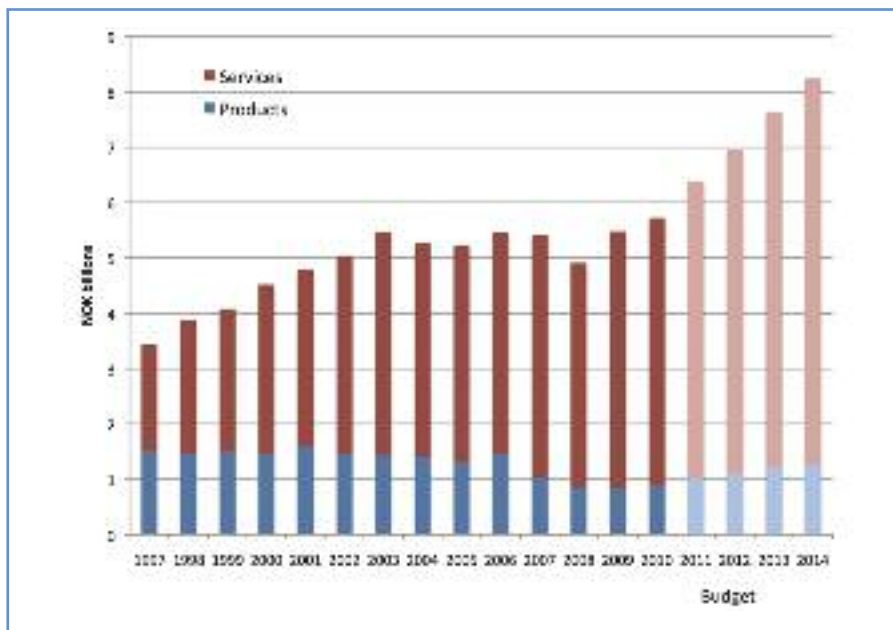


Figure 3. Turnover of Norwegian-produced goods and services, from 1997 to 2010, including the companies' forecasts up to 2014

and to further develop the AISSat-2 satellite to be built in 2011. The Space Station also will be used to ensure the safety of ship traffic in the pirate-infested seas off the coast of Somalia.

The countries involved in the Space Station, the USA, Canada, Japan, Russia, Brazil and the ESA countries have in principle agreed that operation should be extended to 2020. In the autumn of 2010, the ESA countries failed to agree on a financial plan for operation of the European part of the Station. ESA wishes that the countries commit "healthy money" to the Space Station programme at the Council Meeting in March 2011.

In space transport, the international launch market is stable. The ESA-developed Ariane 5 launch vehicle has 60% of the launch market and during the year orbited 12 large communications satellites. Norwegian companies have steady production runs for Ariane, but the market for Arianespace, the company that markets, integrates and launches the launch vehicles, is critical due to market fluctuations and low profits. ESA now is reassessing the structure of the European launch vehicle industry with an eye to making it more efficient. But it's clear that not

even in Europe can access to space be ensured without public funding.

Satellite communications

Since the 1970s, Norway has been at the forefront of the use and commercial applications of satellite communications. With the support of its Board, NSC has helped maintain and further develop the country's capabilities during the restructuring of the past few years. The restructuring phase has led to developing new companies and to increased activities in existing enterprises.

NSC has assisted a working group tasked with assessing the feasibility of cooperation between The Ministry of Defence and The Ministry of Trade and Industry in meeting Defence needs for satellite capacity. The working group recommended a national solution, but the Government went for cooperation with Hisdesat, a Spanish company. NSC now participates in a group set up by the Ministry of Defence to ensure repurchase associated with Hisdesat's satellite acquisitions.

Satellite navigation

Galileo is the largest European joint infrastructure commitment and the

largest ever EU space project. Together with GPS, Galileo will be Europe's as well as Norway's primary system for positioning, navigation and timing. With its appreciable economic activity, demanding topography and management responsibility for extensive land and sea areas, Norway needs better, more reliable navigational aids. Satellite navigation is a reliable, cost-effective solution.

The EU recently released the results of the midway evaluation. It was found that the total development of Galileo will cost €5.4 billion, or €1.9 billion more than originally estimated. The Commission will continue the Galileo development with funding already allocated up to 2014, when part of the system is scheduled to be operational. In 2011/2012, the Commission will put forth recommendations for further development and operation of the system until commissioning in 2020.

The European satellite navigation programme also includes support, the European Geostationary Overlay Service (EGNOS), that aims to ensure the quality and reliability of GPS satellite signals in Europe. The open EGNOS service was declared operative in October 2010. In 2011, the Safety of Life (SoL) service in EGNOS will be certified for aviation. This means that Norwegian aviation authorities can plan the introduction of satellite-based procedures for EGNOS-assisted landing at Norwegian airports.

Over the past few years, NSC has assisted the Ministry of Fisheries and Coastal Affairs by following up the Norwegian Radio Navigation Plan and now is assessing the use and vulnerability of satellite navigation systems relative to various user sectors.

Earth observation

NSC has long prioritized greater use of Earth observation data in environmental monitoring and management of Norwegian areas. Norway plays an active role in the ESA Earth observation programme concerning the choice of new satellite projects and the ways in which data are used.

The promising new initiatives include

the met.no use of satellite images for better forecasting of winds near the coast and in fjords, and the Norwegian Mapping Authority's use of gravitational satellites to more accurately map regional gravitational fields.

ESA's Cryosat research satellite for the study of ice was launched in 2010. Over the next few years, it will measure the thickness of sea ice and assess the climate-driven changes in the large Arctic and Antarctic ice sheets.

ESA has begun building the next generation of geostationary weather satellites. (Meteosat third generation). Preliminary activities have started for the next generation of polar weather satellites.

With partial financing from the EU, ESA is building a series of environmental monitoring satellites in the GMES programme. They are scheduled for launch in 2013. The intent in the long-term is to transfer ownership of the satellites to the EU, as was done for Galileo. The Norwegian responsibilities in the EU part of the GMES programme have yet to be clarified and are on the agenda for 2011.

NSC is involved in polar monitoring. Additionally, it plays a central role in international work to establish global monitoring of tropical forests, as a direct follow-up of the Government's climate and forests project.

Space research

The Norwegian space research community is prominent in solar physics, auroral studies and cosmology.

Norwegian solar physicists use European, American and Japanese satellites and interact with NSC in planning the next ESA solar research satellite.

In the past year, Norwegian cosmologists have been extensively involved in the initial analyses of data from the ESA Planck space telescope. Norwegian scientists have prominent positions as a result of smooth cooperation over the years between the University of Oslo, NSC and The Research Council of Norway.

In accordance with the Government's commitment to revitalize the Andøya Rocket Range and Norwegian sounding rocket activities, the NSC in December supported the ECOMA rocket campaign that successfully launched three sounding rockets for studies of meteor dust in the upper atmosphere. NSC also supported construction of technical activity buildings at the Andøya Rocket Range.

Communications and education

Prior to the launch of the Norwegian AISSat-1 satellite, NSC, the Norwegian Defence Research Establishment and Kongsberg Seatex held a packed press

conference. There was considerable interest in the satellite, and Minister of Trade and Industry Trond Giske and Coastal Director Kirsti Slotsvik were quoted widely in the media. The launch from India was postponed until 12 July, which renewed media interest.

NSC co-organized the ESA Living Planet Symposium in Bergen that drew 1200 participants. In connection with the Symposium, a magazine entitled A Northern View on a Living Planet was launched to show the scope of Norwegian Earth observation.

NSC has provided educational and development funding of the AnSat student satellite programme that started in 2006. The programme is well underway, and to date 83 students from two universities and a college have participated. They developed, built and tested three satellites that will be launched to acquire data. In response to the need for future expertise in Norwegian space activities, the Board decided to extend the programme for three years, until 2014.

In 2010 there were some 1000 media mentions of NSC, nearly three per day. Along with frequent lectures, many school visits and a busy romsenter.no website, the media coverage helped publicize science and technology.

Oslo, 22.02.2011



Øivind Stene, Chairman



Jøran Moen



Edel Storelvmo



Paul Narum



Marie Nymark Melle



Bo Andersen, Managing Director

Figures from profit and loss account 2010

NOK 1000 (1€= NOK 7.8125 as per 31 December 2010)	2010	2009
PROGRAMME ACCOUNTS		
<i>Programme income:</i>		
Programme revenue from Ministry of Trade and Industry	565 909	460 658
Other revenues	11 072	11 854
<i>Total programme income</i>	<i>576 981</i>	<i>472 512</i>
<i>Programme expenses:</i>		
ESA, Mandatory basic activities	37 935	40 174
ESA, CSG Kourou	10 381	11 224
ESA, Mandatory scientific programmes	75 562	86 198
ESA, Earth observation	125 164	68 770
ESA, Telecommunications	54 932	41 882
ESA, Navigation	18 723	44 716
ESA, Space station, Microgravity and Exploration	41 335	14 005
ESA, Space transportation	30 938	15 989
ESA, Technology development	91 261	69 410
ESA, Esrange Andøya Special Project	28 144	30 479
Radarsat	3 003	6 809
NSC support scheme	58 400	43 932
<i>Total programme expenses</i>	<i>575 778</i>	<i>473 588</i>
PROGRAMME RESULT	1 203	-1 076
OPERATING ACCOUNTS		
<i>Operating income:</i>		
Operating revenue from Ministry of Trade and Industry	47 400	40 600
Other operating revenues	52 639	45 501
<i>Total operating income</i>	<i>100 039</i>	<i>86 101</i>
<i>Operating expenses:</i>		
Salaries and social expenses	28 713	24 648
Other operating expenses	72 059	57 223
<i>Total operating expenses</i>	<i>100 772</i>	<i>81 871</i>
Depreciation	638	609
Operating profit	-1 371	3 621
Net financial income	-18	6
OPERATING RESULT	-1 389	3 627
TOTAL RESULT	-186	2 551

Pictorial review of 2010

January

An eventful year for Rolf Skår

Rolf Skår was appointed one of ESA's two ombudsmen responsible for arbitrating disputes in the space sector, such as between companies after contracts are entered. In December, Mr. Skår was named Knight, First Class of the Royal Norwegian Order of St. Olav, in recognition of his initiative over many years in building up and leading Norsk Data and for his contributions to space activities when he was associated with the Norwegian Space Centre. ©Norwegian Space Centre



Satellites help Haiti

On 12 January 2010, Haiti suffered a major earthquake of magnitude 7.0 M_w that levelled the capital of Port-au-Prince. The International Charter on Space and Major Disasters ensured that relief workers had continuous access to updated satellite maps of the affected areas to speed rescue and aid work. Also see page 14. ©SERTIT 2010



February

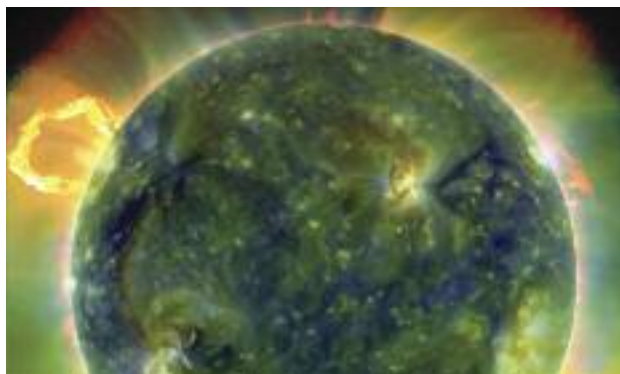


Space station room with a view

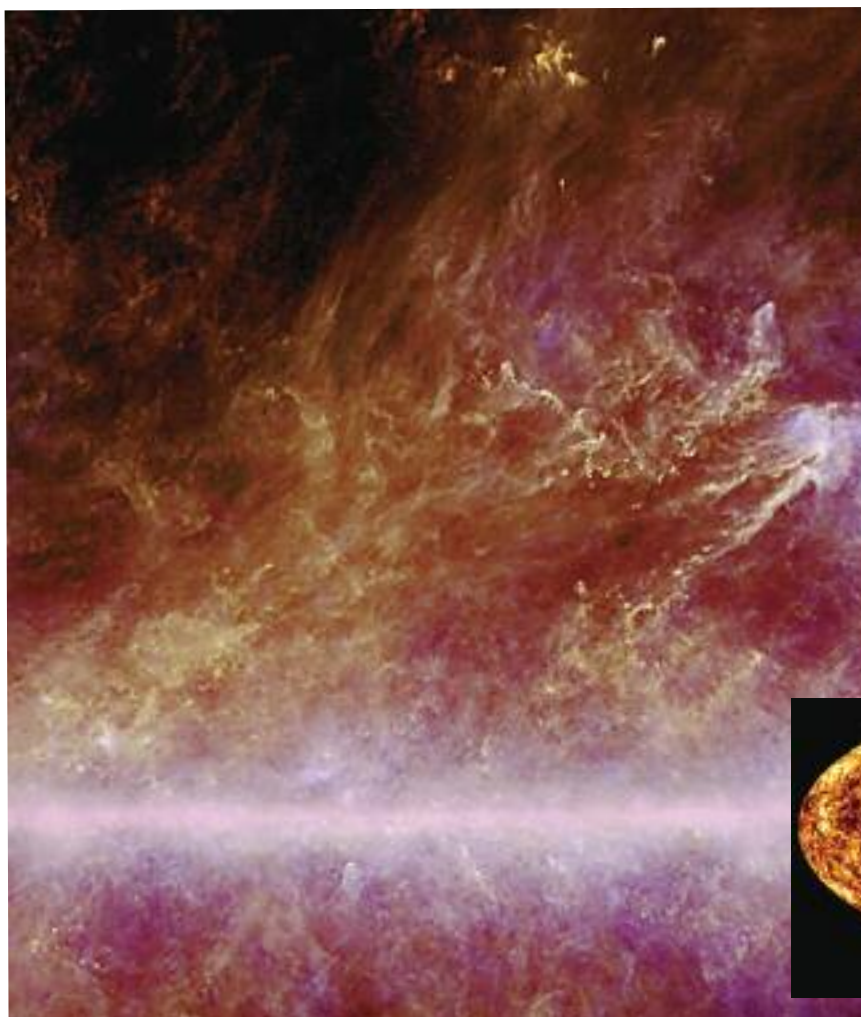
In the first half of February, the ESA-built Cupola 3 observatory module was attached to the International Space Station (ISS). It is a hexagonal cupola for observation, work and relaxation. It is attached to the Node 3 Tranquility module, which is fitted with a treadmill for exercise and with environmental systems that recycle waste water, remove CO_2 and generate oxygen. ©ESA - D. Ducros, 2010

The sun in focus

In early February, NASA's Solar Dynamics Observatory (SDO) was placed into an orbit around the Earth. It will acquire huge amounts of data on solar processes that will benefit scientists, including those of the Solar Physics group at the University of Oslo. The group will study the functions of the sun and the basic processes of space weather that affect satellites orbiting the Earth as well as electricity grids on it. In late February, a fact book on the sun, "Our Explosive Sun: A visual Feast of Our Source of Light and Life" by NSC staff member Pål Brekke was published. ©NASA/Goddard/SDO AIA Team



March



The cold dust of eternity

In mid March, the Planck space observatory supplied its first images. The spectacular pictures show giant filaments of cold dust stretching throughout our galaxy. Scientists hope that analyses of the filaments will lead to understanding the forces that form galaxies and to what triggers the birth of stars.

ESA's intention is that the Planck space observatory shall help probe the mysteries of the universe, including how it and galaxies were created. Scientists at the Institute for Theoretical Astrophysics at the University of Oslo are taking part in the project.

©ESA and the HFI Consortium, IRAS
©ESA – D. Ducros



Close view of Phobos, a Martian moon

In early March, the Mars Express spacecraft orbiting Mars flew by Phobos, the larger and closer of the planet's two moons. At a distance of just 67 kilometres from Phobos, the spacecraft provided scientists with unique data and images that may afford insights to its history and physical characteristics. Apparently Phobos has high porosity and may be just a lump of captured asteroid material that orbits Mars.

©ESA/DLR/FU Berlin (G. Neukum)



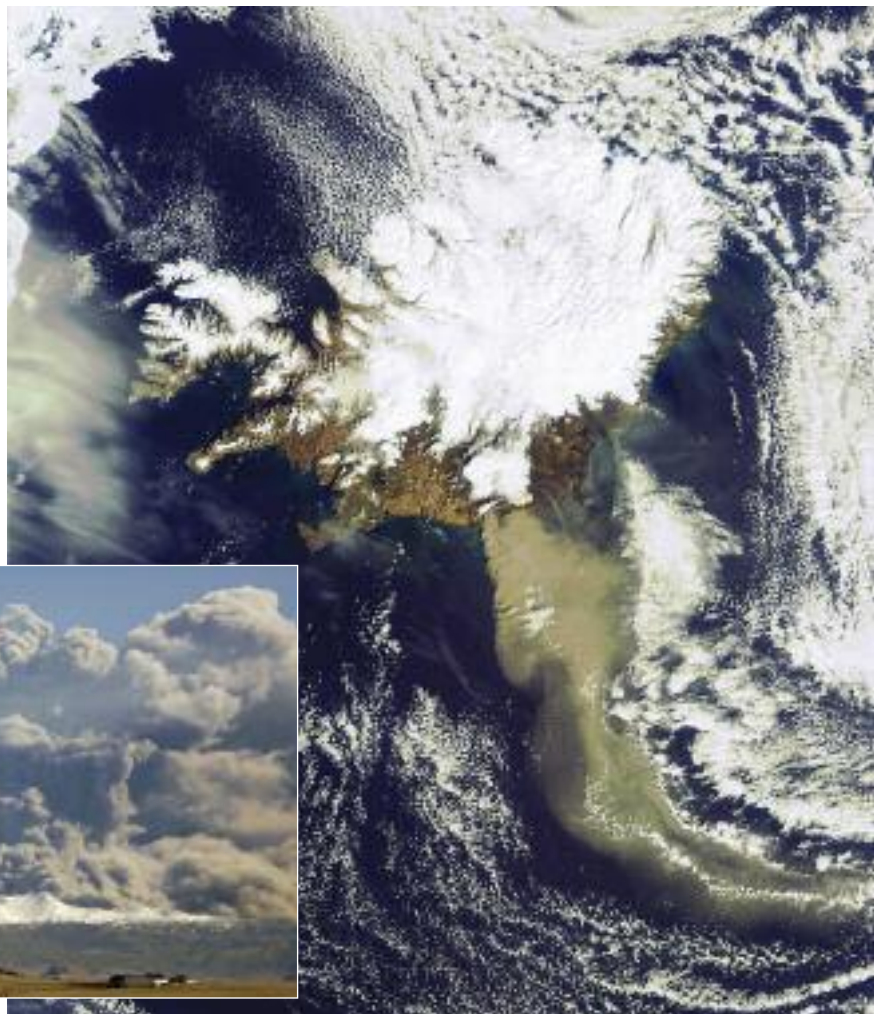
April

**CryoSat-2 orbited**

On Thursday, 8 April, ESA's Earth Explorer CryoSat-2 was launched. It is dedicated to precision monitoring of the annual changes in the thickness of sea-ice in the Polar oceans. It also will probe the surfaces of the ice sheets that cover Greenland and Antarctica to permit study of their changes. The goal is to find how much ice remains on Earth as well as to assess its thickness and the impact of climate change on it. Several Norwegian research groups are involved in CryoSat-2 and will use the data it acquires. ©ESA

Satellites monitor volcanic ash

In late April, thousands of aircraft across Europe were grounded due to the hazard posed by an enormous ash cloud spewed out by the Eyjafjallajökull volcano on Iceland. The ash cloud spread south-eastwards and blanketed Europe as travellers waited and waited for the air to clear so they could continue their journeys. Weather satellites and research satellites can provide data on volcanic emissions and eruptions. Norwegian researchers are now working to develop improved volcanic ash warning systems for aviation. ©ESA ©Ámi Friðriksson



May

Following oil spills from space

At the end of April, the Deepwater Horizon offshore drilling rig exploded while drilling in the Gulf of Mexico. Every day, the sea-floor gusher spilled out enormous quantities of crude oil. By May the spill had become a disaster. It was the third disaster of 2010 for which satellites were used to chart damages and forecast their spread, as in estimating the impact of the spill on coastal areas along the Gulf of Mexico.

©ESA



Birth of an enormous star

In 2009, ESA's Herschel infrared space observatory was launched together with Planck. Herschel will be used to study the oldest, coldest structures in space, including former stars and galaxies and the ways in which they were formed. In May 2010, ESA presented the first images from Heschel. One image captures a star in the act of formation. The embryonic star already contains eight to ten times the mass of our Sun. Moreover, it's surrounded by some 2000 solar masses of gas and dust on which it can feed.

©ESA/PACS & SPIRE Consortium/
HOBYs Key Programme Consortia

June

To Mars – in Moscow

Mars500 is a ground-based experiment simulating a manned flight to Mars. The simulation is at a facility in a dedicated building in Moscow and will last until November 2011. The crew comprise six persons, from left Diego Urbina and Romain Charles from Europe, Wang Yue from China, and the Russians Alexej Sitev, Alexandr Smoleevskij and Sukhrob Kamolov, who will work, live and train as astronauts on the long mission. The object is to simulate a 250 day mission to Mars, landing and a month spent researching the planet, and finally a return mission of 230 days. ©ESA



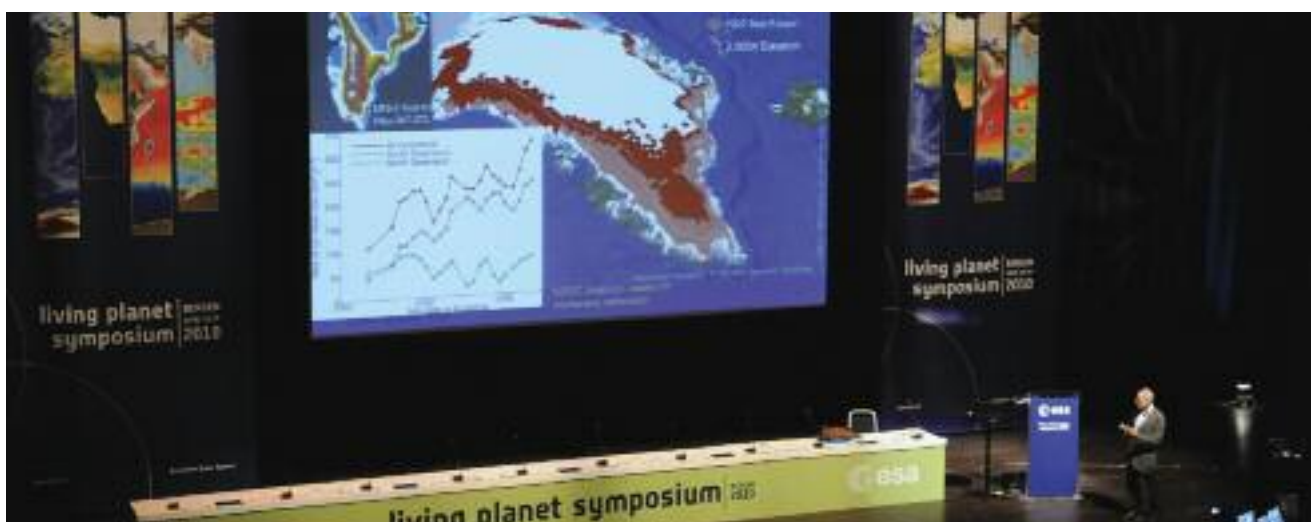
Norwegian ship detector first in space

Europe's first ship detector in space is Norwegian and now transmits data from the space station. The Norwegian Automatic Identification System (NORAIS) was actuated in June and acquires data on ship traffic round the world. NORAIS receives signals from Automatic Identification System (AIS) transmitters on ships. The NORAIS results will be compared with the data downloaded from AISSat-1, Norway's first satellite, launched in July. ©NASA



Satellites for a living planet

At the end of June, the Living Planet Symposium, ESA's largest ever research symposium on Earth observation, was held in Bergen, co-arranged by ESA, NSC and the Nansen Environmental and Remote Sensing Center (NERSC). Its programme included presentations of the initial results from Europe's three new research satellites, the Gravity field and steady-state Ocean Circulation Explorer (GOCE) satellite, the Soil Moisture and Ocean Salinity (SMOS) satellite and the CryoSat-2 satellite used for studying ice thickness. ©ESA – T. Schonfelder



July

Norwegian satellite launched

The Norwegian AISSat-1 satellite launch from India on 12 July at 05:52 Central European Time was perfect. AISS-1 is an experimental maritime surveillance satellite fitted for relaying Automatic Identification System (AIS), an automated tracking system used on ships and by Vessel Traffic Services (VTS). The satellite increases AIS

coverage from waters near coasts to all sea areas administered by Norway. AIS eases the identification and coordination of vessels in search and rescue operations, which contributes to the safety of seagoing vessels in northern waters and around Svalbard. Monitoring environmental events and the transport of dangerous cargoes is another application. ©FFI/NASA/Norsk Romsenter ©ISRO



Close-up of asteroid Lutetia

On 10 July 2010, the European Rosetta comet orbiter took a close-up image of Lutetia. The image shows that Lutetia, an asteroid with a diameter of 100 km, has many craters and scars on its surface. Comparison with asteroids and comets suggests that Lutetia was formed at the same time as the Earth and other planets of the solar system. Perhaps the distant traveller can reveal how the planets were formed. Some comets and asteroids even contain organic molecules, so understanding Lutetia may provide clues to the formation of the Earth and the solar system.

©ESA 2010 MPS for OSIRIS Team MPS/UPD/LAM/IAA/RSSD/INTA/UPM/DASP/IDA



August

European soda can satellite finale

Students from ten European upper secondary schools met at Andøya to launch high-tech soda cans in the CanSat satellite contest. For half a year, they had worked on the small payloads the size of a soda can. In August, the soda can satellites were launched on small rockets to an altitude of one kilometre. On the way the payload instruments measured parameters such as variations in the Earth's magnetic field and solar radiation. The contest is part of the ESA initiative to motivate young people to study the natural sciences and technology.



From ocean depths to outer space

At the 2011 Offshore Northern Seas (ONS) biennial conference in Stavanger, the Think Outside the Planet online network stand exhibited technology interchange between space activities and the oil and gas sector. The visitors included King Harald V of Norway, who was briefed on space activities and the importance of technology interchanges. NSC is a partner in the network set up to further technology interchange between space activities and other sectors, particularly the oil and gas sector. The Network also arranged a meeting, lectures and a mini-conference. The guest of honour was Dr. Peter Diamandis (left), founder and chairman of the Ansari X Prize Foundation. Bjørn Ottar Elseth, NSC, welcomes Diamandis to the conference. All photos ©NSC



September



Galileo participation signed

At the end of September, Norway and the EU signed a bilateral cooperation agreement for Galileo. The agreement allows full Norwegian participation in Galileo programme, which enables Norwegian companies to compete for contracts. Moreover, Norwegian authorities can influence the development of Galileo so the country's specific needs are taken into consideration. Galileo is a European satellite navigation system that will work together with the American GPS system and other navigation systems. Galileo will ensure that Norway has independent access to satellite navigation. The system also will offer greater precision and operational safety in the far north. ©ESA - P. Carril



Space agreement with Japan

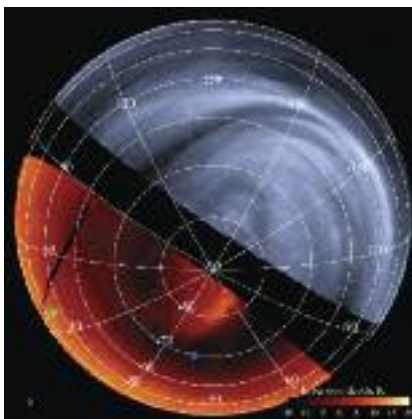
28 September 2010, the Japan Aerospace Exploration Agency (JAXA) and NSC signed a top-level agreement on space activity cooperation. Japan and Norway already have worked together in several space research sectors, particularly in atmospheric studies. Japanese researchers are involved in research on the aurora. Japan also takes part in the European Incoherent Scatter Scientific Association (EISCAT), which has large radar antennas on Svalbard and in northern Scandinavia that are used to chart changes in the ionosphere and the Earth's magnetic field.

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October

Venus Express encounters air resistance

The European Venus Express orbiter got a warm welcome when it flew closer than ever to Venus. Venus Express orbits our warm neighbouring planet and dived down into the poisonous atmosphere to measure its density. This showed the polar atmosphere of Venus to be 60% thinner than expected, perhaps due to processes yet to be understood. The atmospheric fly through also found that the density of the atmosphere varied considerably between the day and night sides of the planet.



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ultraviolet image:
ESA/MPS/DLR/IDA

Space help to disasters turns ten

For ten years, the International Charter for Space and Major Disasters has benefited disaster relief work round the world. The Charter gives registered users rapid and free access to satellite data. To date, the Charter has aided relief work in more than 300 disasters in 100 countries, including the forest fires that raged in Russia in 2009. Norway takes part in the Charter through its membership in ESA. The Rescue Coordination Centre (RCC) at Bodø can activate the Charter for Norway, but to date activation fortunately has not been necessary. ©ESA



November



Ten years of ISS operations

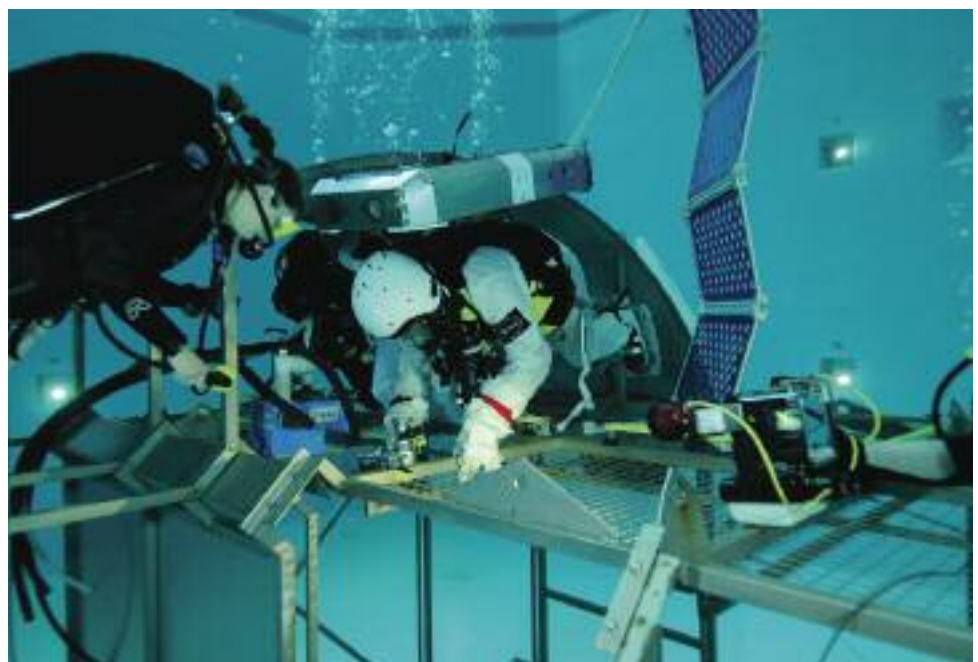
November marked the tenth anniversary of the first astronauts boarding the International Space Station (ISS). The USA, Russia, Japan and 11 European countries, including Norway, have worked together to build and use ISS. Today ISS is a huge satellite, the size of a football field, with an interior as large as a five-room apartment. It is fitted with several laboratories, two bathrooms, an exercise room, and a 360 degree window where Shannon Walker has an enviable view. ISS is a permanent outpost in space and a remarkable laboratory for research in physics, medicine, biology, material technology and space science. It is expected to remain in operation for at least ten more years.

©ESA/NASA

European astronauts finish basic training

Six ESA astronauts graduated upon completion of basic training at the European Astronaut Centre (EAC) in Cologne, Germany. Their basic training included subjects relevant to space and to work on the International Space Station. In addition, they trained in robot operations, survival, attaching and docking of two space vehicles, diving to simulate space walks, and Russian language. Three of the astronauts will soon go on their first missions, the first in 2013.

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December



Norspace lands major Galileo contract

In December, Norspace of Horten signed a major Galileo supply contract for NOK 170 million (€21.8 million). It's the largest single contract ever in the history of Norwegian space activities, and it may lead to more. Norspace will deliver frequency generators and Search and Rescue Transponders (SART) for Galileo satellites. The Galileo satellite navigation system is one of the largest ever EU industrial projects and will improve satellite navigation round the globe. It also will ensure that Europe has independent access to accurate time, position and navigation information worldwide.

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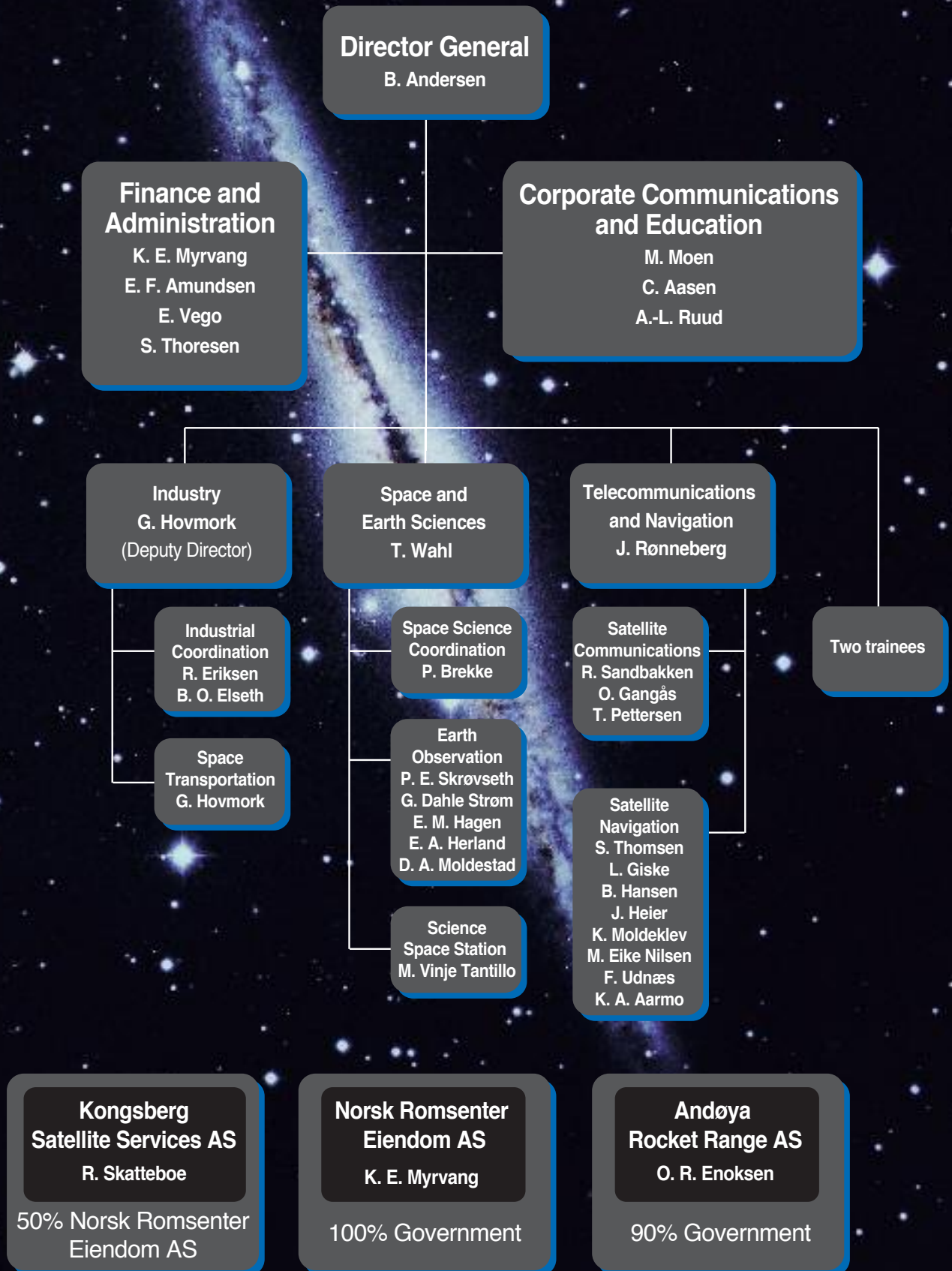
SpaceX successful

On 8 December 2010, the SpaceX space transportation company successfully launched the Dragon spacecraft that went round the Earth twice in a low-Earth orbit before landing in the Pacific Ocean. The Dragon spacecraft is design to deliver cargo to the International Space Station. In the long-term, it also is designed to carry people. The successful Dragon flight was a feather in the cap for President Obama, whose new space policy calls for private companies to provide transportation to and from the space station.

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Organization of the Norwegian Space Centre as per 1 May 2011





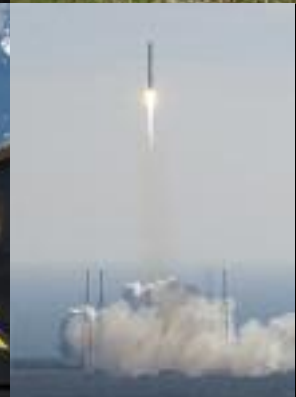
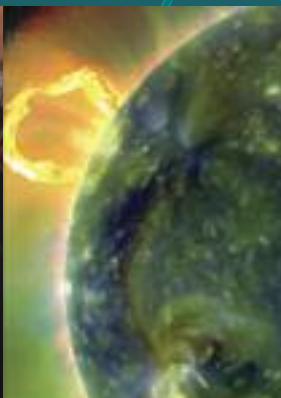
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