



Space Activities 2021 Netherlands Space Office

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Netherlands Space Office

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Preface

“A mind-blowing mission.” That is how outgoing state secretary Mona Keijzer described ERA - the European Robotic Arm that was built in the Netherlands - during its presentation to the media. When you hear words like those coming from a high-ranking government official, you know you are witnessing something truly special.

Space is about pushing boundaries, which more often than not requires a long-term perspective. For some high-tech projects and programmes, you can only begin to reap the rewards many years after the first seeds were sown and the initial plans were on the drawing board. Two such projects reached a critical phase in 2021. In the summer, I got to watch ERA's launch with my own eyes. On Christmas Day, the entire world witnessed the launch of the James Webb Space Telescope, carrying with it the MIRI instrument that the Netherlands made an important contribution to.

Launches of new missions such as these two often make headlines all over the world. It just so happens that the Netherlands played an important role in both missions. That makes us proud. The long road leading up to a launch is less glamorous, as is all the hard work that can only begin afterwards. Yet that is precisely where most of the rewards of space projects come from. While developing a project, countless men and women working at various businesses and institutions not only push the boundaries of technology, but also their own. The added value of space technology only becomes clear once it reaches its orbit around the planet or some other destination out in space and begins sending down data for scientific or social applications. Even that can make you feel proud, as I got to experience for myself when NSO received the Innovation Award from the Group on Earth Observations for our G4AW project, which utilises satellite data for the purpose of food security.

At the moment, as we are preparing for the ESA Ministerial Council 2022, the Netherlands once again has to make choices that will affect our country's future position and success in the space sector. NSO is drawing up a recommendation that will help the cabinet make these choices.

It all revolves around the added value of space technology for such social themes as security & strategic autonomy, care for our planet, discoveries in space and innovation & growth. How much should the Netherlands contribute to autonomous European access to space, especially in light of the current crisis? To what extent does the Netherlands want to be a high-tech country and how important is space for this purpose? Should the Netherlands keep investing in using observations from space for air quality and - possibly - water management? Does the Netherlands aspire to maintain its prominent role in the field of astronomy and the development of the space telescopes needed for astronomical research? How can we take even greater advantage of the Netherlands' unique position as a space country with the NL Space Campus and ESTEC as the beating heart of European space sector?

The answers to these and other questions and the choices that politicians ultimately make will determine the future of the Dutch space sector and the rewards it has to offer. These rewards come in the form of Dutch high-tech in space, scientific breakthroughs and especially solutions to the social challenges we face down here on Earth.

I sincerely hope that the Netherlands can continue to reap these rewards in the future.

I hope you enjoy reading our annual overview.



Harm van de Wetering
Director Netherlands Space Office

1 Developing the Dutch space sector



1 Developing the Dutch space sector

Despite being a small country, the Netherlands is a relatively major player in the international space sector. That is the result of the clear choices we make and our investments in promising technology for the future. Just look at the ongoing development of small satellites, laser communication in space, new earth observation technology and schemes designed to stimulate startups with ambitions in space. We are currently reaping the benefits of the clear choices we made in the past. That is especially true this year, which marks one of the biggest milestones in Dutch space history.

Highlights

→ Launch of the Dutch robot arm ERA

The European Robotic Arm was launched in the summer of 2021. This robot arm forms an important addition to the international space station ISS and represents an absolute milestone in Dutch space history. ERA was developed by a consortium of Dutch businesses and knowledge institutions led by Airbus Defence and Space Netherlands. The robot arm will be commissioned in the spring of 2022. European astronauts are training hard to learn to use this fine piece of Dutch high-tech engineering.

→ First satellite for Dutch Ministry of Defence

The Dutch military has taken its first concrete step into space. The BRIK-II satellite was launched on 30 June 2021. This is an experimental project by the Royal Netherlands Air Force, developed in collaboration with the Delft-based company Innovative Solutions in Space (ISIS) and Delft University of Technology. Defence Vision 2035 states that space has become an essential link in the information-based operations of our armed forces. For example, they make heavy use of navigation and communication systems. Now, a nanosatellite has been added to the Dutch arsenal. The launch is an initial test designed to demonstrate the potential of nanosatellites for military and civil uses.

→ Entrepreneurs challenged with SBIR technology

The so-called SBIR technology scheme (Small Business Innovation Research) helps businesses position themselves commercially with the help of technology developed for ESA programmes. With the SBIR technology, NSO and ESA challenged entrepreneurs to develop new technology centred around a product or service (prototype) with applications in the space sector. The products must contribute to ESA's programmes and improve the market position of the Dutch space sector in the long term. In 2021, ten businesses received a subsidy to perform a feasibility study on their idea.

→ Stimulating Dutch innovation

Innovation is essential for a small country such as the Netherlands. In order to remain successful and relevant in the international space sector, we must continue to grow and develop. This is made possible with support from the national government in the form of the GSTP and ARTES programmes. In 2021, each of these programmes awarded subsidies to multiple proposals. For GSTP, the focus is on products developed by SMEs. Although ARTES primarily centres around telecommunication, it also covers developments in e.g. the field of solar panels.

→ New startups at NL Space Campus

The NL Space Campus is growing fast. In 2021, the realisation of the International Meeting Facility on the ESTEC grounds was tendered and plans were finalised for the development of a "base camp" at the heart of the campus. The organisation of NL Space Campus was also expanded. Meanwhile, space incubator SBIC, located on the grounds of the NL Space Campus, welcomed various new startups. For example, the winners of the European Galileo and Copernicus Masters competitions, Soilspect and Carble respectively, have earned a place at SBIC.

→ Dutch high tech on board Norwegian satellite

For the first time ever, a small satellite will be able to use laser communication thanks to the Dutch instrument SmallCAT. SmallCAT was developed by TNO in 2021 as part of ESA's ARTES programme, with support from NSO and the Ministry of Defence. By investing in laser communication now, the Netherlands is strengthening its position within NATO in this regard. SmallCAT is also important for the Dutch space industry, as it can lead to new developments in laser communication that are funded with money that does not come out of the space budget.

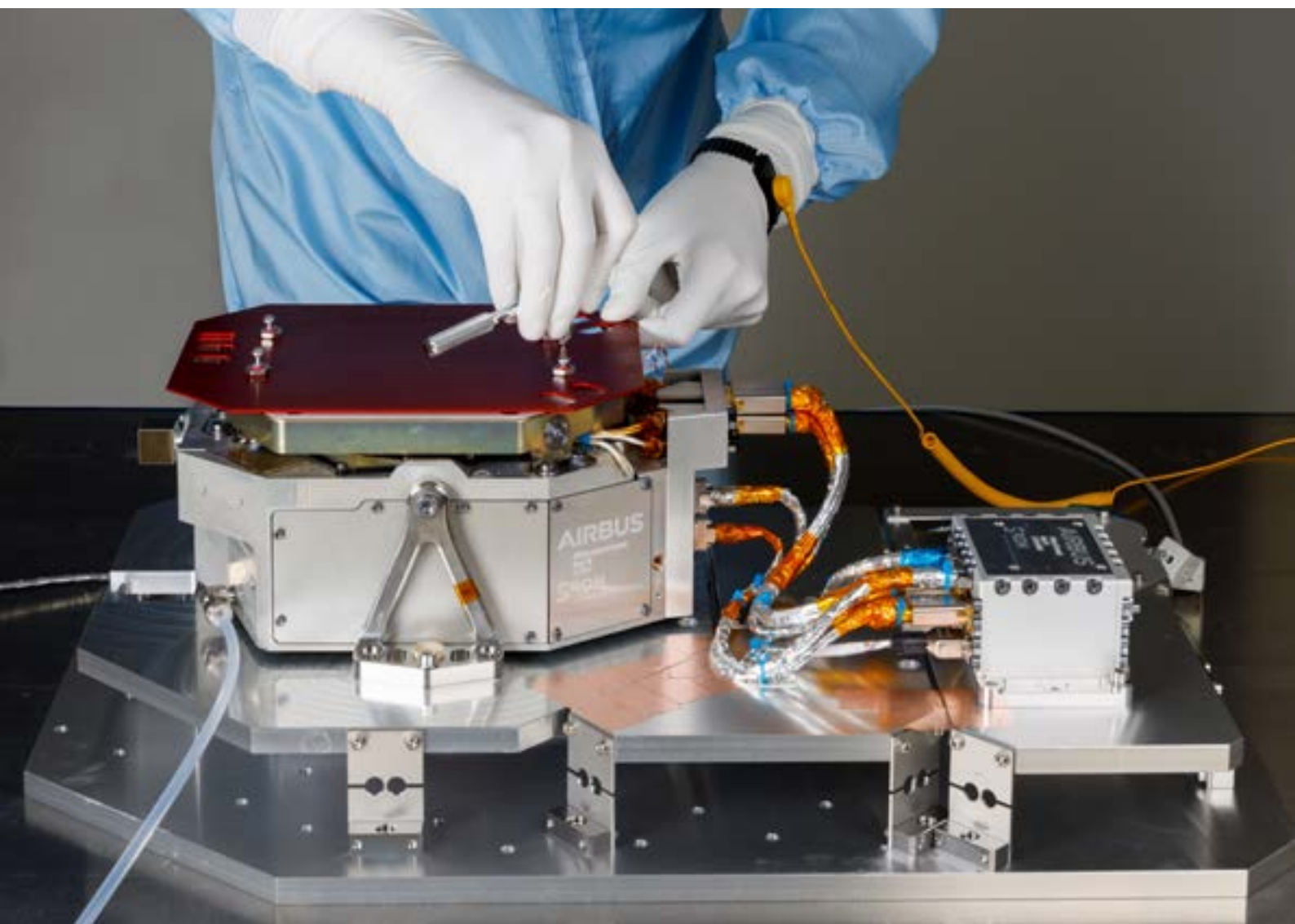
→ SPEXone delivered to NASA

In 2021, the Dutch instrument SPEXone was extensively tested before being delivered to the American space agency NASA for integration with its PACE satellite. After the launch in 2023, this state-of-the-art Dutch satellite instrument will study aerosols in the atmosphere. In doing so, it makes an important contribution to the study of the complex relationship between the oceans, the atmosphere and the climate. SPEXone was developed by SRON and Airbus Netherlands, with technology from TNO. The instrument's development was made possible with support from the Ministry of Education, Culture and Science.

*A technician prepares the SPEXone instrument ►
for vibration testing.*

→ Looking for opportunities in Europe

With programmes such as Copernicus and Galileo and various technology development programmes, the European Union is becoming an increasingly important player in the international space sector. As the Netherlands is currently not making optimal use of the opportunities that Europe offers, NSO and the Netherlands Enterprise Agency decided to take action in 2021. Webinars organised by Groundstation/dotSpace by order of NSO brought together entrepreneurs who want to apply for subsidy together in Brussels. Additionally, an online tender desk was developed to provide relevant information concerning European tenders in the space sector. The first concrete results of these efforts are expected in the second half of 2022.



Esther Peters
Director NL Space Campus



“We see new partnerships form”

Open innovation. Those two words neatly sum up what NL Space Campus stands for. Since 2019, director Esther Peters has been developing this international hub for space activities in Noordwijk: “The Campus aims to bring parties in the space sector together with their peers and with other sectors.”

The campus received its final name in 2021: NL Space Campus. Why was this name chosen?

“The Dutch space sector positions itself abroad under the banner of NL Space. It has become a powerful brand that Dutch parties feel comfortable with. We want those same parties to feel very welcome at the campus. It made sense for us to take advantage of the established name of NL Space. It goes well with the role we envision for the campus: to strengthen and unify the Dutch space sector.”

How does the campus intend to strengthen the Dutch space sector?

“Studies show that a quarter of the success of high-tech campuses stems from the presence of technical knowledge and innovation strength. For us, ESTEC serves as a source of innovation and technology development. Twenty-six hundred highly trained professionals work there to push the boundaries of what is possible with space technology. Then there are the Galileo Reference Centre, the space incubator SBIC and companies such as Decos and ATG. Many campuses would be jealous of what we - already - have to offer in this regard.”

That takes care of the first quarter. What determines the remaining 75% of the success?

“That comes from ‘social’ innovation. It is the result of sharing and applying knowledge and bringing people together. One of the things you need for this is a place where people can meet up. On purpose and by chance, at the coffee machine, at a lecture or during a workshop. People from the space sector, as well as startups and professionals from other sectors. Our job is to bring together people from the worlds of government, business, education and research.”

I expect the coronavirus pandemic did you no favours, did it?

“These last few years, it has been more difficult to facilitate and organise meetings. Above all, we sorely missed those chance meetings that often lead to wonderful new ideas and partnerships. The development of the physical infrastructure also suffered some delays.”

What (online) steps did the NL Space Campus manage to take in 2021?

“We have achieved some wonderful concrete results. We created a design for the activation of the area, including a square, pathways, a canopy and a fablab that will be realised in 2022. Every last Thursday of the month, we organise the networking event NL Space Campus Network & Drinks together with several of our partners. At these events, we can see our community grow and new partnerships form. One of those new partnerships is with Leiden University, Delft University of Technology and Erasmus University Rotterdam. We have organised successful Curiosity Events for which researchers submitted challenges concerning e.g. quantum technology and radiation in space. We have also introduced *communities of practice*.”



What is a community of practice?

“It is about sharing practical solutions for a challenge in a specific sector. For example, we invited the bulb growers of Greenport Duin- en Bollenstreek. They wanted to know what they can do with space technology and satellite data. We organised this together with Unmanned Valley, whose work centres around drone technology, and we are already making new plans for the future. During the gathering, it became clear that a combination of drone data and satellite data would offer tremendous added value for the bulb sector.”

When will NL Space Campus take physical form?

“In a way, it already has. Just look at e.g. ESA ESTEC, the Galileo Reference Centre, space incubator SBIC, companies such as ATG and Decos and of course the Space Expo museum, which draws more than one hundred thousand visitors annually. They are all located on the grounds of the NL Space Campus. Of course, we also want a place where we can organise our own activities and facilitate meetings and collaboration. In 2022/2023, we will therefore begin work on the development of a base camp. It will include catering facilities and a fablab where professionals and students from different fields can work on new technology and prototypes.”

What activities on campus are you most looking forward to in 2022?

“That would be the LDE NL Space Campus Summer School. It had to be cancelled in 2021 because of the coronavirus. We are giving it another shot in 2022. Students will immerse themselves in the space sector for a whole week, including three days in Noordwijk. They will go on three company visits per day and work on their own space business challenge, the results of which they will present at the end of the week to a panel of experts. It is a great opportunity to expand their CV. In late September, as part of the programme for Leiden European City of Science, the European Space Week will be held in Noordwijk. It is a space festival that offers various activities, including the Industry Space Days and an open day at ESTEC. There are various side events, a hackaton and an XL version of our Network & Drinks. I hereby invite everyone from the space sector to join us!”

2 Coordinating national and international space programmes



2 Coordinating national and international space programmes

Space activities are often complex affairs that call for effective collaboration and a long-term perspective. Each driven by their own role and interests, scientists, businesses and government organisations such as space agencies work together on groundbreaking technology or innovative applications. NSO often plays a coordinating role in the national and international programmes that make this possible. Furthermore, NSO advises the Dutch government on matters pertaining to effective space policy.

Highlights

→ A new director for ESTEC

Franco Ongaro served as director of ESA's technical centre ESTEC in Noordwijk since 2011. He announced his departure in 2021. Ongaro was always willing to act as host; a role he played very well. Among the guests he received at ESTEC were members of Parliament, ministers, foreign delegates and groups of schoolchildren. In 2020, he was awarded the title of Officer in the Order of Orange-Nassau for his many contributions. Torben Henriksen now serves as acting director of ESTEC. Meanwhile, ESA also got a new director. On 1 March 2021, Josef Aschbacher became the organisation's new Director General.

→ James Webb Space Telescope launched

After years of delays, the James Webb Space Telescope (JWST) finally launched in December of 2021. For the Netherlands, this launch was cause for celebration in a number of ways. The Dutch space sector was involved in the development of MIRI, one of four instruments on board of the telescope. Under the supervision of NOVA, several organisations including TNO, ASTRON and SRON contributed to building MIRI's spectrograph. Furthermore, the European Ariane 5 space launch vehicle was used to launch the JWST into space. Airbus Defence & Space Netherlands builds the engine frames for this rocket and APP is responsible for the igniters. The JWST will be fully operational by the summer of 2022. At that time, dozens of Dutch astronomers will get to work on processing and interpreting the JWST's observations. Expectations are already sky high.

→ Dutchman plays key role in mission Harmony

The European space agency ESA is exploring whether Harmony can become the tenth satellite mission in the European Earth Explorer programme. The Dutchman Paco Lopez Dekker, the mission's principal investigator, plays a key role in this process. Harmony consists of two identical satellites that receive radar signals transmitted by ESA's Sentinel-1 satellite. This results in valuable and highly detailed data on land (deformation, e.g. as a result of earthquakes and volcanic eruptions), water (the interaction between ocean and atmosphere and rising sea levels) and ice (changes in the volume and glacier deformation). Over the course of the next eighteen months, ESA will assess the technological and scientific feasibility of the mission. The launch is expected to happen around 2028.

◀ *The launch of the James Webb Space Telescope on an Ariane 5 rocket.*

→ The European space programme is changing

EUSPA - the European Union Agency for the Space Programme - was formed on 12 May 2021. This executive body of the European Commission stimulates the use of space with such programmes as Cassini, Horizon and Copernicus. Furthermore, EUSPA is responsible for the Galileo navigation programme. In the years to come, it will gradually become clear how the organisation will perform its various duties. Its goal is to allow European citizens to reap maximum economic and social benefits from the possibilities that space has to offer.

→ Space advice and ESA Ministerial Meeting

NSO has been tasked with drawing up a recommendation regarding Dutch space policy for the coming years. The focus is on the added value of space for the economy, science and society as a whole. The main points of NSO's recommendations will be announced in April 2022. A concrete recommendation regarding the exact allocation of the space budget will follow after the summer. This timing is no coincidence. ESA's Ministerial Meeting will be held in November 2022. At this conference, ESA's member states - the Netherlands among them - will decide what they want to contribute to Europe's various space programmes over the next three years.

→ Evaluation Dutch space research

The independent research and consultancy firm Dialogic was tasked by the Ministry of Education, Culture and Science with evaluating Dutch efforts in the field of space research. This has led to a number of important conclusions. First: space research is growing in scope and it is becoming more comprehensively embedded within the Dutch knowledge landscape. Second: besides astronomy and astrophysics, earth observation has become one of the Netherlands' scientific strong suits within the field of space research. Third: Dutch space research has a major scientific impact at the global level. Fourth: Dutch space research is becoming more comprehensive and makes a relevant contribution to solving an increasingly wide range of social issues.

→ NSO programmes and schemes evaluated

How well does NSO's GO programme perform? What is the outcome of the Partnerships for Space Instruments & Applications Preparatory Programme (PIPP)? What results have been achieved with the Instrument Development Programme (IDP)? A scientific committee (by order of the Dutch Research Council) and Dialogic (by order of NSO) sought to answer these questions, respectively. According to the Dutch Research Council, the GO programme contributes to one of the primary goals of the Dutch space policy: maximising the social, scientific and economic relevance of space for the Netherlands. The GO programme's high-quality scientific results are used for earth observation and planetary research. The Ministry of Education, Culture and Science has therefore decided to continue the GO programme. Dialogic's overall conclusion is that the PIPP and IDP schemes are generally effective and efficient and that both financing instruments enhance the anticipatory ability of the Dutch space research system.



Rens Waters

Professor of Astrophysics at Radboud University



“The Netherlands must not be afraid to invest in space research!”

Rens Waters, professor of Astrophysics at Radboud University, is studying planets outside our solar system. He uses the new James Webb Space Telescope for this, to which the Netherlands made an important contribution. “For decades, we have been incredibly good at space research. We have to strengthen our position further.”

The James Webb Space Telescope will go “online” in the summer of 2022. What will you be using the JWST for?

“I study the atmosphere of exoplanets, which are planets orbiting other stars. What compounds can be found there and in what compositions? We never had an objective way to answer those questions. With the JWST, we do now. My research forms part of the larger questions that humanity is trying to answer. How did life first form? Are we alone in the universe? What is our place in the universe?”

That sounds exciting. Why do you need this new telescope for your research?

“The objects I study are relatively cold. They can only be detected with a telescope that is itself extremely cold. The James Webb Space Telescope meets that requirement. It is exceptionally well suited for the detection of infrared radiation. This allows us to study the birth of the first stars and galaxies shortly after the Big Bang, as well as the composition of exoplanets.”

In your research, you use MIRI, an instrument that was partially developed in the Netherlands.

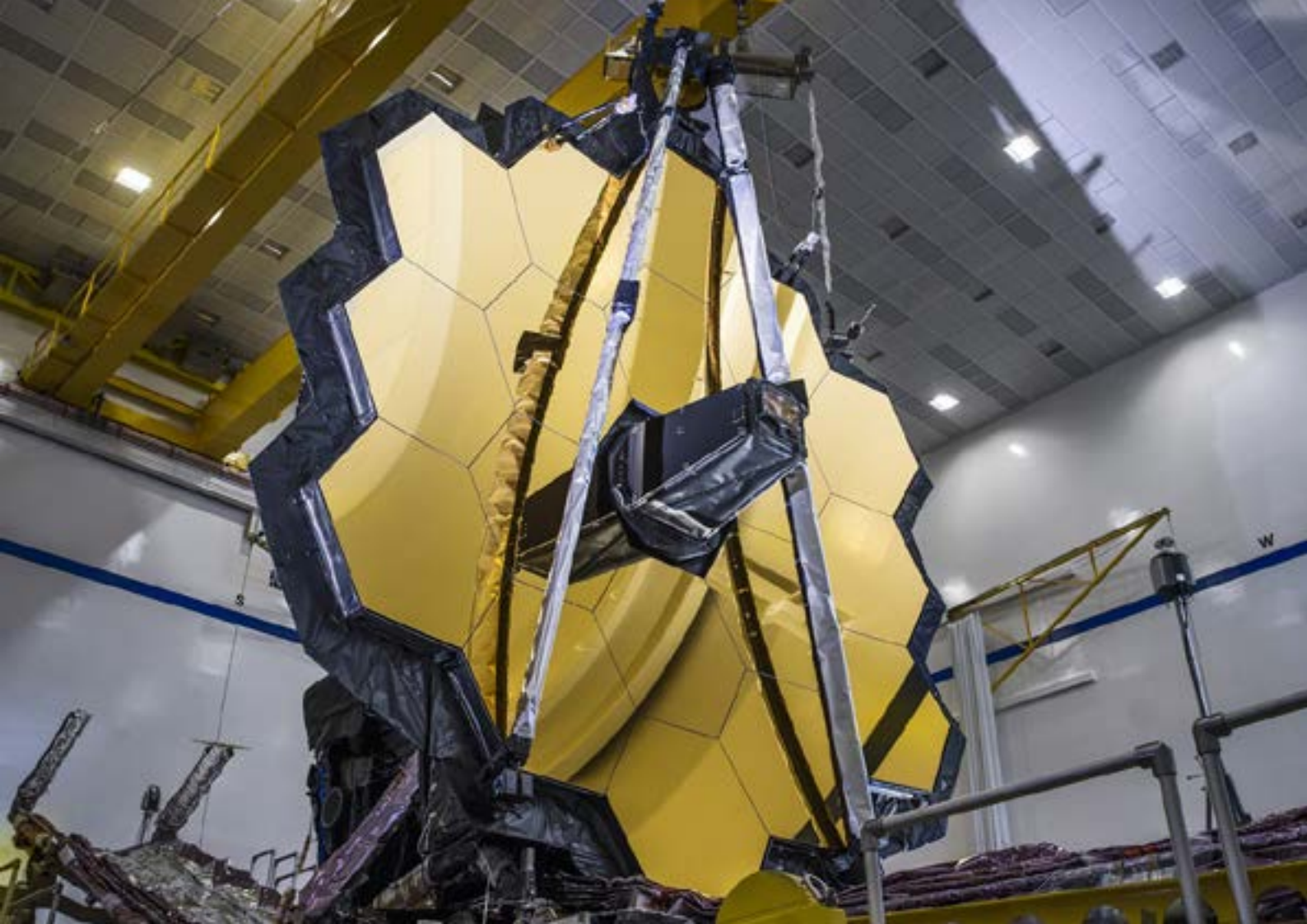
“That’s right. The Mid Infra Red Instrument is one of four instruments on board the JWST. The Netherlands built an important component of this instrument: the spectrograph. For this, we owe a great deal to Ewine van Dishoeck. Back in the nineties, she stressed how important for astronomical research it would be to add an infrared instrument to the JWST. The Netherlands’ excellent track record when it comes to developing satellite instruments also played a major role.”

How come the Netherlands has such a rich tradition in space research?

“This goes back to the 1960s, when space exploration first took off. Back then, a number of pioneers recognised the potential of space technology for astronomical research. They founded laboratories where scientists and engineers could work together. Sometimes, projects were based on scientific questions. Engineers would develop instruments that scientists could use to answer those questions. Other times, things happened the other way around: engineers developed hardware and scientists only discovered later on what groundbreaking research they could perform with it. This interplay between science and technology resulted in a high-tech infrastructure in our country that we continue to benefit from to this day.”

What has it brought us in concrete terms?

“There are direct results, such as scientific discoveries in the field of astronomy to which the Netherlands makes an important contribution. This is the type of research that my colleagues and I conduct on a daily basis. As a result of the Netherlands’ contribution to the development of instruments for space missions, we are also among the first who get to use these instruments for our research. This allows us to play a prominent role on the international scientific stage.”



James Webb Space Telescope

What about indirect results?

“Conducting space research requires incredibly complex technology and genuine innovation. You must constantly push the boundaries of what is possible. Over the years, the Netherlands has developed one of the most prominent tech sectors in the world in terms of knowledge. In the field of space research, we play in the big leagues. As the JWST project demonstrates, we get a say in what the space missions of the future will look like.”

You need the right people for that. And the right resources...

“That much is clear from the JWST, as well as other instruments that the Netherlands has built, such as the earth-observation instrument Tropomi. On the one hand, you need people who love nothing more than taking on a major technical challenge. They make sure we can maintain our knowledge level. On the other hand, the government has to support projects at the right times. Especially when it comes to fundamental science.”

Would you say it is wise to invest in space research?

“Yes, absolutely. Because of its history, the Netherlands has obtained an excellent position in the field of space research. Our job now is to maintain that position and, ideally, improve it further. Once you are a forerunner in a certain field, the industry can reap the benefits of that, for example by marketing technological innovations outside the space sector as well. I would like to tell the government to not be afraid to invest in space. Keep stimulating the space sector, because it is an enormous growth market that offers myriad opportunities for Dutch science, knowledge institutions and industry.”

3

Making better use of space technology and satellite data



3 Making better use of space technology and satellite data

Satellites are our eyes in space. With the help of advanced instruments, they can see far more than we ever could. This is especially true when artificial intelligence is used to process the vast quantity of data coming from space. The Dutch space sector is developing practical and effective applications for satellite data with the help of the Satellite Data Portal and government support in the form of various financial schemes. These applications are designed to help solve social issues and make the work done by inspectorates considerably more efficient.

Highlights

→ Satellite Data Portal expanded

Since 2012, the Satellite Data Portal has been providing Dutch businesses with free access to high-resolution satellite data. This gives Dutch parties an edge in their development of new applications for these data. They can e.g. develop pilots centred on the Netherlands and then market their application on a global scale. In 2022, the Satellite Data Portal was made easier to use and expanded with a number of new functionalities. Among other things, infrared images were added to the viewer as directly viewable satellite images and user stories illustrate the many possible applications of satellite data. An option that allows users to create their own time-lapse videos was also added. These time lapses make it possible to quickly and efficiently observe changes in the landscape.

→ Space technology for climate adaptation

All over the world, there is a growing focus on climate adaptation. Here in the Netherlands, we are also thinking about how best to cope with the effects of climate change. NSO organised two workshops on this theme and called on businesses to come up with ideas on how to use satellites for climate adaptation and mitigation. This call, in the form of a special SBIR competition, resulted in twenty-seven submissions. Among other things, the ideas concerned ways to make the Dutch tree stock more resilient, water management and *carbon credits*, the compensation system for CO₂ storage in the soil. In total, six businesses were selected to receive financial support to conduct a feasibility study. In 2022, four of these businesses will deliver a prototype of their proposed application.

→ Coronavirus boosts popularity of webinars and workshops

Before 2020, video conferencing still felt a bit awkward for many of us. Since the corona crisis, however, we have all grown used to it. This form of communication offers an easy and efficient way to reach larger groups of people, e.g. with workshops and webinars. NSO organised several of these over the course of 2021. About the possibilities of satellite data for potential users. About the importance of earth observation for e.g. municipalities and the Cultural Heritage Agency. About the possibilities of Copernicus for dealing with specific challenges in coastal regions. About big data and artificial intelligence; a workshop that drew a large audience of 160 participants, because these days almost every project involves a wealth of data that have to be processed in a smart and efficient manner to create the final product.

→ Tropomi detects methane leaks

The Dutch earth observation instrument Tropomi has no equal when it comes to detecting methane leaks. In 2021, large leaks were detected in Louisiana, Turkmenistan and Australia, among other places. Major point sources of methane emission attract the attention of researchers, governments and enforcement officers - as well as the businesses responsible for the pollution. They are eager to know where unexpectedly large volumes of methane are being emitted. After all, such aberrant emissions often point to a leak in a pipeline or factory that has to be dealt with as soon as possible in order to save costs. Tropomi's success raises the question of whether satellite data can play a similar role in detecting CO₂ emissions and whether they can contribute to the nitrogen problem.

→ SBIR competition for change detection

How can you look for illegal activities at major construction sites? How can you locate ditches that are illegally being dug or filled in? One way is to deploy inspectors in the field. However, it is perhaps far more efficient to use satellites to detect changes. Two SBIR competitions organised by NSO centred around change detection. Applications are currently being developed for the Netherlands Labour Authority, which wants to look for illegal labour at construction sites. A project with Rijkswaterstaat and STOWA has already been completed, resulting in a practical application that automatically informs inspectors about where to expect water management violations.



Jeroen Waanders

Advisor Innovation at the Drents Overijsselse Delta Water Authority



“The potential of satellite data for water authorities is enormous”

Steeds betere satellietgegevens nemen waterschappen werk uit handen. Dat zegt Jeroen Waanders, adviseur Innovatie bij Waterschap Drents Overijsselse Delta (WDOD). Waanders is een man met een missie. Volgens hem kan waterbeheer in Nederland efficiënter en beter met behulp van gegevens uit de ruimte.

Dutch water authorities manage 350,000 kilometres of waterways. How does that work?

“Most water authorities use aerial photographs to assess the state of the area once per year, while the condition of ditches is inspected by deploying hordes of inspectors in the field. Farmers are partially responsible for maintaining these waterways, but the water authorities have to make sure this maintenance is actually being carried out. In the past, these inspections took us a week to carry out and 1.5 man years’ worth of capacity. Since 2019, however, we have been doing things very differently...”

What changed for your water authority at that time?

“Our inspection workload doubled after a merger. We did not get any extra people, though. That was when we began looking for alternative methods. That ultimately led us to the Satellite Data Portal. We used satellite images and machine learning to inspect ditches. As in previous years, 93% of ‘our’ ditches were in fine condition. There was no reason to send out any inspectors to these locations. This meant all our inspectors could immediately go to the areas where there were problems.”

What can you see on the satellite images you get from the data portal?

“They show the same area we manage on a daily basis, only from an entirely different perspective. When an inspector is out in the field, their vision is limited to the fifty to one hundred metres in front of them. If they want to know what lies beyond, they will have to walk or cycle over there. Satellite images show us exactly what condition the ditches are in. Whether there are any ongoing construction activities in the area. Whether ditches have been filled in. Whether there is any vegetation. The most recent satellite data even allow us to determine what type of vegetation grows in the ditch. The quality keeps getting better all the time.”

Does that increase in the quality of satellite imagery present any new possibilities for water authorities?

“Satellites have been used for some time to e.g. monitor soil moisture. With the increasing resolution, they can now also be used for operational tasks. Together with the Waterschapshuis, Rijkswaterstaat and STOWA and an SBIR subsidy from NSO, we are currently looking for ways to put satellites to even better use for water management purposes.”

Can you give us an example?

“For the NL Change Detection programme, we are looking at fifteen different user cases that we want to be able to detect. These range from vegetation around dykes and the use of chemical pesticides to an inventory of artworks and possible modifications of the landscape. The potential of satellite data for water authorities is enormous.”



How important is it for the government to take the lead in this development?

“Subsidies are a wonderful instrument to promote the use of satellite data. In truth, the Satellite Data Portal has become an essential tool for the management of public space. Our goal for the NL Change Detection programme is to develop an algorithm that can automatically detect changes in the landscape using the latest satellite images. That will result in a national information service that all supervisory bodies in the Netherlands can utilise.”

Your water authority was the first to use satellite images for the purpose of supervision. Do you expect other water authorities to follow suit?

“Satellite data are not a particularly well-known resource at the moment. It is high technology out in space. What can you do with that? How does it work? There are so many questions right now. The interest is certainly there, though. Other water authorities are visiting us to see how we do things, or I go to them to give a presentation. I show them how much more information you can get from satellite images.”

What do you expect your job to look like in ten years’ time?

“Who knows, we might have a swarm of nanosatellites specifically designed to perform tasks for the water authorities. Who can tell? In any case, inspectors will monitor their region from more perspectives than ground level alone. It starts with satellite images, which you can use to detect potential issues. You then move on to aerial photos or you could decide to send out a drone to capture the images you need. The final step is to send an inspector into the field.”

Does that still happen? Inspectors do not have to fear for their jobs?

“I firmly believe that inspectors are here to stay. In fact, things will only get better for them. All the preliminary selections, the menial tasks, the fruitless inspections; satellites will take care of all that for them. We only send our inspectors to places where there is very likely a problem. Places where they can use their many talents to resolve situations. Because they only have to go where they are really needed, they will have more time to do the job they are good at - and do it right.”

4 Utilising satellite data for food security



4 Utilising satellite data for food security

In recent years, the Dutch G4AW programme has introduced millions of small farmers to valuable applications of satellite data. This has proven to be an effective strategy, which is inspiring other countries to also combine development aid and technology. The United Nations ultimately want hundreds of millions of farmers in developing countries to reap the benefits of hightech in space.

Highlights

→ NSO wins international award with G4AW

The Dutch government launched the G4AW - Space for Food Security programme in 2013. At that time, ESA's Copernicus programme was still in its infancy and the inaugural Sentinel satellite had not been launched yet. Nevertheless, the Netherlands recognised the possibilities of high-tech space technology for development cooperation early on. After all, small-scale farmers and pastoralists could benefit greatly from having access to high-grade satellite data. Eight years later, the success of the G4AW programme has not gone unnoticed. In 2021, NSO - which is responsible for the G4AW programme on behalf of the Dutch Ministry of Foreign Affairs - received the GEO Innovation Award from the Geneva-based Group on Earth Observations (GEO).

→ New ambitions at the GCA summit

In January 2021, the Netherlands hosted the Climate Adaptation Summit, a gathering of the Global Commission on Adaptation (GCA). With the help of videos, stories and a podcast, the Netherlands demonstrated the possibilities of space technology in the field of climate adaptation. Several case studies from the G4AW programme have been included in the blueprint that GCA has developed for future investments. By 2030, these investments are to provide 300 million farmers access to climate advice based on, among other resources, satellite data. NSO remains unabatedly enthusiastic about the potential of satellite data for development aid and is currently evaluating how it can contribute to the realisation of the UN and GCA's goals.

→ Prize for stimulating the use of geodata

The G4AW programme has resulted in a number of services with impact for small-scale farmers and other entrepreneurs in developing countries. However, it turns out that many farmers are unwilling or unable to pay for these services. What then? That is the question NSO posed as part of the knowledge competition Open Geodata for Food Security. Businesses and institutions are being challenged to come up with novel solutions. With different revenue models or creative ways to contribute to food security, more efficient water usage and more sustainable land usage without requiring a big financial contribution from the farmers. The submissions for the contest will be evaluated in the first half of 2022.

→ Evaluating and sharing knowledge

The Ministry of Foreign Affairs and NSO are evaluating the G4AW programme with various studies. The results of these studies are presented in the form of reports, but also in videos and podcasts. This is done in order to share as much of the acquired knowledge as possible with the rest of the world and evaluate the government's policy. Other parties and governments can then put our knowledge and experience to good use for the development and execution of their own programmes and/or projects. All evaluations can be found via the G4AW website: G4AW.spaceoffice.nl.

→ Satellite data for water usage in agriculture

In addition to the G4AW programme, the Dutch government stimulates the use of space technology for more efficient water usage in the agricultural sector. This all began with technology developed in Wageningen that was applied in Yemen. Studies showed that the technology could be applied on a larger scale in Africa and the Middle East. In 2017, the Ministry of Foreign Affairs allocated resources to allow the Food and Agriculture Organisation of the United Nations (FAO) to develop and scale up the WaPOR database with the Dutch technology. Preparations for the second phase of the project - once more co-funded by the Netherlands - began in November of 2021. A public tender organised by FAO is expected in 2022.

*Thanks to satellite data, farmers in Uganda ►
can make use of micro-insurance.*



Mila Luleva

Head of the remote sensing department Rabobank



“Satellites are crucially important to us”

In 2021, Rabobank launched project Acorn, which is designed to help small farmers in developing countries and combat climate change at the same time. Mila Luleva, head of the remote sensing department: “Satellite data make new solutions scalable and in doing so hopefully pave the way to global success.”

Project Acorn brings many elements together: small farmers, satellite data, CO₂ emissions, the climate. Let's start at the beginning. What does “Acorn” stand for?

“The abbreviation is short for ‘agroforestry carbon removal units for the organic restoration of nature.’ Simply put, we stimulate small farmers in Africa, Asia and Latin America to store CO₂ on their land. They can do this by growing different plants and trees alongside e.g. their cocoa or coffee beans. The result is a combination of agriculture and forestry: agroforestry.”

Why would these farmers want to care for other plants and trees, besides the crops they actually earn their income with?

“Agroforestry protects farmers against the impact of climate change, improves the quality of the soil and diversifies their diet, compared to a monoculture. On top of that, they receive financial compensation. Major corporations all over the world have to reduce or offset their carbon emissions. One way to do that is by purchasing carbon removal units on the market for emission allowances. They can reach out to small farmers for this, who earn these units by storing CO₂ through agroforestry. A single hectare of land can easily produce eight units. At the current exchange rate, a small farmer can earn thirty to fifty percent more revenue per year.”

Why is this option preferable to planting a large forest somewhere in the world as a way to offset one's carbon emissions?

“Planting a large forest made up of a single type of tree only results in the storage of CO₂. Acorn wants to do more than that. We want to serve more sustainability targets than fighting climate change alone. Agroforestry contributes to our planet's biodiversity. On top of that, small-scale farmers benefit from this method as well. They have more income security and may even be able to hire new people for their business.”

Both literally and figuratively, there is a large distance between you and the farmers who have joined the project. How do you safeguard the project's quality?

“Quality control is very important to us. We have therefore initiated a certification project with the Plan Vivo Foundation. This organisation evaluates our methods and ensures everything is being done in a scientifically sound manner. It lets us know that the carbon removal units we sell to our clients are of sufficient quality, but also how they were created, whether the farmer uses fair-trade methods, if they take care of their employees and more.”

What role does space play in project Acorn?

“Satellites are of crucial importance for this system. For starters, they are used for the quality control purposes I mentioned. Satellites can measure - regularly and with high quality - how much vegetation a farmer grows on their land. We then know how much CO₂ that farmer is storing on their land.”



Furthermore, satellites are essential for the scalability of the project. Our goal for project Acorn is to reach more than twenty million farmers all over the world. Without the global coverage that satellites provide, that would simply be impossible.”

Besides Rabobank, are any other Dutch parties involved in this project?

“We are working together with parties such as Satelligence and Space4Good. We have also launched pilot projects with VanderSat, 52impact and FarmTree, among others. Of course, these businesses are competing against each other to produce data of the highest quality. In the end, however, we are all part of a larger ecosystem that aims to use geo-information to resolve social issues.”

How does project Acorn relate to the G4AW programme, through which NSO gives millions of small-scale farmers - particularly in Africa - access to satellite data?

“Our aims are the same. We want to help small farmers and make them more resilient. We do this via the market for CO₂ emissions. Partly due to projects such as G4AW, the Netherlands is a global leader in the field of satellite applications and the use of geodata. The fact that not only the national government but also a corporation such as Rabobank uses these data proves that their importance will continue to grow in the years to come.”

Acorn was launched nearly one year ago. What are your hopes for the future?

“Developments in the space sector are happening incredibly quickly. As time goes on, we get access to more and more satellite data of an increasingly high resolution. In part, we owe that to ESA’s Copernicus programme and to the European Commission. The Netherlands is and will remain a pioneer when it comes to using space technology and geodata for agricultural purposes. As a bank, our goal is to make optimal use of these resources.”

5 Stimulating international trade



5 Stimulating international trade

The second year of the coronavirus pandemic was one of lockdowns and of measures imposed and lifted. All the while, the Earth kept turning and the Netherlands' international efforts in the field of space technology continued unabated. Video conferencing proved to be an excellent alternative to physical missions in many cases and one which sometimes even led to new opportunities. By keeping its eye on the ball, the Netherlands was able to attend prominent trade shows and gatherings. In the UN, the discussion about important space-related themes continues uninterrupted.

Highlights

→ Innovation mission to Bremen

In the run-up to the annual Space Tech Expo, NSO organised an “innovation mission” to Bremen. Contrary to the Space Tech Expo itself, the emphasis here was on *downstream*: the development of applications on Earth using space technology and satellite data. Participants in the mission explored opportunities for the Netherlands and Germany to collaborate on shared social themes. In this manner, both parties tried to create opportunities that the individual countries might not be so quick to seize - if at all.

→ Coronavirus pandemic expedites collaboration with India

Over the last two years, the corona measures have had a major impact on NSO's ambitions abroad. However, a crisis can also open up new opportunities, as demonstrated by the collaboration with India. Rather than wait until it was once more possible to go on a regular mission on location, NSO worked together with the Dutch consulate in Bangalore to organise a series of online workshops. Suddenly, the vast distance between the Netherlands and India was not as much of an obstacle anymore. The Indian and Dutch space sectors envision opportunities for collaboration on such themes as air quality and agriculture. A pilot project designed to monitor the air quality in India is currently being developed.

→ Opportunities for Kazakhstan in earth observation

Kazakhstan is roughly seventy times larger than the Netherlands and the country has a population of nineteen million. No shortage of room then, but the country does lack access to valuable geo-information and satellite applications. The cooperative alliance Nevasco has ambitions for Kazakhstan in this regard. NSO also recognises the potential of collaboration between both governments. The planned mission to Kazakhstan in December of 2021 was cancelled because of the coronavirus. However, preparations are in full swing to send a delegation there in 2022. During this visit, the focus will be on such topics as illegal logging, forest management, drought, agriculture and ice monitoring.

→ World Expo and IAC in Dubai

Space technology was a major topic during the World Expo and IAC, held last October in Dubai. A delegation from NSO and the Dutch space sector attended both the IAC and the Space Week of the World Expo. Together with SpaceNed and the Dutch consulate in Dubai, NSO organised the NL Space VIP event at the Dutch pavilion of the World Expo. Carel Richter, Consul General in Dubai, opened the reception for the Dutch space sector and its business relations. In light of the expected corona measures, the IAC did not feature an NL Space pavilion this year. However, bilateral meetings were held with e.g. India, Japan, the United States, Ukraine and Belgium, as well as meetings with several major international space companies. The Dutch delegation also took part in the annual IAF meeting and a NASA meeting about future exploration plans. The Netherlands will be represented with an NL Space pavilion during the next edition of IAC, to be held in Paris in September 2022.

→ Tackling international challenges with COPUOS

“Irresponsible.” That is how the Netherlands condemned the intentional destruction of the Cosmos 1408 satellite by Russia in November of 2021. The action created a debris cloud that compromises the safety and sustainability of space. Space debris and other international challenges, such as light pollution and the frequency policy for satellites, are among the topics discussed by the United Nations’ Committee on the Peaceful Uses of Outer Space (COPUOS). NSO is collaborating with the Ministry of Economic Affairs and Climate Policy, the Ministry of Foreign Affairs and the Radiocommunications Agency to discuss global challenges in space in this international forum.

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DUBAI



Akanksha Sharma

Innovation Attaché Consulate-General of the Kingdom of the Netherlands in Bangalore, India



“India has a strong need of Dutch expertise”

The Indian market continues to open up to foreign businesses. This presents opportunities for the Dutch space sector, says Akanksha Sharma, senior policy maker at the Dutch Innovation Network. Based in Bangalore, Sharma helps Dutch businesses and institutions gain a foothold on the Indian market.

You work for the Dutch consulate in Bangalore, India. How did you end up here?

“I have always been intrigued by international collaboration. When I started my career, I helped startups and scale-ups from all over the world gain access to the Indian economy. That brought me into frequent contact with embassies and consulates. I have been working as an innovation officer since 2013 to promote collaboration between the Netherlands and India.”

Being Indian, what aspects of the partnership between these countries do you find most surprising?

“What stood out to me from the beginning is the openness of the Dutch culture. As a small country, the Netherlands has always relied heavily on international trade. Collaboration comes naturally to many Dutch people. I had to get used to the directness of the Dutch. In India, people are not as quick to tell you ‘No.’ They tend to beat around the bush a lot more. The Dutch simply tell you what they want or do not want. That makes the collaboration very clear, effective and efficient.”

Where do you believe the biggest added value of the partnership between the Netherlands and India lies?

“It lies in the water, agriculture and health sectors, or ‘wah’ for short. That word means ‘super’ or ‘amazing’ in Hindi. In our communication, we add an exclamation point: WAH! The exclamation point represents key enabling technologies such as big data and artificial intelligence.”

What about space?

“Space is certainly important as well. India has had its own space programme since the seventies. There are actually pictures of rocket and satellite components being transported by ox cart. Those are incredible images. In the decades since, science and technology have always been important and budgets have grown over time. Bangalore has become a hub for electronics and IT. It is also home to ISRO, the Indian Space Research Organisation.”

How large is the Indian space sector?

“A study from 2021 shows that the Indian space sector is worth \$1.9 billion per year. It also shows that the sector has more than tripled in size over the last twelve years.”

What opportunities are there for Dutch parties on the Indian space market?

“The collaboration between the Netherlands and India dates back to 2014, when the student satellite Delfi C3 was launched with an ISRO rocket. Since then, there has been a multi-faceted bilateral programme. One of its key aspects involves the use of satellite applications to combat air pollution. That is a major problem in this country. We are working together with a consortium of Dutch businesses and knowledge institutions to develop a model of that pollution. In the fields of water management and spatial planning, there is also a strong interest in Dutch knowledge and technology.”



Sentinel-3 image of the Ganges Delta.

Is it hard for Dutch parties to operate in India?

“If you want to enter the Indian market, you have to have a partner organisation in this country. That is why we do a lot of matchmaking. We can show commercial enterprises in the Netherlands where the opportunities lie in our market. A number of Dutch businesses has already gained access to our market, particularly in the domain of small satellites. In the years to come, the number of opportunities available to Dutch businesses will only increase. It is the result of a regulatory change implemented in 2020 that is gradually opening up the Indian market for foreign businesses.”

How have the corona years of 2020 and 2021 affected the collaboration between the Dutch and Indian space sectors?

“The COVID pandemic actually contributed in a small way to getting new projects off the ground. Before the crisis, everything was done with physical meetings. That is both costly and time consuming. Now, we have all grown used to digital conferencing, which has drastically reduced the distance between our countries. In April of 2021, a digital meeting was held between the Dutch and Indian Prime Ministers Rutte and Modi. Space was literally one of the talking points during this meeting, which means it was discussed at the highest political level. It has certainly given a boost to the collaboration between our countries in this field. Immediately after that meeting, we organised a series of workshops together with NSO, e.g. about air pollution.”

How do you expect the partnership between our countries to develop in the future?

“India has a strong need of the space technology and expertise that the Netherlands has developed, particularly in the field of small satellites and technological innovation. This creates opportunities for alumni of e.g. Delft University of Technology, for startups and for major industrial parties and knowledge institutions. I expect our partnership, which is almost a decade old now and which has received a new impulse in the last two years as a result of COVID, to continue to grow in the future.”

6 Communicating and inspiring



6 Communicating and inspiring

Space is high tech, innovative, commercially promising and a source of inspiration for young and old. No wonder then that the Dutch government invests in space. How is our tax money being spent? What benefits does space offer our society? How can we train the next generation of space engineers and space researchers? NSO communicates about and inspires with space technology at trade shows, in the media and with educational projects at schools throughout the country.

Highlights

→ NL Space at Space Tech Expo in Bremen

Nederland was in 2021 goed vertegenwoordigd op de Space Tech Expo in The Netherlands had a large presence at the 2021 Space Tech Expo in Bremen. The NL Space pavilion attracted a large crowd of both German and Dutch visitors. Ronald van Roeden, the Dutch ambassador in Germany, also visited the pavilion. Coinciding with the Space Tech Expo, NSO organised an “innovation mission” to Bremen and the surrounding area as a pilot. This mission was specifically designed for businesses that are developing satellite applications and utilising space technology on Earth. Participants say the innovation mission was a big success and certainly worth repeating in the future.

→ Video series for the Weekend of Science

For the second year in a row, the open day at ESA ESTEC in Noordwijk had to be cancelled due to the coronavirus. This meant there was no white and orange NL Space tent where the Dutch space sector could present itself to the general public. In order to inform as many people as possible about all the good that space technology does for our society, NSO came up with a clever trick. It produced a series of ten videos to tell the highly diverse stories of the men and women who work in the industry and in science. Stories told with the help of items from our everyday lives. Together, the videos present a good overview of what the Netherlands is capable of in terms of space technology and why the Dutch government invests in the space sector.

→ Record number of participants in the Mission X project for schools

Space is a wonderfully rich topic for elementary schools. The question is: how can you present the material in a meaningful way? Enter Mission X. In this project for schools, students get to discover everything they want to know about space and what it is like to be an astronaut. Instead of reading a book or browsing a website, they get hands-on experience inspired by astronaut André Kuipers and astronomy journalist Govert Schilling. This year, Mission X was organised for the first time by the Space Expo space museum and immediately attracted a record-breaking number of participating groups of schoolchildren.

→ CanSat competition successful despite setbacks

The CanSat competition has been a fixture in NSO's educational policy for years. Building your own miniature satellite and then launching it into the air with a real rocket; that is about as close to actual space technology as secondary school students can hope to get. Even though the test day had to be cancelled due to the coronavirus and the official launch day was postponed, the participating teams remained as enthusiastic as ever. They soldered, programmed and communicated to their hearts' content, cheered on by their school and local media. Who knows; we may hear from some of the participants again in the future as they embark on their careers as engineers or scientists in the Dutch space sector.

→ ERA media briefing with André Kuipers

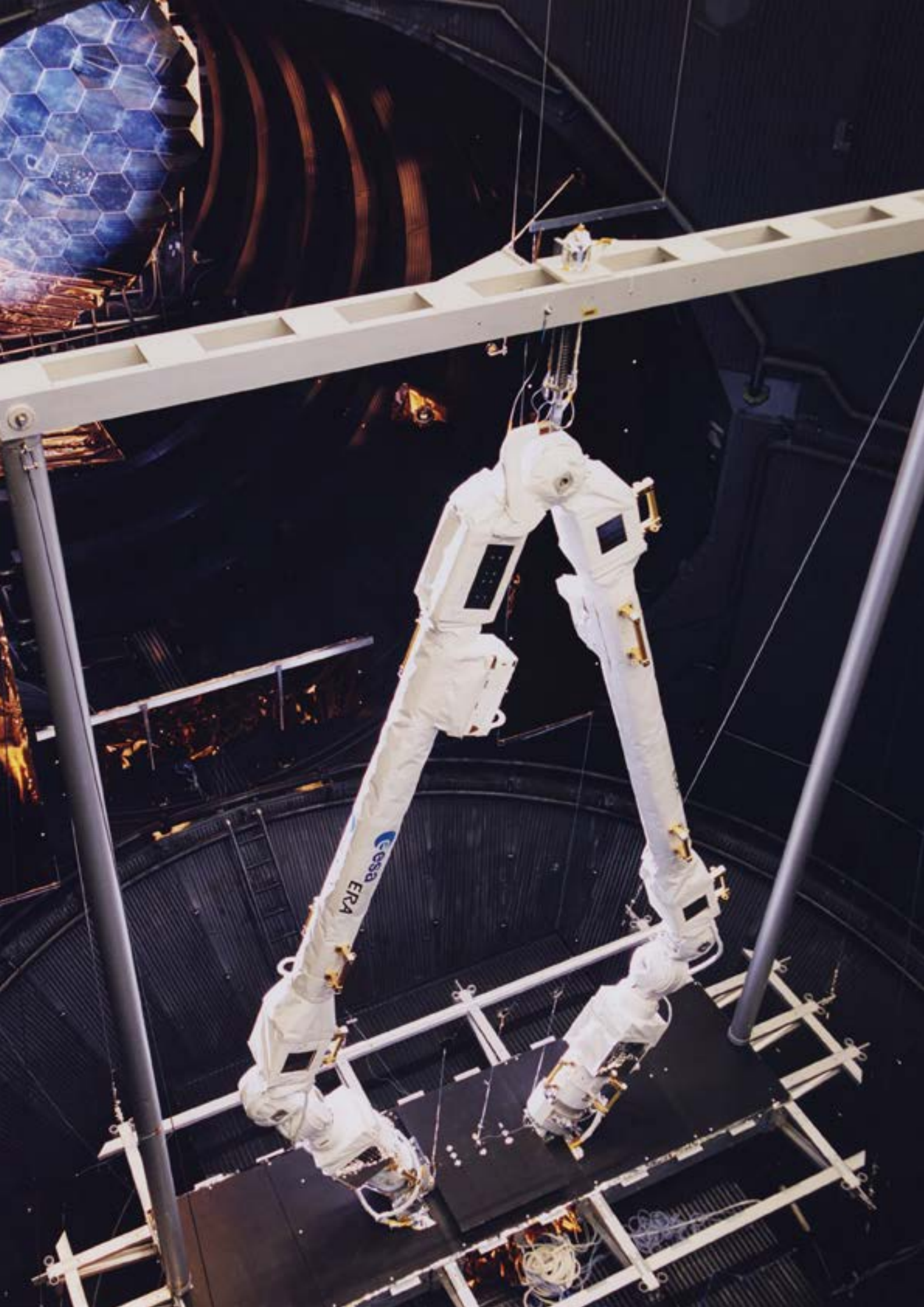
For years, the Dutch space sector had been eagerly awaiting the launch of ERA, the European Robot Arm that was bound for the international space station ISS. In 2021, it was finally time. In order to inform the media as well as possible - and the general public through them - NSO collaborated with ESA to organise a media briefing. Prominent participants in the project talked about their work with ERA and used real hardware to demonstrate how the robot arm moves. State secretary Mona Keijzer attended the briefing. She was proud of and impressed by the possibilities that ERA offers to European astronauts on board of and outside the ISS. The briefing resulted in myriad stories in the media. Soon after, "our" robot arm was successfully launched into space.

→ NL Space webcast for the media

Media are essential for the communication about space technology. More often than not, reporters' focus is on space-related news from abroad, although there is plenty happening in the Netherlands as well. In order to inform the media about Dutch space activities, NSO collaborated with SpaceNed to host a webcast entitled "NL Space, a new orbit around the sun." In it, representatives from the space sector talked about the noteworthy projects they were working on in 2021. A panel of prominent figures from the space sector, including scientist Pieter Levelt and astronaut André Kuipers, was there to provide clarification and context. The webcast was well received by the media and resulted in various items in newspapers and magazines, on the radio and TV and online.

→ Minister Van Engelshoven inspects the SPEXone instrument

The Netherlands has built SPEXone, an earth-observation instrument that will go to space on board the American PACE satellite. The delivery of this instrument to NASA was a milestone for the Dutch space sector. Unfortunately, this milestone could only be celebrated online due to the corona measures that were in effect at the time. As a result, Minister of Education, Culture and Science Ingrid van Engelshoven was present in the SRON cleanroom via a video call to watch as proud engineers inspected SPEXone one final time, before the instrument was shipped to the United States. All in all, it was a memorable farewell to another groundbreaking Dutch earth observation instrument.



Barbara Hoppel
Director Space Expo



“Pushing boundaries: that is what it is all about in space and at Space Expo”

Barbara Hoppel was director of the AFAS Circustheater in Scheveningen and the Beatrixtheater in Utrecht. In late 2019, she took over as director of the Space Expo museum in Noordwijk. She is a director with a mission: “We want a brand-new museum!”

You left two theatres for a space museum, but you did not know much about rockets or satellites. How did you learn what you needed to know?

“I saw it as a challenge to enter the world of space as a layperson. I think being an ‘outsider’ actually works in my favour. It allows me to look at my own museum through the eyes of a visitor. In that capacity, I ask questions of the experts. What will the new James Webb Space Telescope discover and how does it do that? When will a European set foot on the Moon? What good can space technology do for our lives here on Earth? How does the Netherlands contribute to that? These are fascinating stories for me - and therefore for the visitors of Space Expo.”

Being an outsider, relatively speaking, what has surprised you the most thus far?

“I was genuinely surprised by the passion with which people in the space sector talk about what they do. Everyone works in their own field, be it solar panels or CubeSats, satellite instruments or new smart applications. What all these people have in common, however, is an enormous drive and boundless enthusiasm to share stories of what they do with the outside world.”

Stories that a space museum can put to good use?

“Absolutely. In the coming years, we will be renovating Space Expo one step at a time, all the while remaining open to the public. There will be a greater emphasis on space technology today and in the future. We really need the industry and knowledge institutions to pull this off. Luckily, that enthusiasm goes both ways. Over the past two years, ESA, NSO, SRON, TNO, Airbus Netherlands, Cosine, ISIS, Avatar and other parties have actively contributed to the initial stages of our renovation project.”

You had only been director for a few months when the coronavirus pandemic broke out. How has it affected Space Expo's renovation plans?

“Our events and catering activities were basically shut down. Even when there was no lockdown in effect, we could only open our doors to visitors after imposing strict measures. As we do not receive any form of regular subsidy, this has drained our financial reserves. Still, we never gave up. Instead, we looked at what was still possible within the framework of the government’s strict corona measures. For example, we developed an entirely new museum experience together with André Kuipers’ Space Academy: Mission in the Museum. This smart solution helped us achieve some decent visitor numbers after all - although not at the same level as in 2019, of course. That is what it is all about in the space sector: pushing boundaries and making the impossible possible. We will keep doing that and we are looking for parties who want to take on this adventure with us.”



How do you get the space sector interested in contributing to the renovation of Space Expo?

“By explaining to them that the Netherlands truly deserves to be proud of its contributions to European and global space technology. Despite being such a small country, we are among the biggest players in the world in some areas. We are creating an incredible new exposition with the qualification model of the European robot arm ERA. We are also working on plans for a theatre with a prominent role for the James Webb Space Telescope, which the Netherlands developed certain components for. There will also be a strong focus on earth observation and the importance of space technology in our daily lives. These are areas where the Netherlands plays a prominent role. We want to exhibit all the knowledge and expertise we as a country possess. Space Expo is the perfect place to do that.”

Anyone who has ever visited Space Expo during the week will know that you are a popular destination for groups of schoolchildren. How are things going in terms of space education?

“Education has always been an important aspect of what we do. We want to expand on that. We have already reached an important milestone: when we organised the Mission X project for schools in 2021, more classes signed up than ever before. This year, we once again expect to see a record-breaking number of participating students. Besides elementary schools, we are also developing activities for secondary schools, students and lecturers. Space is an incredible topic that can inspire a new generation to pursue a career in science and technology.”

It is clear you do not lack ambition. Where do you see Space Expo in ten years' time?

“By then, Space Expo will have moved to a new location in a beautiful new building. It will offer expositions full of experiences and wonderment, an excellent educational programme and myriad opportunities for the space sector. We want laypersons and professionals alike to be able to enjoy a dynamic museum with immersive exhibits, where we look back on past successes in space and tell the incredible stories of the missions of today and tomorrow.”

News overview 2021



22 January 2021

High-tech from the Netherlands hitchhikes to space on Norwegian satellite

Dutch space technology for laser satellite communication will be tested on board the NorSat-TD, which will launch in early 2022. This is the result of an agreement that the directors of the Dutch NSO and the Norwegian NOSA signed this morning at the embassies in The Hague and Oslo, respectively. The ambassadors from both countries attended the signing of the agreement.



25 January 2021

The added value of satellites for the adaptation to climate change

The Netherlands is hosting the Climate Adaptation Summit 2021. Over the course of twenty-four hours, the Summit (held on 25 and 26 January) will offer world leaders and many stakeholders a comprehensive digital platform. The platform offers inspiration for effectively dealing with climate change. The Adaptation Action Agenda that will be presented will mark the beginning of a decade of expedited international collaboration. The Netherlands Space Office is happy to contribute to the Climate Adaptation Summit.



27 January 2021

Dutch participants win Galileo and Copernicus Masters with innovative applications for satellite data

How can you use satellite data from navigation and earth-observation satellites in innovative ways down here on Earth? Just ask the three Dutch winners of the European Galileo and Copernicus Masters competitions. Yohan Runhaar will be monitoring the health of coral reefs. Elise van Tilborg will help farmers in Africa with their vision on agriculture. Lastly, Tamme van der Wal will help farmers benefit from satellite data in an accessible manner.



1 February 2021

“2021 will be a wonderful and amazing year for the space sector”

The Dutch space community has acquired the reputation of being innovative. When the corona measures made it impossible to organise the traditional New Year's gathering, NSO and the association of space companies, SpaceNed, presented a special webcast instead: “NL Space 2021: a new orbit around the sun.” In this webcast, various experts, prominent individuals and talents shared their biggest space news of 2021. A panel of experts, including astronaut André Kuipers, scientist Pieter Levelt and entrepreneur Jeroen Rotteveel, provided clarification and context for the various items.



8 February 2021

Pieternel Levelt new director of prestigious American lab for atmospheric research

In March, Pieternel Levelt, who currently works as professor of Remote Sensing at Delft University of Technology and head of R&D Satellite Observations at the Royal Netherlands Meteorological Institute (KNMI), will embark on her very own American dream. She will move to Boulder, Colorado, to become the new director of one of the laboratories of the prestigious National Center for Atmospheric Research (NCAR). She will replace the recently deceased Dutch Nobel Prize winner Paul Crutzen. "It is a truly unique opportunity for me to fill his shoes."



23 February 2021

Secretary Van Engelshoven: "SPEXone is good to go!"

Yesterday, space research institute SRON briefly opened its digital doors for the media and the parties that have been collaborating over the past years on the new Dutch satellite instrument SPEXone. On behalf of the Dutch government, outgoing minister Ingrid van Engelshoven of the Ministry of Education, Culture and Science was there to conduct a final inspection of the instrument before it is shipped off to NASA in the United States.



2 maart 2021

2,600 children will receive astronaut training as part of the Mission X project

As the European space organisation ESA continues to recruit new astronauts, schoolchildren across the Netherlands are preparing for their own future in the space sector. In the coming weeks, a record-breaking number of nearly 2,600 students from 129 Dutch elementary schools will take part in the educational space project Mission X.



12 March 2021

Climate adaptation: satellite data crucial for proper decision making

The NSO is behind a number of workshops organised by the association for geoinformation companies GeoBusiness Nederland at the Space Expo in Noordwijk. In the second edition, three climate experts and a hundred invitees shared their insights via live streaming. NSO director Harm van de Wetering: "I want to bring the world of geoinformation users and that of space applications closer together."

News overview 2021



9 April 2021

Satellite mission Harmony: NL space opportunities for radar in space

The European space agency ESA is exploring whether Harmony should become the tenth satellite mission in the European Earth Explorer programme. The Dutchman Paco Lopez Dekker plays a key role in this process. As Principal Investigator (PI) of the mission and leader of a new Dutch “knowledge network,” he strives to increase the Netherlands’ contribution to the use of radar technology in space.



15 April 2021

“Doctor on board” via satellite communication with new Dutch app

The new Dutch application MedAssist Live allows doctors to offer medical assistance in even the most remote corners of the world via a satellite connection and two-way augmented reality. The NSO supported the technology development of the application, which is now ready for commercial use in the maritime industry and various other sectors.



16 April 2021

Proper use of artificial intelligence requires human intellect

Artificial intelligence (AI) is a helpful tool used to quickly extract value from the enormous quantity of data available to us every day. “These last five years, the rate at which the systems can learn and find the right connections has grown exponentially. This makes using satellite data even easier and more interesting,” says Raymond Sluiter during the “Satellite Data and AI for Earth” conference that was organised by NSO and “Wijs met locatie.”



15 May 2021

Dutch innovation Sparkwing creates opportunities on the global market for small satellites

Space is developing rapidly as a global commercial market and it is no longer the exclusive domain of space agencies. The Netherlands has the necessary qualities to play a substantial role in the growth market for space in the future as well. NSO is therefore investing in promising innovation with the ESA ARTES programme. One such innovation is Sparkwing, a catalogue of solar panels for smallsats developed by Airbus Defence and Space Netherlands from Leiden.



19 May 2021

Dutch experiment adds new dimension to research mission to the moons of Jupiter

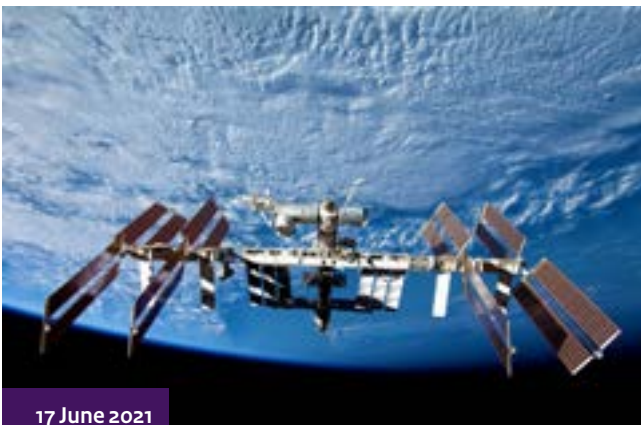
ESA's new spacecraft JUICE - short for Jupiter Icy Moons Explorer - will be tested this month at the ESTEC testing centre in Noordwijk. The Netherlands is responsible for powering JUICE with solar panels developed by Airbus in Leiden. Our country is also involved in the mission on a scientific level. Delft University of Technology together with their colleagues from JIVE will carefully monitor the planetary explorer with radio telescopes located all over the planet, including in Westerbork in the province of Drenthe. In this manner, they are contributing to ground-breaking scientific research of the icy moons of Jupiter.



28 May 2021

Farëlschool in Katwijk wins Mission X 2021

The third grade of the Farëlschool in Katwijk is the Dutch winner of the international school project Mission X 2021. The class came first out of 127 participating Dutch groups by earning the most points. Barbara Hoppel, director of Space Expo, personally stopped by last Tuesday to announce the happy news.



17 June 2021

“The space station will have a clearly visible Dutch contribution”

As a new contribution from the European space agency ESA, the European Robotic Arm (ERA) will be launched to the International Space Station ISS this summer. This marks an important milestone for the Dutch space sector, since ERA was designed and built almost entirely by the Dutch space sector. Sytze Kampen, head of technology at Airbus Defence and Space Netherlands, reflects on the process and looks toward the future: “Above all, I feel very proud.”



1 July 2021

Major update makes Satellite Data Portal more appealing to citizens, businesses and schools

From today, the Dutch Satellite Data Portal boasts a large number of new features, an updated design and greater ease of use. With this update, the NSO continues to invest in the successful data portal, which gives Dutch citizens, businesses and - a new addition - educational institutions free access to satellite images.

News overview 2021



5 July 2021

ERA arm ready for launch: “Another mind-blowing mission”

The launch of the European Robotic Arm (ERA) to the international space station ISS is approaching fast. Last Monday, ERA - which was developed and built in the Netherlands - was presented to the Dutch media. The corona-proof event held at ESA's technical centre ESTEC in Noordwijk was attended by circa forty people, including outgoing state secretary Mona Keijzer and astronaut André Kuipers.



6 July 2021

Kaj Munk College Hoofddorp wins Dutch CanSat competition

Students of the Kaj Munk College in Hoofddorp won first place in the Dutch CanSat competition. CanSat is a challenging project for secondary school students. The school students are asked to build their own satellite within the volume and shape of a soft drink can. The winning team Gaia won the golden CanSat award and a meet-and-greet with astronaut André Kuipers.



9 July 2021

“The strength lies in the combination of both large and small satellite instruments”

From 12 to 16 July, the Netherlands and Belgium are organising the International Geoscience and Remote Sensing Symposium (IGARSS). IGARSS is the foremost annual international symposium for the combination of remote sensing (earth observation) and geosciences. Ilse Aben, senior scientist at SRON and endowed professor of physics and chemistry of the Earth's atmosphere at the Vrije Universiteit, will give a talk at IGARSS about the methane leaks that she and her team discovered using the Dutch satellite instrument Tropomi.



19 July 2021

Astronaut André Kuipers: “Dutch robotic arm makes the work of astronauts on board ISS safer”

The European Robotic Arm (ERA), which was developed in the Netherlands, will be launched to the International Space Station ISS on 21 July. Over the course of his training, astronaut André Kuipers became intimately familiar with ERA. “It is an absolute milestone for the Netherlands to see ERA launch into space.”



21 July 2021

Dutch robotic arm ERA successfully launched to space station ISS

Earlier today, the European Robotic Arm (ERA) was successfully launched to the International Space Station ISS. At 16:58 Dutch time, a Proton rocket took off from Baikonur, Kazakhstan, carrying with it the Russian laboratory module Nauka and the European Robotic Arm, the robotic arm that was developed and built in the Netherlands.



29 July 2021

ERA arm arrived at ISS

“Contact confirmed,” “capture confirmed,” “docking confirmed.” After an afternoon of nail-biting tension, these words were followed by sighs of relief. At 15:29 Dutch time, the twenty-tonne Russian Nauka module approached the international space station ISS at a leisurely pace of ten centimetres per second. This was an important moment for the Dutch space sector, because it marked the arrival of the European Robotic Arm - developed and built in the Netherlands - at its destination. The operations of the ERA arm can now begin.



5 August 2021

Monitoring global water levels with satellite data

Before long, the Global Water Watch will provide anyone with free and highly detailed online access to myriad facts about global surface water levels. The project's goal is to contribute to a more balanced and sustainable use of fresh water and provide clearer information during calamities. The so-called Behoeftestudie Waterbeheer, conducted by order of NSO, provided an important incentive for this development.



19 August 2021

Myriad innovative ideas for satellite applications to deal with climate change

Satellites are important for our understanding of our climate and for monitoring the weather and the climate. How can satellites contribute to our efforts to mitigate or adapt to the effects of climate change? NSO challenged entrepreneurs to come up with innovative ideas. In total, twenty-seven businesses submitted a proposal. Six companies will receive an SBIR subsidy to conduct a feasibility study for their idea.

News overview 2021



20 September 2021

Students launch miniature satellites with rocket

This morning, teams of secondary-school students launched their home-made miniature CanSat satellites into the air at ASK 't Harde. After the spectacular launch, the satellites reached a height of one kilometre. As a result of the corona measures, this year's CanSat competition was not like that of other years. For example, the winner - team Gaia of the Kaj Munk College in Hoofddorp - had already been chosen back in July of 2021.



14 October 2021

Dutch contribution to space telescope JWST gives scientists a head start

The James Webb Space Telescope, the successor of the ground-breaking Hubble space telescope, is scheduled to be launched into space at the end of this year. The Netherlands contributed to the mission by taking part in ESA's scientific programme and by developing a part of the instrument with financial support from the Dutch Research Council (NWO). Dutch scientists expect this investment to pay off - and then some.



1 November 2021

“The Netherlands is number one in radio astronomy; we must take the lead”

With its Partnerships for Space Instruments & Applications Preparatory Programme, the Netherlands supports technological breakthroughs and scientific cooperation in space research. The “Partnership for Space Instruments for Interferometry in Space” is building telescopes that should earn the Netherlands a new Nobel Prize.



10 November 2021

“The Netherlands is leading in small satellites; that is why we need to invest”

With its Partnerships for Space Instruments & Applications Preparatory Programme, the Netherlands supports technological breakthroughs and scientific cooperation in space research. The “Dutch Network on Small Spaceborne Radar Instruments and Applications” is working on smaller radar instruments that can fly through space like a swarm.



16 November 2021

NL Space “on a mission” at Space Tech Expo in Bremen

This week, the Dutch space sector attended Europe's largest space convention - the Space Tech Expo Europe in Bremen - with its own NL Space pavilion. To mark the occasion, NSO, the Province of South Holland, the association of space companies SpaceNed and the Dutch embassy organised two networking events and an “innovation mission.” Ronald van Roeden, the Dutch ambassador in Germany: “It is wonderful to see that the royal visit to Bremen in 2019 has further strengthened the partnership between the Dutch and German space sectors.”



23 November 2021

“This cooperation will lead to great discoveries in space”

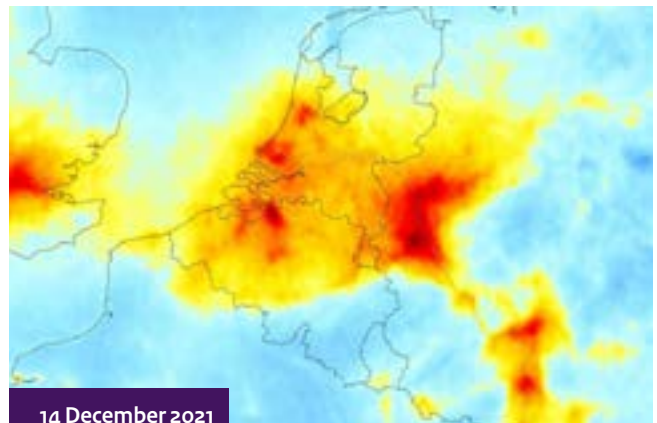
With its Partnerships for Space Instruments & Applications Preparatory Programme, the Netherlands supports technological breakthroughs and scientific cooperation in space research. The “Expertise Network Optical Technology for Exoplanetary Research” is working on innovative sensors for great discoveries in space.



26 November 2021

NSO wins international innovation award for “satellite data for food security” programme

The Netherlands Space Office (NSO) has received this year's GEO Award for Innovation. NSO won the award for its G4AW - Space for Food Security programme, which NSO is carrying out on behalf of the Dutch Ministry of Foreign Affairs. The award was given out today by Dr Argyro Kavvada, GEO's Manager of Sustainable Development Goals Activities.



14 December 2021

“We improve satellite applications by bringing science and society together”

With its Partnerships for Space Instruments & Applications Preparatory Programme, the Netherlands supports technological breakthroughs and scientific cooperation in space research. The “Expertise Network Air Quality” investigates how satellites may help to discover air quality over a street, harbour or highway.

News overview 2021



15 December 2021

Carble and Soilspect win Dutch competition for satellite applications

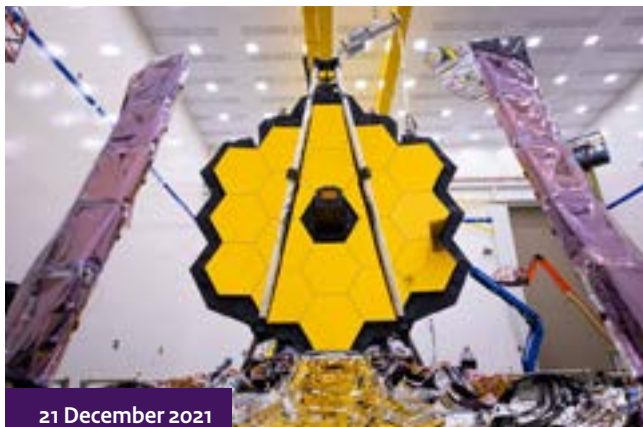
Startups Carble and Soilspect are the Dutch winners of the 2021 Copernicus Masters and Galileo Masters competitions. NSO director Harm van de Wetering announced the news yesterday during the annual Space Awards event. The Copernicus and Galileo Masters are European competitions for new and innovative applications that utilise navigation and earth-observation satellites. In addition to an overall European winner, “local” awards are given to the best ideas from each participating country.



16 December 2021

“Together, we are building an ecosystem for innovations in remote sensing”

With its Partnerships for Space Instruments & Applications Preparatory Programme, the Netherlands supports technological breakthroughs and scientific cooperation in space research. The “Expertise Network Microwave Data for Vegetation Monitoring” aims to be able to monitor crops on Earth in real time from space.



21 December 2021

Launch of James Webb Space Telescope approaches: a golden flower with Dutch ingenuity at its heart

Astronomers around the world are getting excited. If all goes well, the James Webb Space Telescope will launch on 24 December. The Netherlands contributed to this new telescope, which was already famous before it had even left the planet. In the future, Dutch astronomers will use it often in their attempts to solve the big mysteries of our universe.

2021 in numbers



610
teachers
trained with ESERO



24
ESA innovation
projects
supported



562
new users
Satellite Data Portal



87.577
unique visitors
NSO website



1
Knowledge
competition
launched



2
SBIR
innovation projects
launched



4,051,800
farmers in
developing countries
benefitted from the G4AW programme



2
Dutch winners
of the Copernicus
and Galileo Masters

15
online events

met **1271**
visitors/participants



35
news items
published

Colophon

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