

PRO

MAGAZINE

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ESPACIO

Taking the
pulse of
The planet

LSTM MISSION: Earth's Surface
Temperature in Real Time

INTERVIEW

JUAN DE DALMAU
INTERNATIONAL SPACE UNIVERSITY

NEWSPACE

A MATTER OF
ANTENNAS

Unwelcome Visitors



At the time we know about the existence of 900,000 asteroids in our Solar System, out of which over 25,000 are Near-Earth Objects since their orbit brings them close to it. Over 1000 of these objects are in the ESA Risk List, which means that they must be watched by tracking them when passing close to Earth.

Luckily, the larger objects are easier to detect, and their orbits have been thoroughly studied as a result. However, small and

mid-sized objects are much more pervasive in the solar system and they can still cause serious damage, since many are as yet undiscovered.

"In order to calculate the risk posed by these potentially dangerous solar system objects, first we need to survey those objects," says Ivo Saviane, director of ESO's La Silla Observatory. "The TBT project is a step in that direction," he adds.



ESA's Test-Bed Telescope 2 at ESO's
La Silla alongside other telescopes



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TECHNOLOGY

ARQUIMEA

Crisa

DAS
Photonics

deimos
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Space

The drastic transformation of the telecommunications industry leads to new opportunities

"The major investment that deploying these new orbits requires makes optimizing operations paramount within this new ecosystem"

EDITORIAL

THE UNSTOPPABLE advances in technology and the demand for constant communication have encouraged the deployment of satellite networks during the last few decades. At the time, there are approximately 2,800 satellites orbiting Earth, which are a source of vital information for the evolution of telecommunications and the needs that have resulted in the investments made on recent years.

Satellite market trends revolve around new LEO (Low-Earth Orbit) and MEO (Medium-Earth Orbit) constellations that imply a disruptive, albeit a more complex, value proposal. Broadband projects carried out by companies such as SpaceX, AWS and Telesat promise to revolutionize the market in the next 10 years, reaching 990 satellite launches per year by 2028, which would imply a market value of 292 billion dollars, according to Euroconsult. These new constellations will cover 77% of the demand and, with this growing demand, at least 20 countries will launch a satellite for the first time, which means that the market will not only experience an unprecedented growth, but will also see changes in the structure as we know it today, being more encompassing and welcoming new members.

In this context of space revolution, the ground segment will play a major part in making the most out of the high performance promised by the new constellations. It is estimated that by 2028, the ground segment will see a turnover of approximately 14.4 billion dollars; this growth will stem from new types of antennas, such as more compact flat antennas, balloon antennas and parabolic antennas. The efforts of antenna manufacturers are focused on automation and autonomy; the main requirements that they offer are electronic tracking, the ability to track multiple satellites simultaneously and being ready for mobility scenarios, doing away with human intervention in all processes.

Physically, they will be much more compact, easier to handle and suitable for all kinds of surfaces. These new "Smart Antennas" will be the best allies when receiving and transmitting data, as well as to provide new constellations with the highest performance.

**IN THIS CONTEXT OF SPACE
REVOLUTION, THE GROUND
SEGMENT WILL PLAY A MAJOR PART
IN MAKING THE MOST OUT OF THE
HIGH PERFORMANCE PROMISED BY
THE NEW CONSTELLATIONS**

The data obtained during this new paradigm requires a high precision and the goal is to attain a higher integration and autonomy between applications, becoming an alternative to traditional satellites and antennas to attain interoperability between constellations. The ground market aims to reach a virtualization of satellite networks and M2M dependence so that deployments, operation and control can be done remotely. In order to be able to manage the "Smart Antennas" and make the most out of the unfathomable spectrum of opportunities brought about by LEO and MEO constellations, it is necessary to implement new technologies focused on the management of the network and of each antenna. These new digital solutions enable automation and remote control to become a reality, and are fundamental in adapting to the new ecosystem we find ourselves in. The high demand arising from the adoption of 5G implies a connectivity up to 100 times faster than the previous generation. A similar evolution is required in the satellite industry to implement these LEO and MEO constellations and the advantages linked to them: greater speed, lower latency and higher bandwidth.

The radical transformation in the telecommunications industry generates new opportunities (for the digitalization and virtualization of ground segment networks), becoming an indispensable tool, particularly in mobility scenarios: air, sea and land. The major investment that deploying these new orbits requires makes optimizing operations paramount within this new ecosystem in order to be able to evolve and prevent ambitious projects that invest in these new constellations from failing. Cloud-based systems that allow for M2M integration will be the key players in attaining a total optimization of new developments, efficiently unifying space

and the ground segment, the ground segment, which is absolutely critical for success.



Álvaro
Sánchez

INTEGRASYS CEO

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MSS21 OPENING
September 3, 2020

INTERVIEW



OPINION

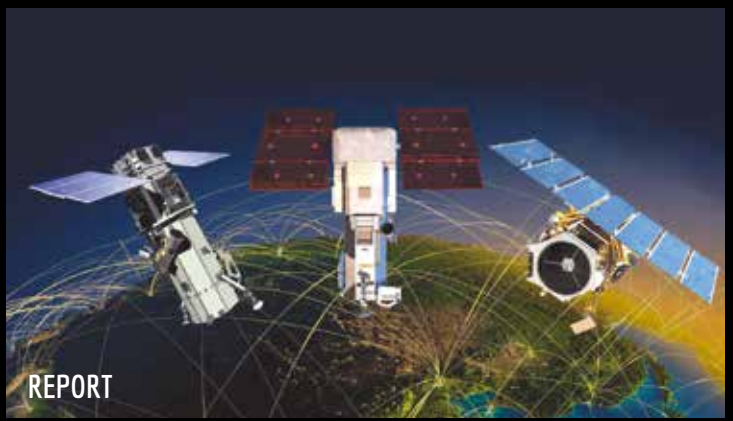


NEWS OUTLET OF TEDAE'S SPACE COMPANIES:

Soluciones, Airbus DS, ALTER Technology, ARQUIMEA, a (Airbus DS), DAS Photonics, Elecnor DEIMOS, GMV, D, Hisdesat, Hispasat, HV Sistemas, IberEspacio, Indra, INSTER, INTEGRARSYS, ORBITALCS, PLD Space, SENER espacial, Tecnalia, Telespazio Ibérica, Tecnobit-Grupo Oesía and Thales Alenia Space España.



OVERVIEW



REPORT



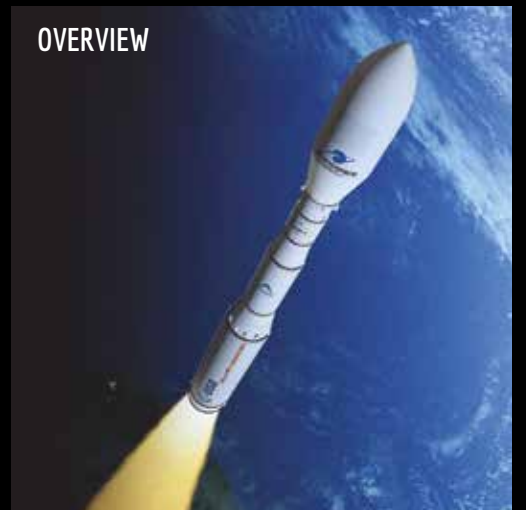
NEW SPACE



CURRENT EVENTS



REPORT



OVERVIEW



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Taking the pulse of The planet

LSTM MISSION: Earth's Surface
Temperature in Real Time

"Copernicus Expansion" is the most ambitious European Earth observation program to date. It offers precise, timely information that is easy to access to improve environmental management, understand and mitigate the effects of climate change and guarantee the safety of the population.

A satellite is shown in the upper left corner, with a blue and yellow data visualization overlay on the Earth's surface below it. The background is a deep space scene with stars.

This initiative is led by the European Commission (EC) in collaboration with the European Space Agency (ESA). ESA coordinates the delivery of data from over 30 satellites. The EC, acting on behalf of the European Union, is in charge of the global ini-

tiative, establishing requirements and managing the services. These services are divided into six main categories: land management, marine environment, atmosphere, emergency response, security and climate change.

Six missions will expand the current capabilities of the Sentinel satellites and address the priorities and political voids of the EU in regard to the needs of Copernicus users. The new industrial contracts will now set the key design phases (Phase B) for these six missions in motion: "Anthropogenic Carbon Dioxide Monitoring", CO2M; "Hyperspectral Imaging Mission", CHIME; "Imaging Microwave Radiometer", CIMR; "Polar Ice and Snow Topography Altimeter", CRISTAL; "L-band Synthetic Aperture Radar", ROSE-L; and lastly "Land Surface Temperature Monitoring", LSTM.

More specifically, the LSTM mission will carry a high spatial-temporal resolution thermal infrared sensor to offer Earth surface temperature observations for a sustainable agriculture.

The mission responds to priority requirements of the agricultural user community for improving sustainable agricultural productivity at field-scale in a world of increasing water scarcity and variability. Land-surface temperature measurements and derived evapotranspiration are key variables to understand and respond to climate variability.

WHAT LSTM MEANS TO SPAIN

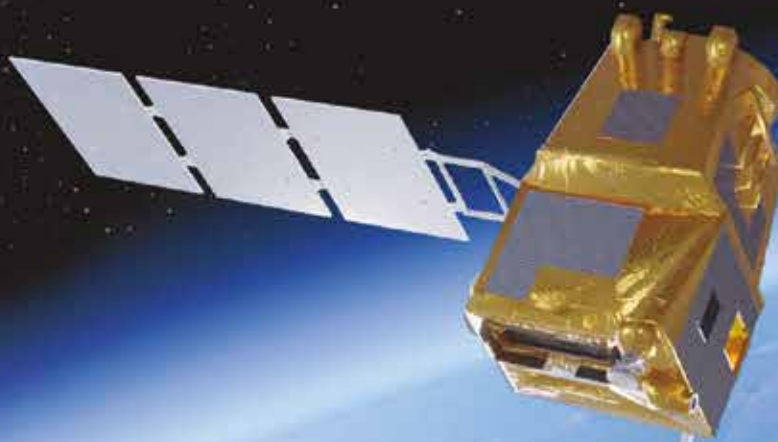
Having been awarded the construction of the "Land Surface Temperature Monitoring" (LSTM) satellite is a major success for Spain, and a reward for the efforts of many people from within and without the sector who have fought for a long time toward this goal. It is the first Copernicus mission that is awarded to a Spanish company as a main contractor.

Worth noting is the fact that the Spanish administration has made significant efforts to bring this mission to Spain, and without their work this would not have come to pass. Already during the Sevilla +19 European Space Agency Ministerial Council, the Spanish ESA Delegation confirmed Spain's willingness to lead one of the most important ESA missions of current times – the new Copernicus

satellites. The companies of the sector are well-prepared to face this challenge. Their capabilities and competitiveness are on par with the best companies in the world.

“The Spanish ESA Delegation confirmed Spain's willingness to lead one of the most important ESA missions of current times – the new Copernicus satellites”

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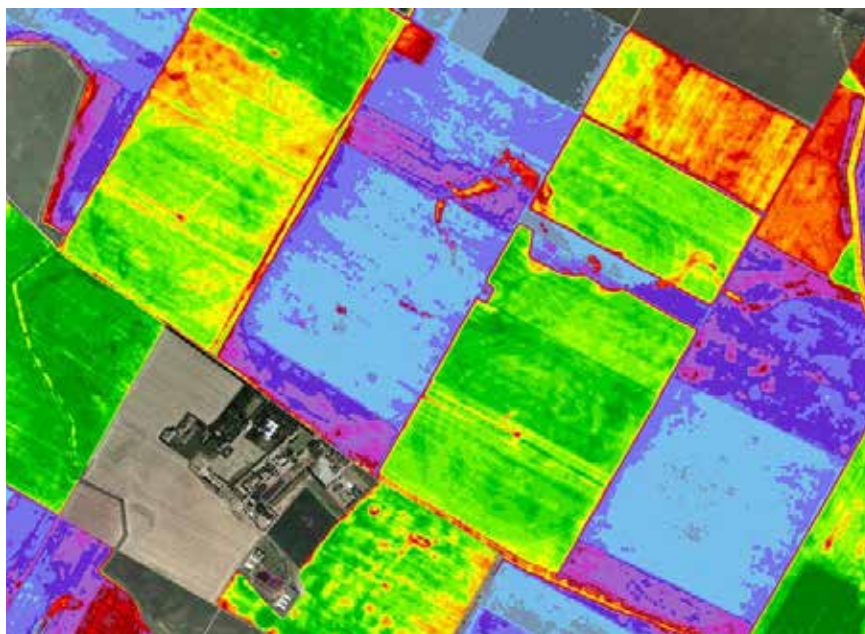


THE MISSION

LSTM is an Earth observation mission that will provide new data to the EU Copernicus program, whose main objective is to monitor the planet in real time. LSTM is among the next-generation Copernicus satellites that will continuously monitor the global temperature of the Earth's surface during the next 20 to 25 years. These measurements will help in understanding the whats, whys and wheres in regard to climate changes that are taking place and may lead to unexpected repercussions. In particular, this mission will address the needs of European farmers to make agricultural production in individual farms more sustainable as water shortages increase and the environment experiences changes.

More specifically, the mission addresses the issues related to water, agriculture and food safety by monitoring the surface's temperature and derived evapotranspiration at a global scale, allowing for robust water-related productivity estimations. The LSTM mission will support the Copernicus land monitoring service, the European and international policies, and downstream applications.

The thermal infrared observations will support a range of additional services



Precision agriculture for sustainable agricultural production

aimed at understanding climate degradation and managing water resources for agricultural production, to forecast draughts and to address soil degradation, natural hazards such as fires and volcanic activity, and coastal and continental water management, as well as issues related to urban heat islands.

"the mission addresses the issues related to water, agriculture and food safety by monitoring the surface's temperature and derived evapotranspiration at a global scale"

THE SATELLITE

LSTM satellites acquire global images of all land and coastal areas in the visible and near-infrared spectrum (VNIR), short-wave infrared (SWIR) and thermal infrared (TIR). Each satellite carries a unique high-precision instrument that enables a resolution of up to 50m in the infrared spectral range. The platform benefits from the heritage of the AstroBus product line, which is highly modular and flexible, and was used in other satellites

such as MetOp-SG, Sentinel-5P, Cheops and Ingenio, thereby minimizing development risks.

The design of the LSTM satellite revolves around the design of the instrument, the need to continuously acquire images throughout the orbit (including on the night side) even during the downlink of scientific data, minimizing development risks through a fast reutilization of already-

developed and proven components, and the final deorbiting at the end of its service life.

The launch of the first satellite will take place in 2028. The awarded contract is for € 380 million and includes one satellite, with the option to build two additional ones. The aim is to use them to offer a continuous stream of this type of data during the next 20 to 25 years.

EL INSTRUMENT

On the other hand, Airbus Toulouse will be in charge of the optical instrument carried aboard the LSTM satellite, which leverages the latest Airbus innovations in programs such as the French-Indian TRISHNA mission to offer a best-in-class instrument. It will acquire very near-infrared, short-wave infrared and thermal infrared images, with a four-day revisit capability.

A two-day revisit can be guaranteed by simultaneously flying two identical satelli-

tes at a sun-synchronous orbit (SSO) of 650 km, which offers a geometric revision of each satellite. The satellites overfly European latitudes at 13:00 hours, when the stress on the crops is at its highest, to facilitate evapotranspiration measurement.

The concept of the design of the LSTM instrument is based on a reflection scan sweep that feeds different flat lenses for each of the three spectral regions. The temperature of the sensors is maintained

at 200 °K in the SWIR region and 65 °K in the TIR region. The focal plane of the VNIR is at room temperature. The control of the parasitic light is ensured through the selection of a robust optical design aimed at these types of instruments. The performance of the proposed architecture is enhanced even more by processing on the ground.

PARTICIPATION OF SPANISH COMPANIES

Airbus Spain is the prime contractor for this mission and will manage over 60 companies and institutions of up to 18 ESA member states that make up the industrial consortium.

Most of the subcontractors have been selected through open competition, after a lengthy Request For Information (RFI) and Request for Proposal (RFP) process, systematically including Small and Mid-Caps and companies unrelated to Airbus. A geographical diversity is applied throughout, with 18 countries having already been included in the consortium and 4 additional countries having the potential to be included.

These are the responsibilities of the Spanish companies participating in the LSTM program:

- **Airbus Spain:** Prime contractor in charge of the management and performance of the program, responsible for the construction and integration of the satellites in its clear rooms and for the testing campaign. Once built and tested, it will be in charge of launch operations and the acquisition and delivery from orbit. It is also responsible for the power control and distribution unit (PCDU), the generic processing module of the instrument control unit (GPM ICU), the front-end electronics of the infrared sensor (FEE TIR) and the front-end electronics of the visible spectrum sensor (FEE VIS).
- **SENER:** Responsible for the design and manufacture of the S-band antennas and of the instrument's calibration and shutter mechanism (CSM).
- **Thales Alenia Space Spain:** In charge of the design and manufacture of the S-band transponders.
- **Crisa:** Es responsable de la unidad de control y distribución de potencia (PCDU), el módulo del procesador genérico de la unidad de control del instrumento (GPM ICU), la electrónica de interfaz con el detector de infrarrojo (FEE TIR), y la electrónica de interfaz con el detector de espectro visible (FEE VIS).
- **HV Sitems:** In charge of providing technical support for the instrument control unit (EGSE ICU).
- **Elecnor Deimos:** Responsible for the observation performance simulator (OP)

GAINED EXPERIENCE

The experience gained in other programs such as CHEOPS and INGENIO has been essential in the ESA's continued reliance on Spain. In particular, the superb work done with CHEOPS had much to do with this. It is a little-known fact that CHEOPS was the first ESA satellite to be delivered within the stipulated timeframe while meeting its requirements in terms of cost and quality.

The loss of the SEOSAT-Ingenio satellite in November of 2020 due to a launch vehicle failure was an unfortunate event that squashed all hopes in regard to its use and results. However, not all was lost during the launch.

SEOSAT-Ingenio was the first Spanish Earth observation satellite designed, built and operated by Spain's industry and institutions. To accomplish this, work was performed in several fields to obtain a product that would generate up to 600 high-resolution images per day. The knowledge acquired has increased the competitiveness of Spanish companies.

In addition, the Spanish space industry developed new technologies as part of the program that have broadened their specialties. The participation of the Spanish industry was widely encompassing, and the program as a whole led to the creation of hundreds of new highly qua-

lified job positions. Because of this it is easy to claim that the main objective of the SEOSAT-Ingenio program has been fully accomplished: to increase the capabilities of the Spanish space industry toward products with a higher added value.

Thanks to these programs we know that the ESA considers Spain to be a reliable, solid partner when leading missions and instruments. The experience gained has served as an introduction letter for the obtainment of new opportunities and contracts, such as LSTM.

BENEFITS OF COPERNICUS

Since the entry into service of the first satellites of the COPERNICUS Program in 2014 (Sentinel 1), the impacts and benefits of the program have been highly significant and highly diverse. They have exceeded all expectations in terms of space industry, reaching other industries and services with a magnificent downstream that has gone beyond what anyone expected. COPERNICUS has become the largest su-

ppplier of geospatial data in the world, with its production currently tallied at approximately twelve terabytes per day. Most of this data is provided in full and for free. The added value offered by COPERNICUS revolves around six axes: atmospheric monitoring, sea environment monitoring, land monitoring, climate change, emergency management and safety.

Total turnover figures exceed 10 billion euros, with more than 15,000 jobs per year. This information includes more than that which is intrinsic to the space sector, since other non-space industries are involved, such as agriculture, sea and land transportation, energy generation & transport and renewable energy.

The benefits to humanity and the protection of planet Earth are countless. Just to name a few, we could mention the assistance to protection during disasters and humanitarian crises, the indexes for the assessment and analysis of climate change, the protection against deforestation and desertification, the monitoring of the atmospheric air composition, snow, ice and sea and ocean water and its shores; and just as importantly, the monitoring of urban growth and the heat islands that it generates.

TEXTS: Francisco Lechón / José Antonio García





Miguel Martín

Host of RPA's (Radio of the Asturias Principality) 'Gravedad Cero' space exploration radio show and founder and director of the 'Splashdown Festival' science communication event

In hindsight, the broadcast of the first chapter of the mythical 'Cosmos' television series in September of 1980 was a turning point in the popularization of science. This is not to say that there were not several noteworthy examples of science communication before it, such as the legendary annual conferences held in Christmas in London since 1825 by the Royal Institution. Scientists and communicators the likes of the physicist specialized in electromagnetism Michael Faraday, ethologist Desmond Morris, naturalist David Attenborough and mathematician Marcus du Sautoy imparted their many master classes at this British institution.

But with "Cosmos: A Personal Voyage," Carl Sagan took things to a new level, making a deep impression in many of today's scientists and engineers. Forty years ago, Sagan brought about the onset of modern science communication through the use of novel audiovisual resources and through the manner in which he approached communication. He contextualized science through historical, philosophical, anthropological and social contexts, showcasing scientific research as an exhilarating adventure, and writing and filming captivating chapters such as "The Shore of the Cosmic Ocean," "The Harmony of the Worlds" and "The Edge of Forever."

Today, during these last few weeks we were able to witness the huge interest over the Mars 2020 mission involving the Perseverance rover. However, it is not the first to roam the red planet: Sojourner (1997), Spirit (2004), Opportunity (2004) y Curiosity (2012) preceded it, but none of these rovers garnered the media attention Perseverance has. The milestones of space exploration are increasingly experienced with passion by a wide audience from all around the world.

And the fact is that, in a not too far future, many high-impact news in the media will be related to science, technology and space exploration. Let's consider, for example, the revolution

that quantum computing will imply, with computers that will be able to solve in seconds what a conventional one would take years to compute.

Or, without looking too far into the future, in 2024, if the deadlines are finally met, budget allocations remain unchanged and there are no unexpected delays, it will be the year when NASA's Artemis III mission will finally take us back to the moon. The scientific and technological advances, the onset and development of new economic niches and the world media repercussions brought about by the return to our natural satellite are hard to quantify, but they will undoubtedly be spectacular. We are at the gates of a new Space Age.



A man in an orange jacket and khaki pants stands next to a small, white, box-like satellite on a rocky, mountainous terrain. The satellite has a large, circular, silver parabolic dish antenna mounted on top. The background shows rugged, brown, rocky hills under a clear sky. The man is pointing towards the satellite.

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A man with glasses and a blue suit is speaking, looking slightly to the right. He is positioned in the foreground on the right side of the frame. Behind him, several flags are visible, including the European Union flag and various national flags, creating a blurred background.

W In the public sector, we have been able to renew agreements and establish new ones for the financing of scholarships, feasibility studies ("Team Projects") and the addition of interns to ESA's practices"

THE PUBLIC INVESTMENT ACROSS ALL OF THESE DEVELOPMENTS IN THE EUROPEAN UNION IS 17 EUROS PER CITIZEN PER YEAR – MUCH LOWER THAN THE DEFENSE BUDGET AND SIX TIMES LESS THAN WHAT THE UNITED STATES ALLOCATES TO SPACE

INTERVIEW

Juan de Dalmau

International Space University

YOU HAVE BEEN IN CHARGE OF THE DAY-TO-DAY OF THE INTERNATIONAL SPACE UNIVERSITY SINCE 2018. WHAT HAVE BEEN THE MAIN ISSUES THAT YOU HAVE ADDRESSED DURING THESE FOUR YEARS?

Faithful to the space subject learning philosophy in an international, intercultural and interdisciplinary approach (the “3 i”), and in continuance of the projects started by my predecessors Mike Simpson and Walter Peeters, we have broadened the network of collaborations with experts, universities and also with sponsors across the five continents to offer courses in Europe, the Americas and Asia-Pacific, and also as virtual courses.

Thanks to the assistance of the 5,200 graduates from different programs who work in 110 countries and act as ambassadors, the visibility of the university is still rising, as is the usefulness of the professional network that it represents.

In the public sector, we were able to renew agreements and establish new ones for the financing of scholarships, feasibility studies (“Team Projects”) and the addition of interns to ESA’s practices, the European Commission, CNES, DLR, ASI, UKSA, CASC and CLTC in China, JAXA, ISRO, NASA, American Astronautical Society, the Australian Space Agency, the Saudi Space Commission and the United Arab Emirates Space Agency, among others.



And in the private sector we are training an increasing number of entrepreneurs: in 2021 we counted over 100 companies created by former students since the foundation of the university in 1987, including Spire, Planet, Zero2Infinity and UARX Space in Spain, for example.

Lastly, the pandemic was an opportunity for the ISU to enter the world of virtual education, and the 2020 "Interactive Space Program" summer university demonstrated that, by implementing innovative techniques, we can obtain the same team spirit and international collaboration than with an on-site program. Meanwhile, as a nonprofit organization, during this pandemic we have had to make great efforts to control our expenses and maintain our income.

THE ISU IS THE ONLY EDUCATIONAL INSTITUTION THAT IS FULLY DEDICATED TO SPACE EXPLORATION, COMPOSED OF IMPORTANT FIGURES OF THE SPACE SECTOR FROM AROUND THE WORLD. HOW DO YOU BENEFIT FROM THIS SYNERGY OF INDIVIDUALS?

When I participated as a student in the ISU's summer university in 1989, with a joint scholarship from ESA and CNES, I lost my apprehension of speaking to anyone in the space sector and I learned the great value of staying in touch with professors and experts. Maintaining and progressively

broadening that network has worked well for me at every stage of my career: my superiors would task me with contacting external organizations such as potential partners, foreign visitors, journalists, etc.

It is surprising for me to see how almost every week we get contacted by a renowned person or public or private organization to offer to collaborate with the ISU. It is easy to see how valuable these exchanges are for our students and their professional development.

DO YOU BELIEVE THAT THERE SHOULD BE MORE CENTERS LIKE THE ISU IN THE WORLD? OR DOES THE ISU'S STRENGTH STEM PRECISELY FROM ITS UNIQUENESS?

The vision of the founders of the ISU includes this phrase: "ISU is an institution dedicated to international affiliations, collaboration and open, scholarly pursuits related to outer space exploration and development."

Many students ask us whether they should study at the ISU or at another, more specialized university, and we always advise them to finish their program at whichever university they are and to then continue with interdisciplinary studies at the ISU.

Master of Space Studies –MSS– students, for example, must have at least a bachelor's

The pandemic was an opportunity for the ISU to enter the world of virtual education, and the 2020 "Interactive Space Program" summer university demonstrated that, by implementing innovative techniques, we can obtain the same team spirit and international collaboration than with an on-site program"

or any other undergraduate degree (in any field, whether technical or human studies) and demonstrate their motivation to follow a career in the space sector.

The itinerant nature of our summer university, the Space Studies Program (SSP), which is hosted by a different university each year, has encouraged collaborations that, in time, have become annual courses imparted at the host university, such as the Southern Hemisphere SSP (SHSSP) at the University of South Australia or the Commercial Space Programs Graduate Certificate at the Florida Institute of Technology and NASA's Kennedy Space Center.

PROFILE OF YOUR STUDENTS AND WHICH COUNTRIES ARE THEY FROM?

A typical MSS class has about 35 students with a degree in engineering or I.T. (50%), astronomy or space sciences (10%), medicine or life sciences (10%), economics or business administration (15%), law, political sciences or international relations (10%); or others such as history, journalism and scientific communication (5%). The average age is 29 years and, geographically, they come from 20 different countries in four continents. On the other hand, a typical SSP class has 120 participants from 25 to 30 countries and an average professional experience of 3 years. The average age is 31 years.

IN SPAIN, WOMEN ARE INCREASINGLY GETTING INVOLVED IN TECHNICAL STUDIES, INCLUDING AEROSPACE ENGINEERING, BUT THEY ARE STILL A SMALL PERCENTAGE IN RELATION TO MEN. HOW DO YOU THINK THE INVOLVEMENT OF WOMEN IN THE SPACE SECTOR BE ENCOURAGED? DOES THE ISU HAVE ANY PROGRAM IN THIS REGARD?

The multidisciplinary profile of our contents and our students allows us to welcome more women than purely technical careers do, and in the MSS 2020 class we had 60% of women.

We have the privilege of counting with two female astronauts among our alumni -Soyeon Yi from Korea and Jessica Meir from the United States-, as well as with their kind availability to give talks in schools and inspire younger women in their choice of studies.

Moreover, the funds provided by the ESA to grant scholarships to member state students are conditional to maintaining a minimum percentage of women. Our professors in charge of each course have the goal of increasing by 5% per year the number of women who are invited to give specialized classes.

We collaborate with organizations such as Women in Aerospace Europe (WIA-E), where we are sponsors, and we offer very generous scholarships to WIA-E members who enroll in our programs. Incidentally, we have been following with interest the recent creation of local WIA-E groups in Barcelona and Madrid.

At a more personal level, it is an honor for my successor as the president of the ISU since September of 2021 to be Professor Pascale Ehrenfreund, a renowned figure as a researcher and director.

HOW WOULD YOU EXPLAIN TO AN AVERAGE EUROPEAN TAXPAYER THE NEED TO INVEST PUBLIC FUNDS IN SPACE EXPLORATION AMIDST THE PANDEMIC CRISIS?

During the summer of 2020, a group of 86 young professionals from 25 countries published a report on "How space technologies will help us prevent the next pandemic" as part of the Interactive Space Program course of the ISU.

Space is today a source of resources for Earth and of jobs in many regions, comparable to the oceans: a source of knowledge about our origins and our destination in the universe; an indispensable observation post for weather forecasts, the understanding of climate change, agriculture, fishing and the environment; as well as a means to provide 5G communication in remote areas. Let's not forget that all the money invested in space programs stays on the ground, mostly in the form of salaries, and that the "exploration" part with crewed flights is relatively small compared to all the satellite-related applications.



The public investment across all of these developments in the European union is 17 euros per citizen per year – much lower than the defense budget and six times less than what the United States allocates to space.

The world economy of space will soon reach 400 billion euros, three-fourth of which correspond to commercial activities. The countries that do not invest in some of these technologies end up buying them from those who did. Saying “let THEM invent” is not a good idea in the long term.

WHAT DO YOU THINK OF THE EVOLUTION OF NEW SPACE?

A few years ago in the United States, advocates of private initiatives in space used to say: “Space is a place, not a government program.” Today we are seeing that space is exactly that: a place where you can engage in scientific research, businesses such as transportation or telecommunications, extraction of resources such as energy and minerals, deploying infrastructure for observation, navigation and geopositioning, tourism and, unfortunately, also espionage and war.

Governments have an extremely important role as clients or consumers of many of those services, and their responsibility, as well as that of supranational institutions, is also to act as regulators so that private initiati-

ves abide by a sustainable and egalitarian development. Soon after the Second World War, over 60 countries signed an agreement that said that celestial bodies are a human heritage. More recently, some countries have passed national laws that enable their companies to commercially exploit natural resources on the Moon. We need good lawmakers and diplomats to come up with regulations that are complied with by everyone, which could be inspired on international maritime law. Or should it be inspired on the Antarctic treaty? In any case, the ISU offers a neutral ground to discuss these issues, and to train the future scientists, engineers, lawmakers and diplomats of space with the values of mutual respect and a peaceful development of space.

IN THAT REGARD, TODAY THERE IS MUCH TALK ABOUT THE “DEMOCRATIZATION OF SPACE” LINKED TO THE ARRIVAL OF SMALL PRIVATE ENTERPRISES INTO THE MARKET OF SPACE APPLICATIONS. IS THAT TERM CORRECT?

The fact that access to space is being democratized is true, mostly thanks to equipment miniaturization and the reduction of launch costs. And also, thanks to the access to Earth and environment positioning and observation data, which can be transformed into tradable information without the need to make significant investments.

Entrepreneurs see new opportunities, investors can better appraise the risks and public administrations evolve toward the role of service buyers or infrastructure users, and also of drivers, facilitators and regulators of commercial activities in space.

We are seeing how all stakeholders are adapting to these changes, and some should even think ahead, as is the case of national and international legislators, in relation to issues such as space junk, the exploitation of extraterrestrial resources or space tourism. Also significantly important is the access of developing countries to the benefits of telecommunication infrastructure, education and training, and satellite information related to agricultural, forest, water, fishery and environmental resources.

The United Nations are working, via the Committee on the Peaceful Uses of Outer Space (COPUOS), on adopting a roadmap for a sustainable development, but they need member countries to work harder on “space diplomacy” to reach an agreement in relation to the recommendations that the countries would subsequently need to adopt.

At a European level, I think we are setting a very good example to the world by im-



posing upon ourselves rules to limit space junk which, in the long run, will benefit everyone and hopefully serve as a model for other countries.

THE ISU SUMMER SESSION WILL BE HELD IN GRANADA (WHICH IS CO-HOSTING IT WITH STRASBOURG) THIS YEAR. WHAT IS THE MAIN OBJECTIVE OF THESE SUMMER SESSIONS?

All summer sessions of the ISU are a unique occasion for administrations and space industries of the host country to show some 250 space professionals –including participants and professors– the capabilities and opportunities for collaboration offered by the country.

The 120 participants enrolled in the program go through an educational experience that is a turning point in their professional development. During nine weeks, from June 28 to August 27 of 2021, they will rub shoulders (with the proper social distancing this time around) with 130 professors and experts who will participate with talks, round tables, visit to companies, or as mentors and members of the jury in group assignments.

The courses imparted cover all disciplines involved in most space projects, such as Politics, Economics and Law related to space activities, Social Sciences: history, ethics, communication, etc. related to space, crewed flights and human performance in space, management and business in the space sector, space sciences, aerospace engineering, etc.

In order to comply with the health measures that will probably be in effect during the summer, the courses will have a hybrid format, with participants and professors located in Granada, Strasbourg and via online presence.



HOW DO YOU THINK THE SPACE SECTOR WILL EVOLVE IN THE FUTURE AND WHAT CAN AN INSTITUTION SUCH AS THE INTERNATIONAL SPACE UNIVERSITY ADD TO THAT FUTURE?

I think the best way to answer is to once again quote the founders of the ISU:

“The International Space University is an institution founded on the vision of a peaceful, prosperous and boundless future through the study, exploration and development of Space for the benefit of all humanity.

It is a place where students and faculty from all backgrounds are welcomed; whe-

re diversity of culture, philosophy, lifestyle, training and opinion are honored and nurtured.

ISU is an institution which recognizes the importance of interdisciplinary studies for the successful exploration and development of space.

ISU strives to promote an understanding and appreciation of the Cosmos through the constant evolution of new programs and curricula in relevant areas of study. To this end, ISU will be augmented by an expanding base of campus facilities, networks and affiliations both on and off the Earth.”

Text: Oihana Casas / Francisco Lechón

A MATTER OF ANTENNAS

In the last issue we discussed the miniaturized satellite platforms known as nanosatellites, its different shapes and dimensions, characteristics and possibilities. Since the quality of the data that they collect is linked to the quality of the signal that they send back to Earth and vice-versa, in this new issue we will focus on how these, in turn, depend on the quality of the antennas that send this data, to the point that they become critical elements in each mission. The re-

sults obtained through the use of a good antenna ensure increasingly ambitious missions, such as radar imaging, radio-frequency monitoring and telecommunications.

These small satellites require specific satellite bus space and, usually, a mechanical deployment after launch. This takes additional weight and space that could be used for another purpose, in addition to the reliability that they must

guarantee. It is important to remember that a high percentage of nanosatellite launch missions (80-90% according to different studies) end up in failure due to the detachment of the antenna during launch and deployment to orbit.

“Nowadays there are several projects that are committed to the miniaturization of antennas and good radiation characteristics”



GROUPS

Nowadays there are several projects that are committed to the miniaturization of antennas and good radiation characteristics. The list of aspects that are important when designing an antenna includes: a range of frequencies where it can be used, its bandwidth, its radiation pattern or diagram, the maximum gain, the input impedance, the cost, the size and, of course, affordability.

Without dwelling too much on technical aspects, and just with the purpose of better understanding their different functions, the types of nanosatellite antennas

can be classified into two main groups: deployable and fixed.

DEPLOYABLE

A myriad of antenna deployment mechanisms exist, with the most widespread being:

Monopole/dipole: the most common among CubeSats, which consist of groups of dipole pairs connected to the output of a splitter.

Helices: helical antennas that have an electrical deployment method due to their size. They are usually designed to operate

from 400 MHz to 3GHz. The structure is axially stowed to reduce their size.

Parabolic: Lightweight and ultra-compact.

The most difficult aspect of deployable antennas is the mechanical deployment system once in orbit, which must be done completely and correctly. Its operation would be affected in case of a failure.

FIXED

The greatest challenge for these antennas is related to their size.

Planar: there is a wide variety of designs. The most common is a planar patch antenna with circular polarization based on two rings.

Another one is the micropatch antenna based on microstrip technology, which is widely popular in applications that require a small size and a simple manufacture. It is easy to integrate into flat and non-flat surfaces, and it easily adapts to microwave integrated circuits. While it is quite versatile, it has some disadvantages, such as low radiation power and limited bandwidth. However, the cost of patch antennas is lower than that of other types due to how simple it is to manufacture them on printed circuit boards.

In general, fixed antennas are considered to be more reliable than deployable ones.

Nowadays, teams of scientists from European and world institutions, universities and companies are dedicated to designing, testing and implementing compact, simple and affordable antennas aimed at improving the functionality of nanosatellites in regard to remote sensing and communications. It is yet another field of research and development that involves an industrial framework whose mission is to get the most out of the narrow field of view of antennas in low orbits to send high-resolution real-time images and videos back to Earth.







In the news

The satellites of the Copernicus missions let us see from space some of the events that make headlines. This is possible both thanks to the high-resolution cameras of Sentinel-2, which allow for the capture of images of the Earth's surface in 13 spectral bands, and to the radar instruments of Sentinel-1, which offer images throughout the year, day and night, which makes them ideal to monitor marine traffic.

Furthermore, the data from the satellites can be used to detect slight signs of changes that can forecast an eruption. Once the eruption has started, the optical and radar instruments can capture the diverse phenomena related to it, such as lava flows, cracks on the ground and earthquakes. The atmospheric sensors on the satellites can also identify the gases and aerosols released by the eruption, as well as quantify their broader impact on the environment.

ABOUT THE IMAGE

A deserted Venetian Lagoon

The image shows the decrease in marine traffic in the waterways of Venice as a consequence of the efforts to limit the spread of the coronavirus – as captured by Sentinel-2.

Credit: Contains modified Copernicus Sentinel (2019-20) data, processed by the ESA, CC BY-SA 3.0 IGO

Text: M. López/ESA





ABOUT THE IMAGE

Snowy Madrid

Captured by the Copernicus Sentinel-2 mission on January 11, 2021, while this image of Madrid seems to have been captured in black and white, it is actually a real-color image.

Credits: Contains modified Copernicus Sentinel (2021) data, processed by the ESA, CC BY-SA 3.0 IGO of Nantes/Space Science Institute



ABOUT THE IMAGE

Mt. Etna erupting

This image of Mount Etna is an eruption captured on February 18, 2021 by Sentinel-2. It has been processed using the shortwave infrared band of the mission to show the flow of lava in bright red.

Credits: Contains modified Copernicus Sentinel (2021) data, processed by the ESA, CC BY-SA 3.0 IGO



— Infrared signal

instants



Gulf of Suez

3 km

21 March 2021



Ever Given - 4

Ships accumulating
in the Gulf of Suez

25 March 2021

ABOUT THE IMAGE

Suez canal traffic jam as seen from space

The images captured by the radar instruments of Sentinel-1 before and after the Ever Given incident. Metallic objects – in this case, the ships at the bay – appear as bright dots in the dark waters.

Credits: Contains modified Copernicus Sentinel (2021) data, processed by the ESA, CC BY-SA 3.0 IGO

WOMEN IN AEROSPACE EUROPE (WIA-E) CREATES A NEW LOCAL GROUP IN MADRID

LAST March, over 50 men and women from different companies and institutions of the Spanish space sector set in motion the project of creating in Madrid a local group of Women in Aerospace Europe (WIA-Europe) – the nonprofit association that promotes the visibility and leadership of women in the aerospace sector.

WIA-Europe is an international nonprofit association born in 2009 that encourages the visibility of women's role in the aerospace sector, fostering the presence of more women in positions of leadership in space via strategic events and community support. Its main objective is to promote the space sector in society and show new generations the enormous opportunities that Space can offer them. In order to achieve this goal, the association pro-

motes various initiatives to broaden the network of contacts among members who are spread across a myriad of organizations and European countries, comprising a total of 16 groups from several cities and countries – from the first local group formed in Bremen, to Berlin, Brussels, Cologne, Darmstadt, Geneva, Leiden, Luxemburg, Munich, Paris, Rome, Strasbourg, Toulouse, United Kingdom and Spain's Barcelona and Madrid.

The activities to be carried out include the promotion of STEM careers and education, with special attention to fields that are directly related with the aerospace sector, such as climate change, drones, satellite aided search & rescue, the assistance to people with disabilities, etc. A number of educational events, conferences, round tables, outreach activities in schools and universities and the participation in career fairs will be carried out for that purpose, as well as interviews for the promotion of female models in the aerospace sector.

Several companies and institutions –including TEDAE– such as HISPASAT, Airbus, Alter Technology, GMV, Thales Alenia Space and organizations such as INTA and Isdefe, are corporate members of the new Madrid local group.

TEXT: Iñaki Latasa



THE INGENUITY HELICOPTER FLIES OVER MARS AND COMPLETES ITS FIRST FLIGHT

THE INGENUITY helicopter has successfully performed the first-ever controlled flight outside the Earth. This device weighing under two kilograms arrived in Mars on February 18 together with the Perseverance rover, from which it detached on April 4. After postponing the test on two occasions due to technical reasons, NASA finally succeeded in having its Ingenuity helicopter fly for almost 39.1 seconds.

The helicopter is flown autonomously because, due to its distance from Earth, it cannot be directly controlled from our planet.

This is a purely technical mission – in other words, the helicopter will not do any science. NASA's objective was to demonstrate this technology to verify

whether it is feasible for future missions. Due to the mobility limitations of rovers such as Perseverance and Curiosity, a helicopter such as this one would allow for terrain recognition and even for the transportation of small loads.

TEXT: IL



MICHAEL COLLINS, THE ASTRONAUT THAT TOOK PART IN THE FIRST MISSION THAT LANDED ON THE MOON WITH APOLLO 11, PASSED AWAY

ORBITING dozens of miles above the lunar surface, he monitored Apollo's command module in solitude while Neil Armstrong and Buzz Aldrin headed for the moon.

The Apollo 11 mission –crewed by Armstrong, Aldrin and Collins– launched in July 16, 1969. Four days later, when the Eagle lunar module set down on the Moon's surface, with Armstrong and Aldrin aboard, Colonel Collins lost contact with his crewmates and with NASA – his line of communication was cut off when traversing the other side of the Moon. These blackouts would take place during part of each orbit he would make.



"I am alone now, truly alone, and absolutely isolated from any known life... I like the feeling. Outside my window I can see stars – and that is all. Where I know the moon to be, there is simply a black void," he wrote while conveying his thoughts for his memoirs in 1974.

While his crewmates took the first spacewalk, Collins would take photographs of the satellite and perform experiments.

The ascent of his crewmates from the Moon and the docking between Columbia and the lunar module were impeccable.

By the time the members of the Apollo 11 crew landed in the Pacific Ocean they were already world heroes.

TEXT: Israel Segoviano



THE FIRST combined tests of Ariane 6 simulated the moment of liftoff when the umbilicals detach from the launch vehicle. These tests are part of the road toward the first flight of the new launch vehicle, to test the interfaces and the mechanical behavior during separation

of this complex cryogenic connection system. In addition, more lengthy combined tests will be performed at the European spaceport in Kourou (French Guiana).

The design of the launch pad has been improved for Ariane 6. The deta-

THE FIRST TESTS OF ARIANE 6 SIMULATED THE MOMENT OF LIFTOFF

achment time is now faster than it was for the previous model. This means that the sequence can be activated at the last possible moment during the countdown – an extremely important fact that reduces the chances of unnecessary detachments in case of a launch abort.

The cryogenic connection system holds the launch vehicle on the launch pad during the countdown for liftoff. The umbilicals supply top-up fuel to the Ariane 6, maintain the correct pressurization of its fuel tanks, cool the engines before ignition and keep the launch vehicle in an optimal condition right up to the point of liftoff. The same umbilicals allow the fuel to be drained safely if a launch is aborted

ESA WARNS ABOUT THE URGENT RISK POSED BY SPACE DEBRIS

DURING THE VIII European Conference on Space Debris held in April, the Director of the European Space Agency (ESA), Josef Aschbacher, warned that uncontrolled satellite debris that remains in orbit around the Earth presents one of the “most urgent” issues for the future of space.

According to ESA calculations, since the onset of the space race in 1957, over 5,000 launches have generated 26,000 objects, out of which 23,000 can be considered to be devoid of any usefulness. But if we take into account objects of under 1 centimeter that remained floating in space, whether because they became detached or because they have been impacted by other objects, that figure rises to over 750,000 pieces of debris.

Regardless of their size, the 56,000 kilometer per hour speed at which they travel turns them into projectiles that can cause catastrophic damage to any satellite and endanger new launches or

the crews of spacecraft or the International Space Station.

In parallel, ESA Director of Operations Rolf Densing assured that we have reached a point where we need some kind of space traffic coordination. “I will give a simple example. If you have an airport with just one plane leaving in the morning and another one coming back in the evening, you don’t need to regulate. But you do if you have permanent traffic,” he added.

Currently, the traffic of satellites, which are seeing increasing use in fields that range from communications to meteorology, is permanent, and the orbits that they use is limited.

Cleaning up the orbits.

The fragmented remains of old satellites and other debris imply a cascading problem. If they impact another satellite, they can cause a chain reaction that could even render a specific orbit unusable. This is why it is especially important to find solutions.

Part of the solution involves removing useless objects from space –something for which the ESA has a mission in store for 2025– and “it is not an easy task,” said Luisa Innocenti, who is leading the ESA Clean Space program.

This is especially true for objects with a small diameter – the result of the fragmentation of objects that are no longer in use.

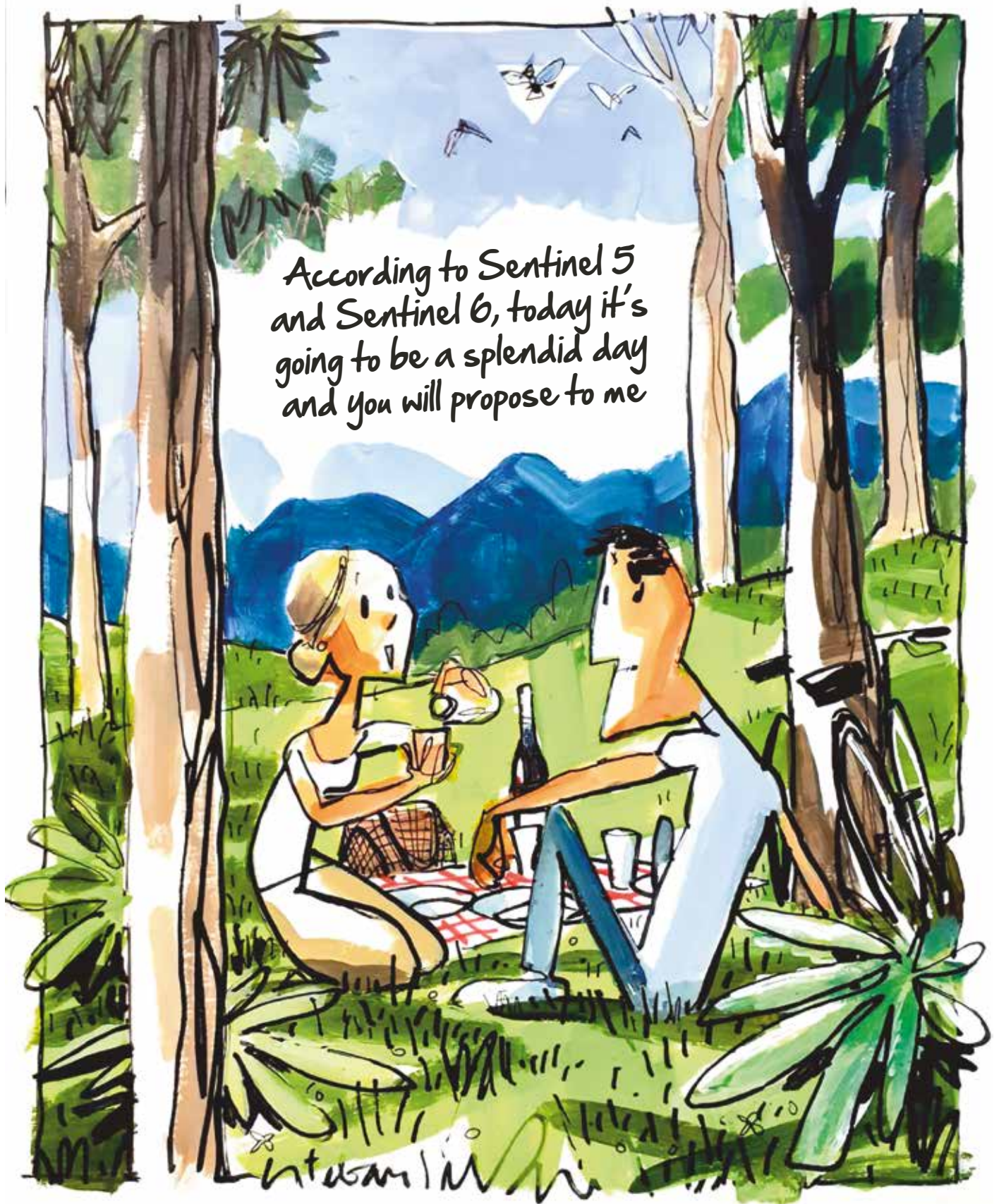
Which is why Innocenti proposes that future satellites meet the requirement of being designed to be removed at a later time. This could contribute toward reducing the generation of space debris, but Innocenti pointed out that it is still necessary to “remove larger objects from the most frequent orbits to avoid collisions and prevent the generation of many small objects that pose a threat.”

The Director of the International Astronomical Union (IAU), Thomas Schilcknecht, discussed another aspect of the problem that is related to what is called the “right to a clear sky” and explained that the view of a clear sky is a human heritage, and he added that just by observing it we “can gain knowledge about the origin of the universe.”

TEXT: Antonio Tovar



According to Sentinel 5
and Sentinel 6, today it's
going to be a splendid day
and you will propose to me





SOFTWARE-DEFINED BROADBAND TRANSCEIVERS

DAS Photonics was awarded the ESA contract for the “Demonstration of an electro-phonic modem for ground segment applications,” by which it will develop a transceiver for software-defined broadband SATCOM applications. The core of this transceiver is based on photonic sampling technologies, enabling the digitalization and synthesis of RF signals directly in digital form. The solution to be developed will be the first demonstration of a complete transceiver.

GMV CONSOLIDATES ITS LEADERSHIP IN THE MANAGEMENT

As part of the H2020 program, the European Commission has awarded project EUSTM to a consortium led by GMV. The purpose of this project is to develop future European capabilities in the field of space traffic management (STM). In addition to leading and coordinating the consortium, GMV also manages the work packages (WP) related to SST (Space Surveillance and Tracking) technologies applicable to STM.



SENER AEROSPACIAL DEVELOPS THE NAVIGA NAVIGATION UNIT FOR THE VEGA-C LAUNCH VEHICLE

SENER Aeroespacial has entered into a contract with AVIO for phases C/D of the navigation unit of the VEGA-C launch vehicle –VNE (Vega-C Navigation Equipment)– after successfully completing phases A (feasibility study) and B (preliminary design). Phase C comprises the development of the specified design, and Phase D involves the qualification and delivery of the first flight model, expected for 2023. Afterward, the company expects to mass-produce this unit.

©ESA/J.Huart



ELECNOR-DEIMOS COMMISSIONED A SPACE VEHICLE FOR THE COMET-INTERCEPTOR MISSION

The ESA-JAXA joint mission, which is the first one to study a pristine comet, is comprised of a mothership and two probes that will perform simultaneous observations of a comet as it begins its journey toward the inner Solar System. Deimos Satellite Systems in Puertollano

will be in charge of the entire design of the secondary probe as part of one of two contracts awarded by the ESA for the design of the mission, which is expected to launch in 2028.



CRISALANDS CONTRACTS FOR 40 M€ IN THREE COPERNICUS EXPANSION MISSIONS

We will supply Power control & Distribution Units (PCDU) for satellites of the future, LSTM and CO2M missions. In addition, for CO2M we will also supply the Payload Power Distribution Unit (PPDU) and for LSTM, the Front-End Electronics (FEE) and Cryocooler Electronics (CCE) units, as well as the Instrument Control Unit's (ICU) Processor Module.



HISPASAT TAKES CHARGE OF THE SIGNAL MANAGEMENT AND TRANSPORT BUSINESS OF MEDIA NETWORKS LATINOAMÉRICA

HISPASAT has entered into an agreement to take charge of signal management and transport for Media Networks Latinoamérica, a subsidiary of Grupo Telefónica linked to the media industry. Thanks to this agreement, HISPASAT strengthens its position as a leading operator in South America for services related to satellite television.



HISDESAT OFFERS HIGH-QUALITY MARITIME AIS DATA

Due to the significant increase in commercial sea freight and global vessel tracking, the demand for AIS data has become essential for many governments and industries around the world. With its exactAIS Platinum Plus tool, Hisdesat integrates satellite and land-based AIS data, boosting the capabilities for the detection of vessels at ports and high-density regions, in addition to offering real-time location and identification data services.



AIRBUS GETAFE: THE THIRD-LARGEST AEROSPACE FACILITY IN EUROPE

In April, His Majesty the King led the inauguration of the new Campus Futura of Airbus Getafe. Its evolution allows Spain to stay at the forefront of the world's aerospace sector.

The new Pedro Duque building is located next to the Campus – named in honor of the first Spanish astronaut – and houses all space-related activities, including Ariane-6.

These additions to Airbus Getafe have turned the plant into the third-largest aerospace facility in Europe after Toulouse and Hamburg.



ADVANCES IN TECNOBIT DISTRIBUTED ELECTRONICS FOR SPAINSAT NG

TECNOBIT – Grupo Oesía was awarded the distributed electronics contract for the Spainsat NG active antenna in 2020. It has been working since then, and the RFCB boards and DL PDR have been successfully passed, and the qualifying engineering models (EM +) have been delivered on time. These electronics are manufactured at the new production zone of the industrial facility of Veldepeñas focused on Space Electronics.



INSTER PRESENTS ITS AERONAUTICAL BROADBAND SATELLITE TERMINAL PORTFOLIO TO JUPROAM

The Aerial Platform Work Group of the Armament and Materiel Program Board (JUPROAM) has held a working session at the facilities of INSTER focused on the new developments of the company in regard to onboard X and Ka band satcom terminals. Real-world tests of the functionality offered by these national technological developments aboard a test vehicle were performed as part of the visit.

GALILEO INFORMATION CENTRE IN MEXICO, CENTRAL AMERICA AND THE CARIBBEAN

Telespazio Ibérica will lead the new Galileo Information Centre for Mexico, Central America and the Caribbean, co-financed by DG DEFIS. During a 36-month period, it will assist in the space outreach efforts of the European Commission to promote the EU Space Programs and their use in the Latin American market. It will increase the visibility of European satellite navigation and foster the cooperation in Galileo and EGNOS between the European Union and regional stakeholders.



PREDICTION OF ELECTRICAL BEHAVIOR OF ELECTRONIC DEVICES WHEN EXPOSED TO RADIATION

Alter Technology and the National Center of Accelerators (CNA) are creating a database with all available information about radiation tests on electronic components. The purpose of the project (PRECEDER) is to predict the behavior of electronic devices when exposed to radiation via Machine Learning, by analyzing the structure of irradiation testing result sets – mainly those used in space projects – to offer robust solutions for New Space.



INVENTIA PARTICIPATES IN THE TESTING CAMPAIGN OF THE SAS ANTENNA FOR METOP-SG

After years of efforts to develop jointly with AIRBUS the contract that INVENTIA was awarded by the ESA in 2016 for the provision of the SCA MGSE assembly, integration and testing, AIRBUS Madrid completed the integration of the MID antenna and passed the testing campaign at the DTU's facilities in Denmark, with the antenna mounted on the RF Test Adapter and a mock-up of the satellite developed by INVENTIA.



BRTA PILOTU

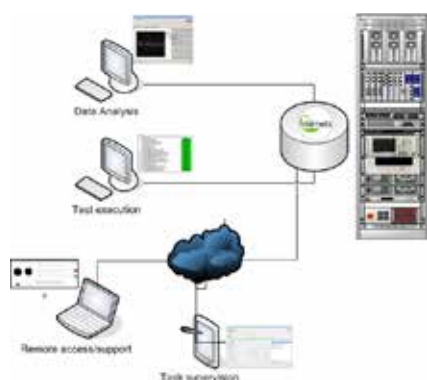
In 2019, the Basque Government presented BRTA, Scientific-Technological Consortium of Euskadi, of which TECNALIA is a part of alongside other 15 centers. The purpose of BRTA is to address the industrial challenges of Euskadi and compete with major corporations that are international leaders in technological research & development. BRTA PILOTU was created as part of the initiative to add capabilities in regard to product development and space application. The group has presented initiatives for scientific instruments, satellite subsystems and enabling technologies for the Basque space industry.



AEROSPACE VIRTUAL TESTING

Orbital Critical Systems develops the FAVIT project, financed by Clean Sky 2. Its main objective is the development of proposals to improve aerospace standards for the implementation of Virtual Testing for system certification.

This study involves the interaction with the main stakeholders of the industry and certifying bodies, so that there is a consensus in regard to the obtained results. FAVIT will improve and accelerate design and verification processes based on the state of the art of the Virtual Testing technology.



INTEGRASYS HAS DEVELOPED APIS FOR ALL OF ITS SATELLITE PRODUCT PORTFOLIO

Integrasys has developed effective APIs for all of its product range, including Beam Budget (technology for link budget calculation), Satmotion (focused on automated network deployment), Alusat (network maintenance system) and Vectorsat (detector of interferences and Calibration and RF System).

The main goal of this software company is to automate the design, deployment, monitoring and maintenance of the network, offering clients the most effective technologies.



DLR AWARDS GTD A CONTRACT FOR THE DEVELOPMENT OF A MEASUREMENT COMMAND & CONTROL SYSTEM FOR THE P3.2 TESTING FACILITY IN LAMPOLDSHAUSEN

GTD has proposed a 100% reliable solution based on standard and robust industrial products. In this way, GTD can guarantee long-term maintainability, reducing costs and risks during the development and integration of the system. The main challenge is to minimize the impact in the use of the facilities, improving performance and test result availability for end customers and users.



THALES ALENIA SPACE WILL PLAY AN ESSENTIAL PART IN GALILEO SECOND GENERATION

Thales Alenia Space will supply the first six satellites of Galileo Second Generation, which will be placed into orbit in late 2024. Leaning on innovative technologies, these satellites will increase the precision of the Galileo system, as well as the robustness against interferences and jamming, and the resilience of signals. Thales Alenia Space in Space will play a key part by supplying several subsystems and critical equipment for the six satellites.



PLD SPACE EXPANDS ITS WORK TEAM

Since November, this company from Elche has added over twenty new members to work on the MIURA 1 and MIURA 5 developments. The plan for the remainder of FY2021 is to continue expanding its staff with different professional profiles: engineers, technicians and administrative staff. All open positions can be seen at: <https://www.pldspace.com/es/empleo>



ENAGÁS AND SEPIDES JOIN SATLANTIS' CAPITAL

Enagás led a capital increase of €14M in SATLANTIS, a leader of Earth observation through the use of microsatellites.

This investment was accompanied by SEPIDES, enabling SEPI Group to strengthen its presence in the space sector, entering the world of New Space. SATLANTIS will provide a very high precision methane emission measuring service to address the needs of the Oil&Gas industry, in the face of new European emissions regulations for the sector.

MAGAZINE
PRO ESPACIO

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issue

Mars EXPLORATION

and all you need to know about the
Spanish space sector

TEDAE
Defensa, Seguridad, Aeronáutica y Espacio

№ 42 | MAY | 2015

MAGAZINE

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Taking the
pulse of

The planet

Temperature in Real Time
LSTM Mission: Earth's Surface

ANTENNAS
A MATTER OF
NEWSPACE

INTERVIEW
JUAN DE DALMAU
INTERNATIONAL SPACE UNIVERSITY