

CONNECTED

A MAGAZINE BY  **LEMO**

JULY 2014 N°1

Space for All by Young Swiss Company

LEMO's Roaring Contribution to Motorsports

Meet Nextage, the Robot Factory Worker





There are thousands of technical magazines in the market. So why should LEMO launch one of its own? The first reason can be summed up in one single word: passion.

We are passionately interested in high technology and its applications, ceaselessly pushing back the limits of the human race, bringing into our everyday life what was mere science fiction when we were children full of dreams. CONNECTED pays tribute to the world of technology and to those who make it.

In this first issue you will discover for example a young Swiss company aiming to widen public access to space travel, a futuristic Japanese humanoid robot and Hungarian super e-bikes. All of them started off as slightly crazy projects, but have become reality thanks to passionate people.

The second reason for creating this magazine is YOU. We have been committed to offering you the best connectors and the best of services for almost 70 years. We wanted to give you something new, something personal. Something that materializes LEMO's quest for excellence. This "something" is now in front of you: a high-quality technological magazine, created just for you.

Welcome to CONNECTED!

Alexandre Pesci
Corporate CEO
LEMO

PASCAL JAUSSE
CEO, SWISS SPACE SYSTEMS

“Technology is not an end in itself. It is merely a tool that makes it possible for man to compensate for his weaknesses, to make his dreams come true and to progress.”

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EDITORIAL BOARD:
Alexandre Pesci, Raymond Voillat,
Serge Buechli, Judit Hollos Spoerli,
Richard Thomas, Essencedesign

ENGLISH TRANSLATIONS:
Judit Hollos Spoerli, Patricia Paredero

GRAPHIC DESIGN:
Essencedesign



1.

3. NETFLIX LAUNCHES A MAJOR OFFENSIVE IN EUROPE

Netflix is about to radically change the European TV series and film distribution market. Already present in England, Scandinavia and the Netherlands, the US giant will go a step further to conquer Germany, France, Belgium, Luxembourg, Austria and Switzerland. Netflix (48 million subscribers, a quarter of them in Europe) have achieved a turnover of 4.3 billion dollars in 2013 (+22%). The announcement of this new expansion has caused legitimate concern among the distributors in these countries.

4. A GREAT YEAR FOR THE CONNECTOR INDUSTRY

According to Connector Supplier, 2014 will be a good year for growth and profits will be excellent. The first three months of 2014 suggest the full year is going to result in high single-digit growth. This is thanks to a rising demand, stable prices and lower raw material costs (including the three big materials that make up a connector: precious metals, copper and plastics).

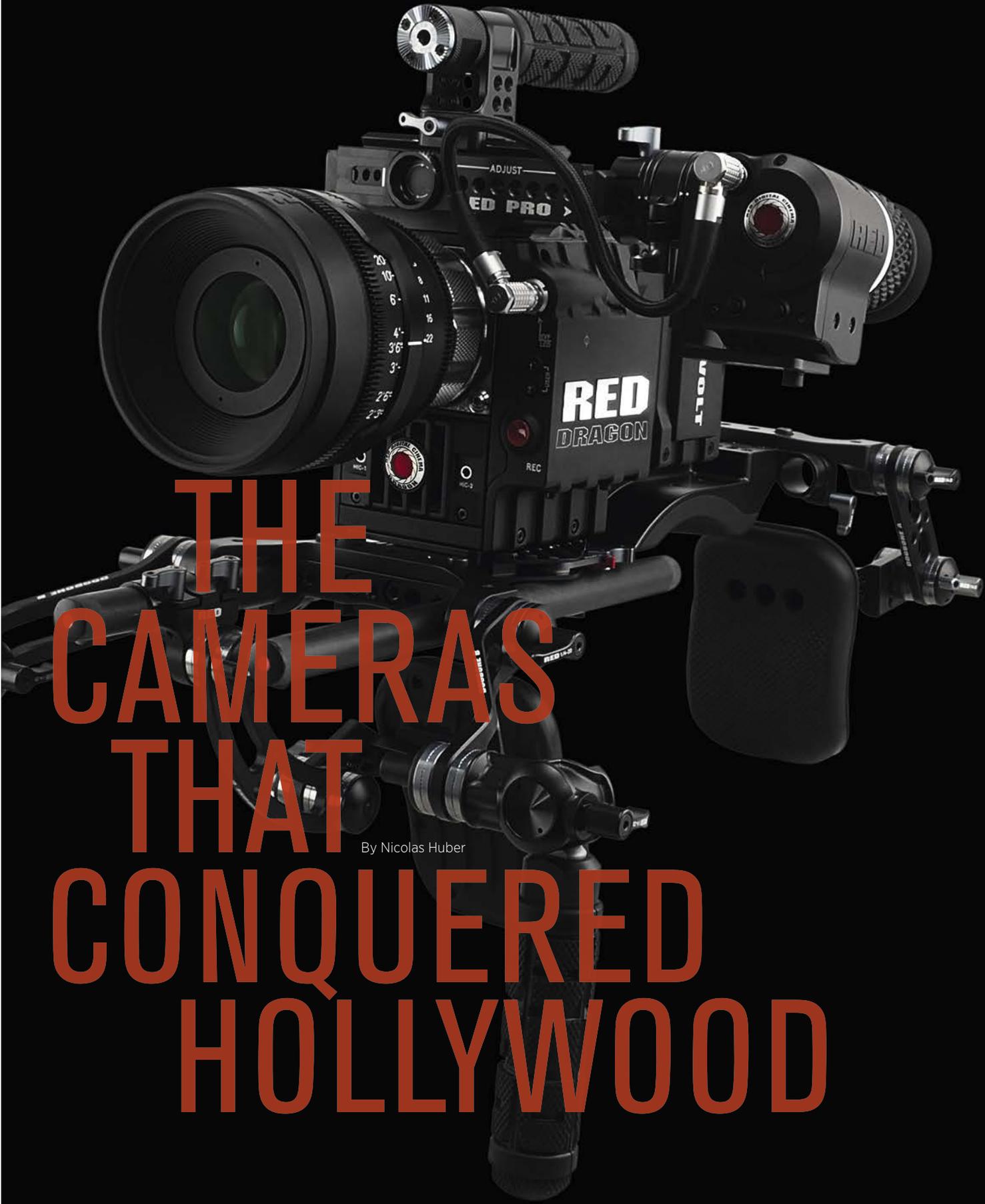
Source: Bishop & Associates

5. COMING UP : AROMATIC MOBILE PHONE

The oPhone has just been launched on the crowdfunding Indiegogo platform and it could be available as of 2015. Why is it so special? It will make it possible to send scented sms messages. The sender will use the web or a scent-tagging application, to compose a scent and then send it. The recipient's oPhone will recompose the scent and it will diffuse it in the form of small vapour puffs. It will be possible to exchange about 300,000 different scents. The oPhone was designed by a Harvard professor and his students.

2.





THE CAMERAS THAT CONQUERED HOLLYWOOD

By Nicolas Huber

From nowhere to everywhere in only 8 years, this is the amazing performance of Red Digital Cinema in the world of image acquisition. Their cameras – the first widely adopted digital camera to shoot in 4K – have speeded up Hollywood’s transition to being predominantly all-digital. The Californians are now preparing to take on the broadcast world as well. Red is a prestigious customer for LEMO.

In 2007 Apple had taken by surprise the mobile phone giants, by launching a revolutionary Smartphone. The same year, in a more discreet way, but just as disruptive, the young company Red Digital Cinema launched a digital movie camera that took the movie giants by complete surprise. Hollywood has been forever changed.

From a technological point of view, 2007 is already well in the past. At that time, digital movie cameras – called “HD” maybe slightly too early – recorded pictures in 1080-line resolution – an image quality way behind the classic 35mm. Enters the Red One. With its MYSTERIUM sensor, it records in 4096-line resolution. This was the first 4K digital camera to gain traction in the camera community, years before 4K became a new high definition standard. Moreover, the camera body cost less than 20,000 dollars. What’s even more important for Hollywood: image quality, thanks to their proprietary REDCODE technology, bridged the gap between digital and film.

Four times superior resolution than other digital cameras. Less than a quarter of the price of the cameras being used in Hollywood at that point. The Red One was a technological UFO that no one saw coming.

However, this UFO did not come from nowhere. The founder of Red Digital Cinema is Jim Jannard, also the founder of the famous Oakley sunglasses brand. His relationship with the cinema world is more obvious than at a first glance. A passionate and experienced camera man himself, Jannard carries on the same quest with Red as with Oakley: to get the best possible image to the brain. He started Red off with a blank sheet to create a worthy successor to film cameras. The Red One was the first master stroke.

The new camera went on to convince Hollywood enthusiasts, who, like Jannard, thought that HD was not good enough. Steven Soderbergh, who filmed “Che” with beta versions of RED ONE and Peter Jackson, who produced “District 9” – also shot on RED ONE – are two of the very first fans.

Since then, Red has never let off the gas pedal. They have introduced new sensors: the 5K MYSTERIUM-X, then 6K DRAGON, offering an even better resolution, a larger dynamic range and colour depth. They have also launched new and modular camera models: Scarlet and Epic.

Today, Red Digital Cinema’s top-end model is the Red Epic Dragon. Fitted with a 6144x3160 sensor, it records at 6K resolution, in 100 images per second. To please camera men who like to film by hand, there even exists a variant made of magnesium and carbon fibre, weighing 500 grams less than the aluminium version.

Red now employs a staff of about 400, which is a lot less than Sony or Panasonic. In this case though, don’t believe the Hollywood taglines: size does NOT matter. In only eight years, Red Digital has in fact evolved from a start-up developing a camera project, to become a Hollywood reference for equipment.

Thousands of films have been made with Red Digital cameras. Blockbusters, such as “The Hobbit” trilogy, “The Great Gatsby”, “Prometheus”, but also – thanks to the affordable price – independent films, documentaries or even video clips.

By making a giant contribution to image definition and quality, while simultaneously reducing costs, Red has sped up Hollywood’s transition to a mostly digital landscape and does not intend to stop there.



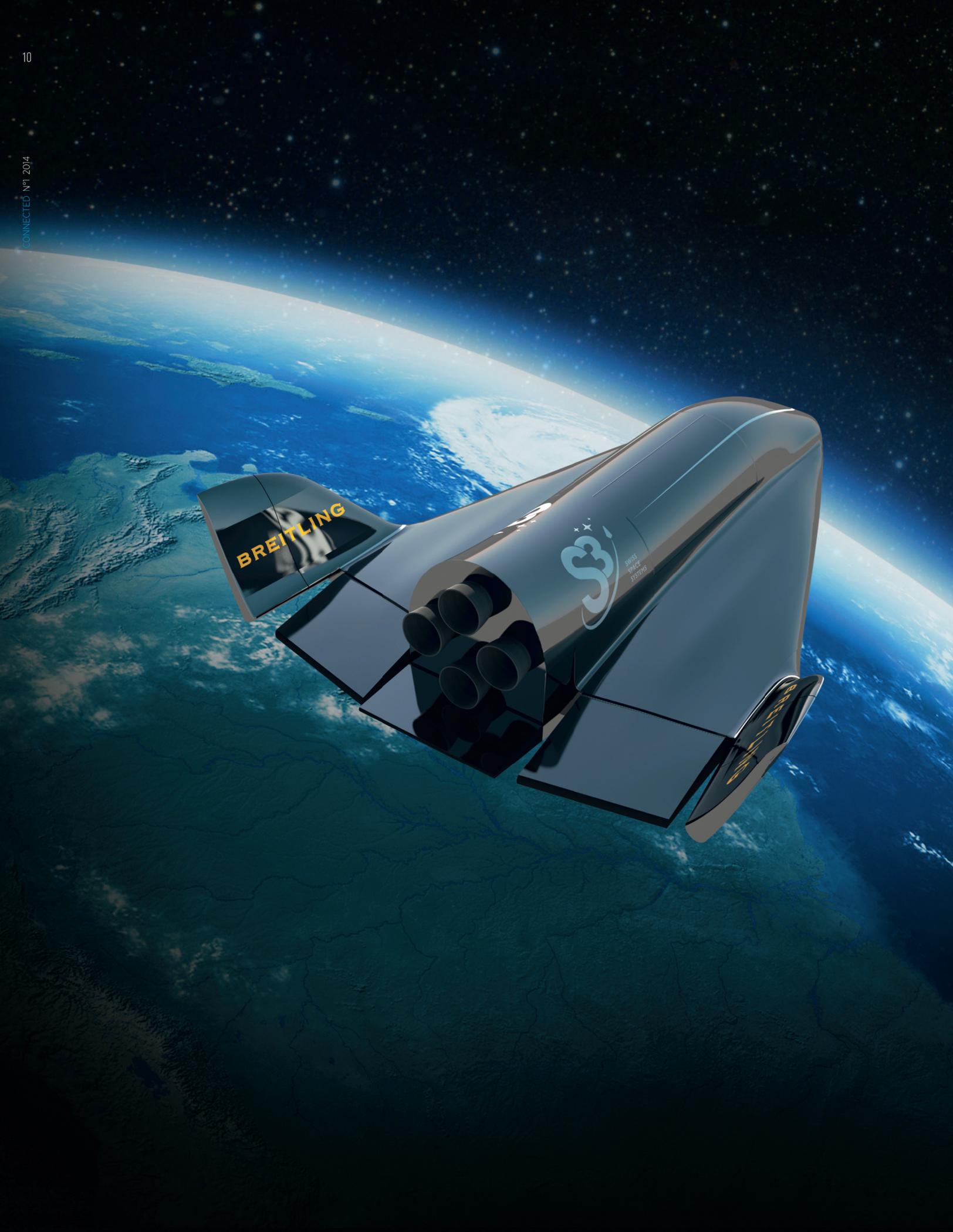
After cinema, Red Digital is now preparing to enter the world of broadcast. At this year’s NAB, (National Association of Broadcasters) exhibition, the company has announced their Red 4K Broadcast Module. It will allow users to stream real-time 4K video off their Epic or Scarlet Dragon cameras at up to 60FPS.

In search of perfection, Red works with the best component suppliers. For their connectors, they were looking for a company renowned for the quality and compatibility of its products. LEMO connectors have thus been fitted on Red cameras since the alpha versions of Red One.

The California-based company has selected the B Series in various models and sizes. They ensure the perfect connection of the Red camera body to its multiple accessories (motor-controlled camera lens controllers, power supply, viewers, etc.). LEMO has also developed an exclusive owner connector (a socket with 6 contacts) for Red.

The fact that such a high range and avant-garde company as Red has selected LEMO is already a prestigious recognition. The choice of B series LEMO connectors – a LEMO standard for 45 years – highlights just how much the quality and the precision of all its products counts for the Swiss manufacturer.

Since 2007 Red Digital’s competitors have of course brought out their own digital high resolution models – including in 4K – and less expensive than before. However, Red Digital still remains the leader. With them, LEMO is ready to *boldly go where no technology has gone before.*



A young Swiss company is aiming to widen public access to space travel. First for satellites, then for passengers. Their concept: to use existing systems. Their style: independence and discretion. Swiss Space Systems have already managed to convince major aerospace companies. This is just their first victory.

SPACE FOR ALL

By Nicolas Huber



“We are not interested in the current market for microsatellites. We are going to create new demand.”

A deafening roar: two McDonnell Douglas F/A-18 cut across the sky. Nothing unusual in this part of the Swiss countryside, halfway between Lake Geneva and the capital, Bern: it is here in Payerne that one of the two main airfields of the Swiss Army is situated. What's much more unusual is what is happening not far from the runways, in an ordinary building on the industrial estate.

Outside, only a discrete black plate indicates the owner of the premises: S3 – Swiss Space Systems. It is only when you arrive at the door, protected by a fingerprint recognition sensor that you realise that this place is out of the ordinary. The interior confirms your impression: minimalist and pure, with contemporary new furniture, photos of the space conquest, models of rockets and space shuttles and, just behind the reception, a huge 4 meter tagline “Space for all”. It is here, in this young start-up atmosphere that the staff of Swiss Space Systems is working. There are 65 today, projected to be a hundred by the end of 2015.

With a budget of 280 million dollars, S3 is a discreet Tom Thumb compared to the great and highly-publicised SpaceX, Virgin Galactic or Blue Origin owned by billionaires Elon Musk, Richard Branson and Jeff Bezos. Nevertheless, the Swiss company belongs to the same prestigious club – that of private investors in space travel. Moreover, S3 bravely announce their ambition: to become a global leader in microsatellite launches, no less. To reach their goal, S3 are developing their own unmanned space shuttle, SOAR. The 16 m wing-spanned spacecraft originates from various abandoned small shuttle projects (ESA's Hermes and NASA's X-38).

To date, the programme is running on time. The first commercial microsatellite launch is planned for 2018. By then Swiss Space System will have moved nearer to the military airfield, into a brand new spatioport built on the 26,000m² of land that they have just acquired in Payerne.

This small town with a population of 9,000 will thus become the S3 hub. Similar to what Toulouse has become for Airbus – on a smaller scale. This is where the shuttle will be assembled, the ground tests, flight preparation and maintenance carried out. From there SOAR will be transported to launch sites already reserved in Spain (Canary Islands), the United States (Florida, Colorado) and in Asia (Malaysia).

Wait a second... a spatioport, a space shuttle, satellite launches all over the world, and all that Made in Switzerland? When S3 was inaugurated in March 2013, the news was definitely met by surprise, even disbelief.



However, disbelief soon evaporated when the young founder and CEO Pascal Jaussi (unknown and not even a millionaire) introduced his colleagues. First of all, Professor Claude Nicollier, a Swiss national hero, the first (and only) Swiss to go into space. An astrophysicist and an ex-ESA (European Space Agency) astronaut, he has also taken part in several NASA space shuttle missions, namely maintenance operations on the Hubble space telescope. Does this make you think of Sandra Bullock in “Gravity”? Similar, but not fictional. Claude Nicollier is the president of S3, which is a moral and scientific guarantee: if he is on board, it means that the project is a serious one. Not forgetting the other 21 partners with impressive credentials. As for the material, the French Dassault Aviation, the English Meggitt, the Italian Thales Alenia Space, the Spanish Elecnor and many others. The scientific contributions are from Stanford University, Moscow State Technical University, the Von Karman Institute in Brussels, the EPFL (Swiss Federal Institute of Technology) in Lausanne and the European Space Agency. All of them are worldwide references.

The extraordinary combination of these various different partners is, according to Pascal Jaussi, the true innovation brought about by the small Swiss Space Systems.

“The Russians provide the best engines, the Americans the best in electronics, explains the CEO. We have selected the very best of worldwide aerospace. Despite the historically and diplomatically sensitive nature of these technologies: the Russians would not have shared them with the Americans and vice versa. However, they agree to do so with us.” For what reason? The “Swissness” of the startup, answers Pascal

Jaussi without hesitation. *“The image of neutrality, independence, stability and confidentiality of Switzerland. Each and everyone has brought his own dish to our big technological “buffet”, knowing that we will not ask for his recipe nor give it out to someone else.”* Moreover, Switzerland is not considered to be a competitor in the world of aerospace giants. Our country is the younger sibling, both stable and discreet, who is trusted by the others.



The combination of existing technologies – the initial concept of the startup (see interview on page 16) – gives a major advantage: Swiss Space Systems does not have to invent anything. This is cost saving and ensures additional reliability and time compared to those who have chosen to innovate, such as Larry Page (co-founder of Google, shareholder of Planetary Resources, who wants to extract platinum from asteroids). The real technological challenge for S3 is to integrate them. This mission is currently being accomplished in the “cathedral”.

The “cathedral” is the nickname for a room that is higher and more secure than the others. This is where the engineers and test pilots are brought together, their desks surrounding the empty space where the elements of the SOAR shuttle will soon be assembled.

Their mission is far from being simple. The multiple types of technology used are of various origins and from different eras. The Kuznetsov engines, the interior structure from Dassault Aviation or Sunaca’s outer structure were not designed to be put together. There will certainly be problems and unexpected difficulties, so it is to streamline development that those concerned are gathered in the “cathedral” within earshot of each other.

In spite of its nickname, this room is surprisingly ordinary. No hi-tech laboratory, no engineers in white coat and cap working in a cleanroom atmosphere devoid of the slightest speck of dust. The reason is contained in the name of the shuttle: an evocative acronym, though grammatically incorrect: SOAR for “sub-orbital aircraft reusable”. S3’s vehicle is more of an aircraft than a space shuttle. No lost hair will provoke accidental combustion on re-entering the atmosphere. Its assembly requires rather aeronautical mechanics – open air and patches of oil included.

So, how will a suborbital shuttle launch satellites into orbit? SOAR will be launched from 10 km altitude from the back of an Airbus space shuttle carrier. It will then climb to 80 km and free a small launcher that will place the satellite (or satellites) into orbit. The shuttle will then glide down and land on the spatioport runway. SOAR will be subject to maintenance before taking off again. The time frame will be much shorter than that of other launch methods.

The small launcher is the only non re-usable element of the system. For the first time, the Kuznetsov engines, fitted to the SOAR, shall not be sacrificed after one single use. The fact that the components are reusable to a large extent and that the fuel consumption is ten times less than for a classic launch, represent S3’s major asset. They will offer launches into orbit for 11.2 million dollars (less for scientific research), compared to a current cost of over 44 million dollars. For Pascal Jaussi, this is THE answer to those who doubt the economic viability of the project.

"Some tell me that the current market for micro-satellites is not huge. This is true but we are not interested in the current market, clarifies the CEO, we are going to create new demand." His business plan is based on a simple idea: "By reducing the launch cost by 75%, we are giving the possibility to a large number of applications to be re-activated. We also encourage the creation of new ones." The CEO enthusiastically quotes some examples: monitoring coastlines, fishing areas, the Amazon rainforest, pollution, pipelines, ice melting, tracking of vessels..."Satellites are modern "eyes" open to the reality of the Earth. Until now, they have been a privilege of the richest. We are going to give space access to developing countries, major companies and to the academic world."

2018 is still far away, but there are already a considerable number of bookings: between 40 and 50 satellites have been registered, among them are some of S3's partners. Once fully operational, the startup is planning to launch tens of micro-satellites per month. It is expecting a turnover exceeding 110 million dollars as of the first year.

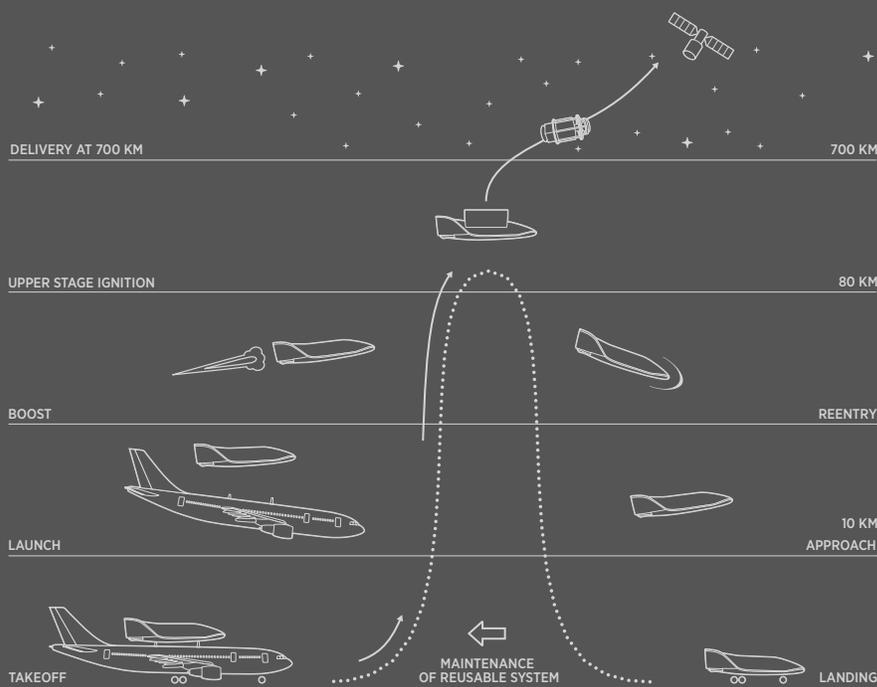
With its high frequency services, low costs and its reusable system, S3 evokes aviation rather than space, voluntarily. The already ambitious objective of becoming a global leader in small satellite launch, this is only the first step for the young enterprise. From 2020, the next step will be transporting passengers from one continent to another by suborbital flights. Not only billionaires, but ordinary passengers will also be able to travel from New York to Dubai in less than two hours.

S3 has already thought about the certifications required for such flights and their acquisition has been integrated from the start of the project.

Until then, the drone-shuttle will be transformed into a suborbital aircraft with pilots and a cabin for up to eight people designed by Thales Alenia Space. This transformation will be a new technical challenge. "However, only these costs will be included in our ticket prices and not the complete development of the shuttle", adds Pascal Jaussi. It makes one think about Richard Branson and his 200,000 dollar tickets for a seat on SpaceShipTwo.

After launching microsatellites, suborbital flights will be a new way for S3 to open space to all. If everything goes to plan, the company may well contribute to revolutionising our vision of civil aviation. |

LAUNCHING SMALL SATELLITES FOR 25% OF THE NORMAL COST





“WE HAVE
PROVEN
THAT OUR
PROJECT WAS
TECHNICALLY
VIABLE”

Exclusive interview with Pascal Jaussi, founder and CEO of Swiss Space Systems. An engineer and test pilot, passionately interested in aerospace, this man is aiming at widening access to space by all means.

How did the idea of the SOAR shuttle and Swiss Space Systems begin?

I joined Professor Claude Nicollier's team at the EPFL* Swiss Space Center in 2005. The study programme focused on reusing the Hermes shuttle, a project that had been abandoned by ESA in 1992, for passenger transport. It was a purely theoretical project, students working on one aspect over six months. I stayed on and four years later, I started to imagine how an industrial implementation could be possible. Since it was not possible for the EPFL, I continued to work on it myself. It took three years.

Three years to move from theory to practice?

To progress from pure research to preliminary industrial implementation: acquiring knowledge about the systems, industrial relations, searching for partners... With one strict prerequisite: not to reinvent the wheel, but to use existing systems for the shuttle, the launcher and the rest.

How did you then convince the aerospace giants?

By starting “at the bottom”, through direct discussions with engineers – namely those involved in the Hermes project – who have developed the systems that I was interested in. I asked them if their technology could work for my project...

And if it did?

Then we could go and talk about it with their boss. Then with finance people (what costs, what profits?), about communication (risks and advantages for the brand?), about the legal aspects (insurance, contracts?). Once all the lights turned green, the CEO could give us his approval!

So you “simply” had to do the same for all the other systems...

Exactly: the landing gear, the engines, the control systems, etc. For all the systems! The hardest was to do them all simultaneously. Each partner, before agreeing, wanted to ensure that the others would do likewise and that the project would succeed. “Dassault will do this? Then I’m on board!” This is how the project moved forward.

What is S3’s current network?

We have 21 partners, the best in their field – Dassault Aviation, Meggit, Thalès Alenia, Sonaca, ESA, Stanford University. Everyone joined the project for various reasons and with various contributions: financing, hardware, engineers and know-how. One common goal: to make money. This is the main difference between modern privatised space conquest and “classic” space conquest, which was State-financed. This is all about business: the partners see S3 as a European mini-SpaceX and they find it financially interesting to come on board with us. So we have developed 21 different win-win situations.

All space conquest projects are extremely complex and one small detail can ruin it all.

Do you ever think about failure?

Our project is not based on inventions, which would be uncertain, lengthy and much more expensive. We use existing technologies that are regularly in space and have been developed by the best. Thus, there is limited risk. There was some scepticism when we started, but now, 16 months later, no one doubts about the feasibility of our project. We have proven to the specialists that we are technically capable of doing it.

Beyond the scepticism about seeing a small company like S3 build its own shuttle, there has also been a keen interest. Space conquest is still fascinating...

At last, our generation has got its own space conquest! Our parents had their own. We grew up with the images of “Star Wars” and science fiction films... but flying cars have not yet emerged and American space shuttles had to come to a halt. Since then, nothing important has happened. Today, thanks to a number of private projects, the adventure goes on, together with passion.

How do you explain this passion?

I think it’s innate. The dream of flying, of soaring, of escaping gravity... Space is really the last frontier. The last of vast expanses that have always inspired man’s urge to travel. There it is, permanently above us, we just can’t ignore it!

Space is often a childhood dream...

Yes, it is and current projects can make it come true, so obviously they inspire us. The depth and intensity of job applications received by S3 is simply magic: I’m sure that no one has ever written such words to tell about their inspiration to become a banker or a pharmacist!

Is this where your philosophy “Space for All” comes from?

Everything S3 does goes in that direction. We give small countries and major companies access to satellites by reducing launch costs by 75 percent; we propose zero gravity flights (see article on page 18) with excellent payment terms; we wish to share knowledge about space, so we are proposing Space Days to the general public, from 6 to 76, as well as seminars for scientists. We are not doing this just to make people go “physically” into space, but also to make the idea of space more accessible and part of our everyday lives. |

* The EPFL in Lausanne is one of the two world renowned Swiss Federal Schools of Technology. Claude Niccolier is a Swiss astrophysicist, ex-astronaut for the European Space Agency.

Pascal Jaussi, a life in the sky

Born in 1976 in Morocco, Pascal Jaussi has always aimed at the sky. The time he spent travelling with his parents gave him a taste for flying from an early age. As a child, he started making model aircraft, interested in the whole process, from designing to flying – a global approach that he has always kept. On his 18th birthday, he was at last able to take his first flying lesson on a glider. Four months later, he was flying solo. He didn’t have his driver’s licence yet, when he got his airline pilot’s licence – why drive when you can fly?

The sudden bankruptcy of Swissair in October 2001 cut short his first professional choice. He then returned towards research – he would never stop studying in parallel with his jobs.

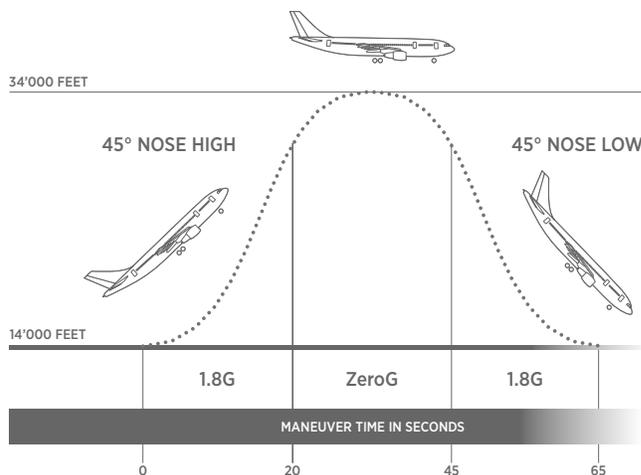
BSc Mechanical Engineering, MSc System Engineering, Test System Course, Chief of Operation Air Force Base are all part of his academic background. He has also spent eight years as a test pilot engineer for the Swiss Air force. He created the company Swiss Space Systems in November 2012, officially inaugurated in March 2013.

Pascal Jaussi is married to an airline pilot and father to an eight-month-old daughter, whom he would like to take on a zero gravity flight, before she can walk: “It would be a nice way of representing future generations, wouldn’t it?”

8000 TICKETS TO ZERO GRAVITY

Have you always been dreaming of floating around like an astronaut? Swiss Space Systems proposes this rare experience, through a fairly original advertising campaign: its modified and certified zero gravity airbus, the one that will transport the SOAR shuttle, will embark on a world tour in 2015 proposing zero G flights in 20 countries. With prices starting at under 2000 euros, S3 claims to be three times cheaper than other organizations proposing such an experience. The preliminary registrations were launched at the end of May and response has been extremely positive with several hundreds of tickets already sold.

The flights will take about an hour and a half. They will make about fifteen parabolas, each ensuring 20 to 25 seconds of microgravity. All together five and a half minutes of being weightless. Far from the experience of ISS astronauts, but doubtless the closest average people can get.



For its tour from January to November, S3 will completely refurbish its aircraft. Keeping up its image close to airline companies, S3 will propose three "classes". At the rear of the aircraft, the "Party" zone: 14.5 m long for 44 passengers (1,990 euros per ticket); in the middle, the "Premium" zone: 10 m for 24 passengers, who will receive an exclusive Breitling chronograph and their own flight uniform (5,000 euros per ticket). At the front, a VIP space to be booked for 50,000 euros: 9 m long for 1 to 12 people (who will of course also receive their Breitling and uniform).

The passengers must be at least 8 years old (and accompanied by a legal representative up to the age of 14). A number of medical conditions must be fulfilled and passengers must sign a form ensuring that they are allowed to fly.

The number of flights in each city has not yet been established: this will depend on the demand. According to S3, all agreements with the airports are almost finalized. *"In case one location should be cancelled, we shall find another and take our passengers there."* assures Grégoire Loretan, communication manager at S3. The young company seems confident that the tour will be a success: *"Our prices are well below others for a similar experience. This will also be the first time that these flights will be proposed to the Middle-Eastern and Asian public."*

Obviously, this tour is a massive advertising campaign and the totally black airbus will certainly not be missed. It will also bring profit that will pay for the SOAR shuttle launcher's operational costs. *"This tour also fits in perfectly with our philosophy: opening up space and its sensations to the largest possible number of people"*, adds Grégoire Loretan.

The flights will also have a scientific role, since the hold will be available for microgravity experiments. Several S3 partners and customers have already booked flights for this purpose. |

Information and preliminary registration:
zerog.s-3.ch



THE HEART OF THE RACE

By Renzo Monti



Formula 1 racing, 24 Hours of Le Mans and M for Motorsports... The M series connectors were designed to be used in the harshest environments. How did the extraordinary success of these new high quality connectors come about? Their designer, Billy Barbey, LEMO's R&D and Product Support Manager, will answer.

Designed for withstanding operating temperatures from -55 to +200°C, for resistance to the most violent vibrations and shocks as well as to oil and hydrocarbon attack, the LEMO M series connectors were made for hard life. Beyond their impressive ruggedness, the company's latest products signify a change of direction for LEMO: they are the first LEMO connectors using a ratchet screw coupling mechanism instead of the standard Push-Pull system invented by LEMO 67 years ago.

The M series originated after demonstrating an aircraft connector development to Formula One teams. The compact F series (F for Formula 1) had been in use by some race teams on sensors on the data logging system for many years. However, it became clear that if LEMO wanted to provide connectors for much higher vibration applications in the region of the engine, we needed to re-consider our connector design for the purpose. *"We were reminded from our discussions with customers that our designs for critical applications within F1 systems should be such that the possibility of a disconnection during a race must never be permitted. Whilst our F series connectors were being used in many applications on F1 cars – for control sensing and harness connection applications in environments ranging from the harsh temperature and vibration of the gearbox and brakes, to the cooler but otherwise demanding connection of the steering wheel – these connectors were not being used directly on the engines or other primary systems."*

Once the review had been completed, Billy Barbey set to work. *"I started by analyzing the competitors, then took a sheet of paper and started to make sketches. We just had to have a solution."* This solution was to be found through improving on the concept of MIL-C 38999 connectors, especially used in aeronautics. Their safety ratchet screw coupling system, with its characteristic clicking noise, makes all unintended disconnection impossible, however intense the vibrations

may be. LEMO's R&D manager was inspired by this technology and worked hard to make it even more reliable as well as much smaller.

After a long period of development, numerous prototypes and iterations, the LEMO M series was born. It features an innovative highly secured coupling system which needs a much greater force to unscrew the connector from its socket than to mate it. This ensures resistance to the most intense vibrations.

The new connector also features an aluminium "Arctic Grip" option, with large external grooves. The reason is to facilitate handling with gloves during intervention in the extreme heat inside the engine bay of a Formula 1, or freezing temperatures typically in defence applications. The M series also offers up to 114 contacts inside the same or smaller volume than any other existing connector available on the market. The pin density is much higher than that which competitors can propose. The M series therefore reduces the number of connectors needed, which equals less cost, better reliability, significant space-saving and lighter weight.

With such performance, the M series soon became a success story, with major annual increases in sales since its launch. Today it is available in many different sizes, housings and contact options, including overmould and backshell fittings with power and fibre optic contacts, and also in USB version. The connector is also manufactured in brass for ships, ocean liners and other marine applications where extreme corrosion resistance is required.

However, whilst the M series is now used in many other industries that require compact, high performance interconnections, it has continued to be increasingly employed in the motorsport industry, the field which brought real success to this LEMO series.

The heart of a Formula 1 car is the Electronic Control Unit (ECU), an extremely expensive system where all electronics data are processed and distributed. Due to the significant space savings provided and the high performance of the contacts, the M Series has been adopted for use on the current version of the F1 ECU, with three size 5 connectors containing up to 114 contacts in a 30mm diameter shell being central to the unit.

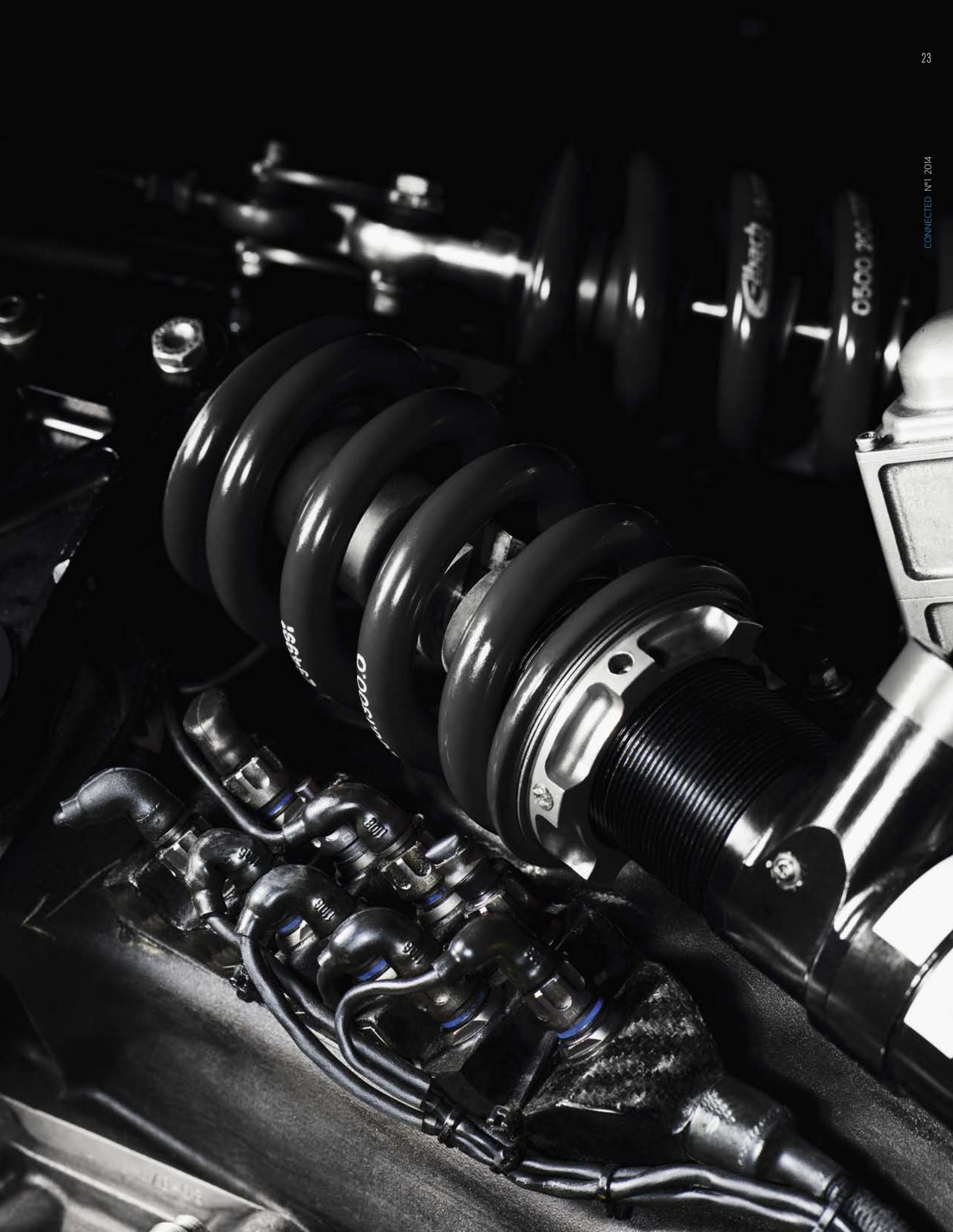
The FIA objective was to reduce costs for small teams by standardising on the ECU to be used, so they no longer needed to develop their own ECU. This decision meant that LEMO's high-tech connectors are now fitted on board all F1 cars. Three LEMO sockets on every ECU also implies three corresponding LEMO plugs to be connected, along with a range of the LEMO F series connectors on junction boxes and other parts of the system. Stocks of connectors for the F1 teams are held at LEMO in the UK due to many of the teams being based there, as well as at other LEMO locations around the globe in support of the motor racing industry.

This is not all: after the F1, LEMO is aiming at becoming the standard in another prestigious championship, the American NASCAR. In the meantime, the M series has passed a different test, in the legendary 24 Hours of Le Mans. The new Rebellion Racing and Oreca R-One cars are packed with M connectors. A full-scale endurance test and the beginning of new records for LEMO. |



Extreme temperatures,
violent vibrations and
shocks, hydrocarbon
attacks: LEMO M Series
connectors were made
for hard life.

A close-up, low-angle photograph of several LEMO M Series connectors. The connectors are dark, possibly black or dark grey, with metallic components. They are arranged in a cluster, with some showing the internal contact points and others showing the external housing. The lighting is dramatic, highlighting the textures and metallic surfaces against a dark background.



A HUMANOID ALONGSIDE WORKERS

By Alexis Malalan

A functional head, two skillfull solid arms, the Nextage robot joins human teams on production lines. As far as applications are concerned, the only limit is the imagination of Kawada Industries' customers.

Humanoid robots working alongside humans on production lines? The Japanese company Kawada Industries took this idea from science fiction to make it a reality. These robots have been designed to work in high-tech industry next to skilled workers. The latest model is called Nextage. Flexible and upgradable, in theory it has unlimited competence and capacity.

The story of Nextage began back in 1999, when Professor Hirochika Inoue, a world famous robotics researcher, contacted Kawada Industries, a company specialized in construction and architectural design. The engineer was looking for an expert, highly qualified partner for developing a humanoid robot for his laboratory at Tokyo University.

The challenge was taken up with great success. After Hirochika Inoue retired from the university, he became an advisor to Kawada Industries and when a new company Kawada Robotics was formed in April 2013, he was appointed Chief Technology Officer.

Among the models created by Kawada Robotics, there is one that stands out. The aptly named Nextage has started a new era in robotics.

Nextage is certainly the skilled worker that production directors had always dreamt about. It is reliable, tireless, multi-tasking, extremely precise and operational on most industrial assembly lines. Fitted with four cameras and two articulated arms, Nextage can easily perform all sorts of cumbersome or tedious operations normally carried out by humans. Nextage is flexible, obviously capable of learning new movements and it easily adapts to any changes in a specific production method.

The most revolutionary aspect of Nextage is that it is the first robot to have been designed to work in the same environment as human operators. In Japan, it does not require any protection system, since it is considered perfectly safe, with no danger at all for its co-workers.

Today over a hundred Nextage robots are working day and night for a number of hi-tech Japanese companies, such as Glory, specialized in money handling machines, as well as Hitachi, the electronics giant.

Inspired by the success of its humanoid robots, Kawada Robotics have decided to further develop their capacities.

They have created Nextage Open, a platform operating on the principle of open source software. Thanks to Nextage Open, researchers can develop new applications and functions using an industry-proven robot.

Airbus is one of the major companies using the system. In Cadiz, Spain, the famous aircraft manufacturer is currently working on a robotics solution to optimize its assembly processes. A Nextage robot has joined the workshops last February and Airbus is working with the Spanish research company Tecnalía to find a way of fully implementing it into their production.

The technological evolution initiated by Nextage Open is in its early stages, but its potential is vast. By combining the performance of the Nextage robot with the industrial expertise of customers, Nextage Open provides robotics with the means of exploring an infinite number of applications. |



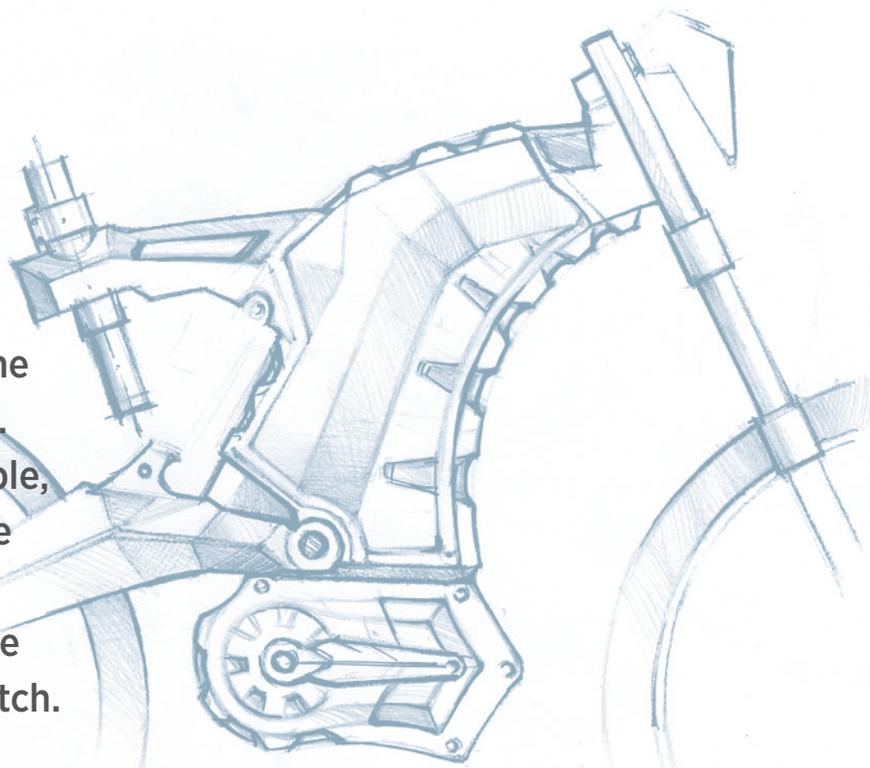
M55

HIGH PERFORMANCE LUXURY E-BIKES

By Brigitte Rebetz



There is a luxury niche market in every field. M55 is a good example, proposing handmade electric bikes with amazing performance and price tags to match. Beast, Terminus and Riviera are the first models of a range soon to be widened.



If you think that electric bikes are only for eccentrics and retirees, then you have never been overtaken by an M55. High-tech, powerful, equipped with components and material normally used in the automobile or aeronautics industry, these premium bikes are manufactured in Hungary by a handful of perfectionists.

When the Beast model was launched in 2010, the press was impressed by this extraordinary e-bike. A supreme vehicle with a sophisticated look, the Beast was called by some "the Ferrari of electric bikes". The comparison is valid for both its performance – almost 80 km per hour on the flat after very little pedalling – and its price tag at around 34,000 dollars. Even the Financial Times has commented on the Beast with appropriate words: "Money well spent".

Two models have followed the intrepid Beast, also produced in limited series.

The highly sophisticated Terminus (five different variants) can be customized. Its components are tailored to the specific size, weight and requirements of each customer. High quality material is

used: CNC machined aluminium 7075 (as in aeronautics), carbon fibre, titanium, hydraulic suspension and disc brakes, inspired by Formula 1. Depending on the motor and the batteries, the power of the engine can reach 2000 W, the speed of 72 km per hour and 80 km autonomy. Moreover, the bike is "intelligent": its motor, connected to a minute rotation sensor, measures pedalling intensity. If the calf muscles seem to be tired, the on-board computer adds just enough energy to maintain the speed.

How about the price of a Terminus? If you are asking this question, the bike is probably not for you: between 35,000 and 40,000 dollars, depending on the variants and selected options.

More discreet but rather chic, the Riviera model has adopted a more classic style with its leather accessories (handles, seat and saddle bag) handmade by the English specialist Brooks. This model, launched in 2013, has been designed to blend in elegantly with an urban environment. Thanks to a transmission belt which replaces the chain, it moves smoothly and silently. It is also a technological jewel: with a certified BionX hub motor, titanium frame, PVD coated parts after hand-polishing and light weight for an e-bike (17 kg). At the price of 13,000 dollars, it is also more affordable than the Terminus.

What will the future hold for the M55? There are many projects, boosted by a new investor. With his staff of ten, the CEO Richard Szöllösi is working on new e-bikes and reinventing parts. He is planning to add traditional bicycles to his product range, though it remains to be seen what "traditional" means for a luxury brand. Richard Szöllösi plans to increase distribution in Europe through his exclusive partners, but we can also find his creations in the United States and in Asia. The bikes will soon be available for online purchasing via the company's new website.

The demand for electric bikes has been increasing since 1998. In Europe alone, 700,000 e-bikes were sold in 2010 against 200,000 in 2007. When Richard Szöllösi started designing his first prototypes eight years ago, he was certainly on the right track. |



JAPAN

LEMO opened its Japanese subsidiary exactly 20 years ago. LEMO Japan has distinguished itself as a think tank, developing innovations that would become world references. A forerunner in fields as varied as HD television and the nuclear industry, the subsidiary is currently working on a new device which could potentially prevent a large number of road accidents.

Japan: a highly demanding market for technological innovation, with a strong growth potential and serving as the gateway to Asia. These three major assets led LEMO to open its subsidiary in 1994, after having been represented by a distributor for many years. Shortly afterwards the small team, which has now grown to a staff of 39, was contacted by the Japanese Television ARIB committee which was seeking to determine new standards for connectors and cables as part of their objective of switching Japan over to digital TV production and transmission completely.

This new technology was developing rapidly, particularly at Sony – who were already developing smaller and yet higher definition cameras. LEMO was invited to present proposals for a new connector to the committee, and after a series of demanding tests on the concept, along with requested modifications, the LEMO product was chosen as the basis for the new standard.

A total of 6 connector manufacturers had presented their options, but the LEMO connector was the only one that passed all the necessary tests. In 1998 the company launched, in cooperation with the Swiss and UK LEMO R&D teams, its 3K.93C connector which has since become the global standard in HD television and successfully installed in many prominent venues around the world.

The arrival of Akira Umemura at the head of LEMO Japan in 2001 marked the start of a new era. Until then mainly dedicated to import and sales, the subsidiary developed cable assembly through several Japanese subcontractors, whilst maintaining complete control of the management and quality processes. This control was further enhanced by creating a large local stock which increased responsiveness. Today cable assembly represents almost half of the company's business.

2001 also saw the launch of another major project regarding N series connectors. Developed with the Japanese national centre for nuclear waste recycling, these remote controlled connectors are now used worldwide.

LEMO Japan was developing fast and opened an office in Kobe in 2003. The company moved to a new 1000 m² building in the Mita area, the best in Tokyo, in 2012 with a grand opening ceremony to celebrate its 18 years of success in Japan. The activities of the subsidiary now include sales, administration, logistics and a technical department, as well as a mechanics workshop for prototype production.

Among its current projects, LEMO Japan is cooperating with several other companies on the development of a new application, involving both medical and automobile technology. Cardiovascular diseases are the second highest cause of mortality in Japan and road accidents due to medical incidents while driving are frequent. This device will detect warning signs from the driver through various measurements – cardiogram, blinking of the eyelids, blood oxygen, etc. and will provoke a call to emergency services with geolocalisation and vehicle immobilisation.

In the long term, for all types of applications, the company aims at extending its product range to complete connection solutions, including connectors, cables, enclosures and active components. |

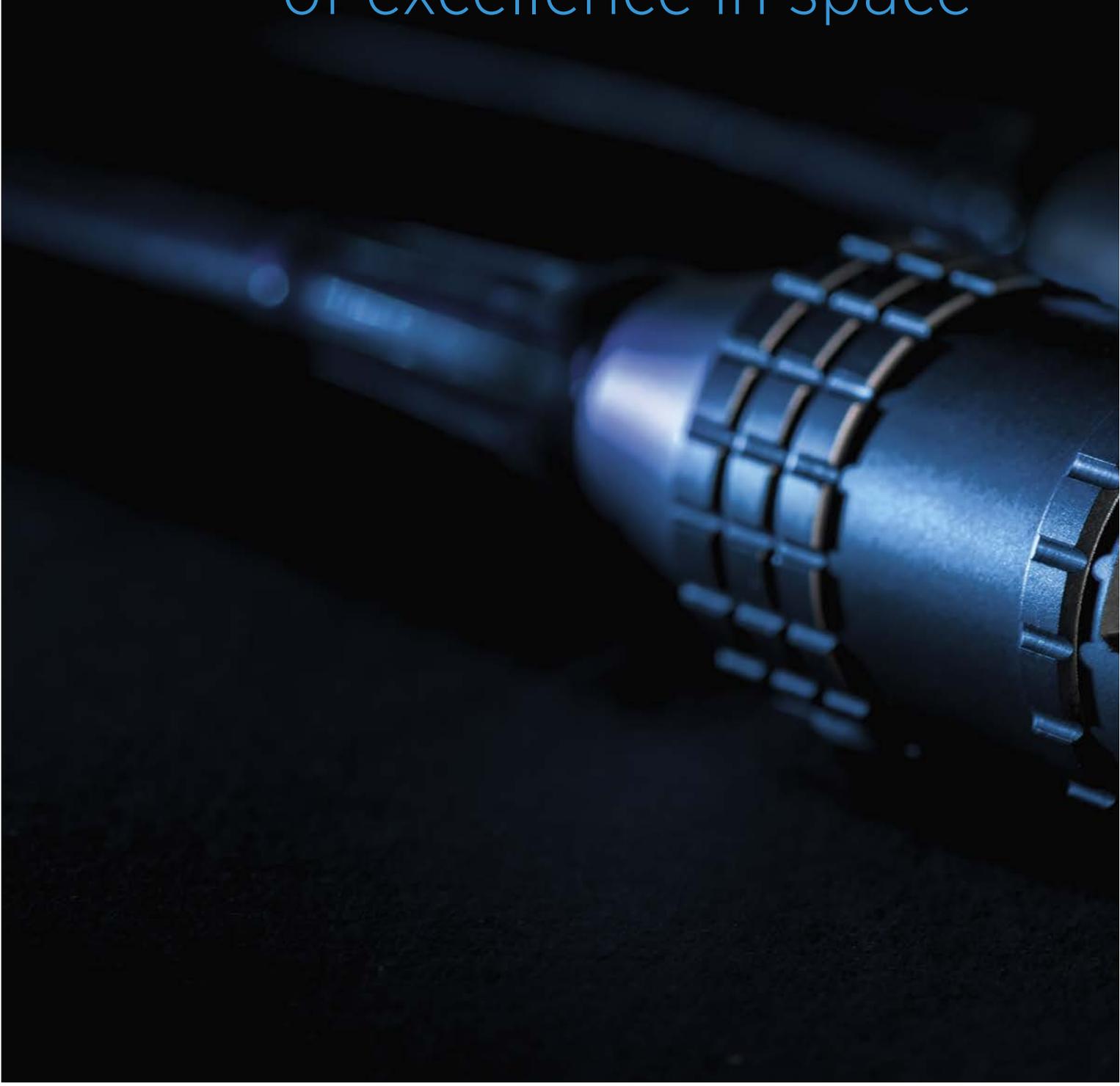
THE BIRTHPLACE OF FUTURE TECHNOLOGY

By Corine Fiechter





Over thirty years
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Tel: (+1 905) 889 56 78
info-canada@lemo.com

CHINA

LEMO ELECTRONICS
(SHANGHAI) CO.LTD
Tel: (+86 21) 5899 7721
cn.sales@lemo.com

DENMARK

LEMO DENMARK A/S
Tel: (+45) 45 20 44 00
info-dk@lemo.com

FRANCE

LEMO FRANCE SÀRL
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GERMANY

LEMO ELEKTRONIK GMBH
Tel: (+49 89) 42 77 03
info@lemo.de

HONG KONG

LEMO HONG KONG LTD
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HUNGARY

REDEL ELEKTRONIKA KFT
Tel: (+36 1) 421 47 10
info-hu@lemo.com

ITALY

LEMO ITALIA SRL
Tel: (+39 02) 66 71 10 46
sales.it@lemo.com

JAPAN

LEMO JAPAN LTD
Tel: (+81 3) 54 46 55 10
lemoinfo@lemo.co.jp

NETHERLANDS / BELGIUM

LEMO CONNECTORS BENELUX
Tel: (+31) 251 25 78 20
info@lemo.nl

NORWAY / ICELAND

LEMO NORWAY A/S
Tel: (+47) 22 91 70 40
info-no@lemo.com

SINGAPORE

LEMO ASIA PTE LTD
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sg.sales@lemo.com

SPAIN / PORTUGAL

IBERLEMO SAU
Tel: (+34 93) 860 44 20
info-es@lemo.com

SWEDEN / FINLAND

LEMO NORDIC AB
Tel: (+46 8) 635 60 60
info-se@lemo.com

SWITZERLAND

LEMO VERKAUF AG
Tel: (+41 41) 790 49 40
ch.sales@lemo.com

UNITED KINGDOM

LEMO UK LTD
Tel: (+44 1903) 23 45 43
lemouk@lemo.com

USA

LEMO USA Inc
Tel: (+1 707) 578 88 11
(+1 800) 444 53 66
info@lemousa.com

DISTRIBUTORS

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CZECH REPUBLIC

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Tel: (+420 2) 679 13973
mechatronic@volny.cz

GREECE

CALAVITIS S.A.
Tel: (+30 210) 7248 144
technical@calavitis.gr

INDIA

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ptinst@vsnl.com

ISRAEL

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NEW ZEALAND

CONNECTOR SYSTEMS
HOLDINGS LTD
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sales@connectorsystems.co.nz

PAKISTAN

ZEESHAN ELECTRONICS
Tel: (+92 51) 444 99 45
zain.sheikh@
zeeshanelectronics.com

POLAND

SEMICON
Tel: (+48) 22 615 64 31
info@semicon.com.pl

RUSSIA

SCS
Tel: (+7 495) 223-4638
(+7 495) 997-6067
info@lemo.ru

SOUTH AFRICA

JAYCOR INTERNATIONAL
(PTY) Ltd
Tel: +27 11 444 1039
jeff@jaycor.co.za

SOUTH KOREA

SUNG SHIN I&C CO., LTD
Tel: (+82 2) 2026 8350
mail@sung-shin.com

TAIWAN

EVERHARMONY ENTERPRISE INC
Tel: (+886 2) 27 07 00 69
ever.harmony@msa.hinet.net

TURKEY

MAK SAVUNMA LTD STI
Tel: (+90 312) 256 16 06
Tel: (+90 312) 257 13 06
sales@maksavunma.com

UKRAINE

U.B.I.
Tel: (+380 44) 568-5765
info@lemo.ua