SPACELINK

June 2002

THE NEWSLETTER OF
ESA'S TECHNOLOGY TRANSFER PROGRAMME

The transfer of technologies developed originally for space applications will receive a welcome push from the creation of a new incubator facility at ESA's research centre in The Netherlands.

European Space Incubators

boost technology transfer

The opportunities for creating innovative new businesses around products and services that exploit technologies originally developed for space has never been so great. The huge interest in spin-off companies and technology transfer has resulted in an extensive network of agencies and initiatives to support the efforts of entrepreneurs willing to take the necessary risks.

ESA has recently given a major thrust to this movement through the creation of the European Space Incubators Network (ESINET) and its pilot development - the European Space Incubator (ESI). The ESI will eventually be located in the Space Business Park near ESTEC – ESA's Research and Technology Centre at Noordwijk, in the Netherlands.

Despite the major potential, Europe suffers from a lack of investment capital available to support space-related start-ups. ESI will help to fill this gap – providing a one-stop shop with access to finance; office, workshop, and laboratory space; training; strategic partnerships and practical hands on assistance. ESI, and each ESINET member, will provide a gateway to the critical mass of support needed when starting up a space-technology-related business.

For more information about ESI and ESINET, contact Bruno Naulais, European Space Incubators Network Manager at ESA. Tel: +31 71 565 4711. E-mail: bruno.naulais@esa.int.

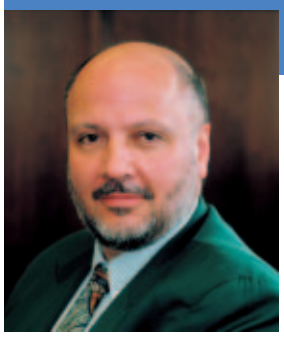
esa

Welcome to the first issue of Spacelink – giving you information and updates from ESA's Technology Transfer and Promotion Office. In addition to ESA TTP news, each issue will contain articles of general interest – such as best practice guidance and technologies available for licence and transfer. As Spacelink is being launched at Farnborough there is an emphasis in this issue on UK developments. Your comments and ideas for articles are invited - in the meantime we hope you enjoy reading Spacelink.

In this issue >>

12 Years of TT Success at ESA

Farnborough International 2002 is a perfect occasion to launch the first issue of Spacelink. After 12 years of operation, it is also an ideal moment to take stock of the achievements of ESA's Technology Transfer Programme.



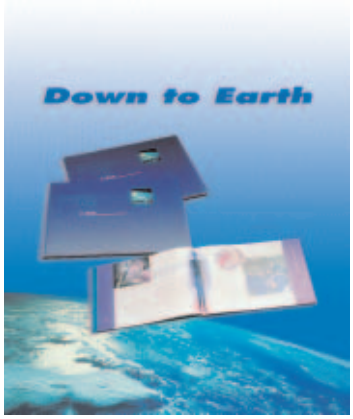
Pierre Brisson
Head of Technology Transfer and Promotion Office

Every year around 250 MEuro is invested in research and development by ESA. Technology Transfer (TT) is one of the routes through which we develop and demonstrate the economic and social benefits of this investment.

ESA's Technology Transfer Programme, the TTP, was established to encourage the wider use of technology developed within the European and Canadian communities and, in particular, to promote the transfer of innovative technology, concepts and methodology from space to non-space applications. Over a period of 12 years we have achieved some remarkable results. We have promoted over 600 technologies developed by European space companies and more than 150 technology receivers have concluded transfer agreements with space-technology donors through our network of TT brokers. The companies involved have generated additional turnover totalling more than 200 MEuro. In addition, nearly 2500 new jobs have been created and more than 20 new companies have been formed.

Sectors such as health care, automotive and transport, environmental protection, energy and so on have profited from the adoption of space technologies. Around fifty examples can be seen in our publication "Down to Earth" showing the ways in which space technology has affected our everyday lives.

Our goal is to increase the benefits of our investments in space even further. The launch of our European Space Incubators Network (see Front Page) is moving the TTP into an exciting new era.



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http://www.esa.int/technology/

In Brief.....

T4TECH service enhanced

The Internet assists technology transfer activity in many ways. One of the most innovative examples is the T4TECHonline service, developed by TTP Network Member D'Appolonia in Italy and supported by ESA and the EC. T4TECH provides consultancy on new technologies by making experts available to answer questions submitted by firms on their particular problems or issues. The portal also provides a wealth of information on new technologies and is now being enhanced as a virtual incubator, delivering focused assistance to new and young technology based businesses.

You can visit the portal at:

http://www.t4techonline.com

Companies and research organisations around the World are now waking up to the fact that their Intellectual Property is often a valuable and largely untapped resource.

BT's Brightstar Incubator, located at Adastral Park in Ipswich, UK.

ESA Heads the Exploitation Boom

Technology-based companies worldwide could be earning millions of Euros in extra revenue by commercialising their IP assets. Many companies and research organisations have large portfolios of patents – most often largely under-exploited and often costing significant sums in patent support fees. Smaller companies are also often unaware of the potential value of their intellectual capital.

In the USA – often seen as a leader in technology commercialisation – it has been estimated that companies are sitting on unused patents valued in excess of $115 billion, with more than 1 in 3 patents not being exploited.

The situation is changing, however. Pressure on core markets is forcing firms to consider proactive exploitation of their unused assets. In the UK, BT has 14,000 patents that it is starting to exploit through its own Corporate Venturing Initiative and through the Brightstar Incubator located near Ipswich. In a most recent initiative, Anglo-Dutch oil giant Shell has set up a Corporate Venture fund thought to be valued at 150 MEuro, and an incubator to help turn employees' ideas into viable business opportunities. Large European public research organisations such as the EU Joint Research Centre and CERN have also introduced IP exploitation strategies over the past few years.

It is against this background that ESA can look back with some pride, having established its technology transfer support programme over 10 years ago.

So what should you do if you believe your company may have unexploited technologies in its portfolio? A good start would be to run them through the simple tests described on Page 7 to determine if they truly have potential. If it is a space technology – or one with space potential – you can enlist the support of the ESA TTP team to help commercialise it.

Tony Anson, then a researcher at Brunel University in the UK working on space applications for smart alloys, obtained support from the ESA TTP to help develop commercial products. That was 10 years ago. Now Tony's company - Anson Medical - has been acquired as part of a new medical technology company grouping on the UK Alternative Investment Market (AIM). The purchase price was in the region of 27 MEuro. These images demonstrate the impressive capabilities of one of Anson Medical's most recent developments - the AORFIX endovascular stent graft. The use of shape memory alloys results in significant benefits over alternative techniques, such as improved resistance to kinking and torsional stress.

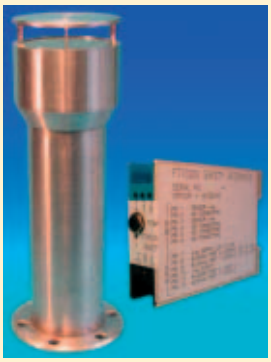
Space technologies have been utilised by companies from a wide range of industries and in applications as diverse as medical implants to cement mixers. Of almost equal diversity are the ways that space technology can be practically transferred to industry. Methods include licensing, joint ventures, further development, outright sale and so on.

These two pages contain a selection of currently available technologies from ESA's Technology Transfer Programme. Details of how to obtain further information and what to do next are given opposite.

Ultrasonic Anemometer

(ref. 1006)

The technology is an innovative solid-state meteorological sensor that incorporates a patented acoustic resonance airflow sensing technique, which can measure both wind speed and direction with a high degree of accuracy. Combined with a high-performance signal processor, the anemometer can measure wind speeds from 0.01 m/s to 125 m/s.



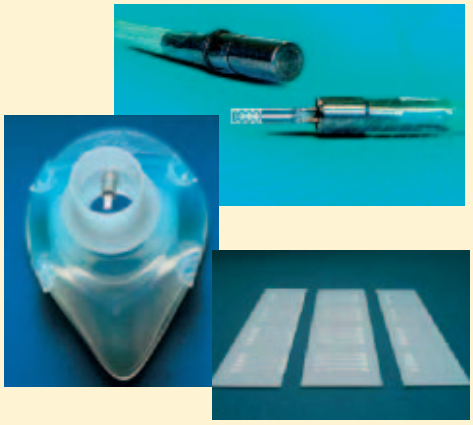
The anemometer is a cost-effective replacement for existing devices. Because its operation is not mechanical it overcomes many of the limitations of existing technologies and requires no routine performance or calibration. Comprehensive data collection and measurement techniques are available to interface with the core unit. The anemometer is physically small and lightweight, yet robust enough to be used in a wide range of demanding conditions. An integral anti-icing capability is incorporated as standard.

In addition to replacing standard equipment used in meteorological applications, a wide range of other uses have been identified, including in the marine, aerospace, construction and process industries.

The technology has been fully developed and is available as an off-the-shelf or bespoke, application-specific product. Patents are in force for the core element of the anemometer. The owners are seeking end users and also licensees and joint-venture partners to address both specialist and mass-market applications for the technology.

Solid-State Gas Sensors

(ref. 417)



This new miniaturised sensor system uses the principle of electrochemical electrolysis. However, the electrolyte in this case is not a liquid as is usual, but a solid. The most commonly used sensor today is based on the solid electrolyte zirconia, either partly or fully stabilised with ytteria. The stabilisation produces oxygen vacancies in the lattice. At elevated sensor temperatures the stabilised zirconia attracts oxygen ions, forming the basis for an oxygen sensor. The sensor can be used for the gases CO, CO_2, O_2, H_2.

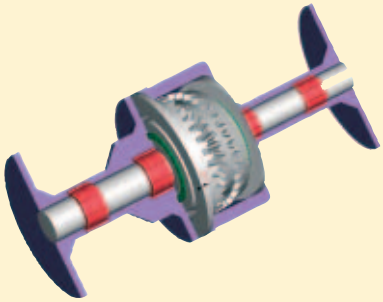
One of the main innovative aspects of this sensor is the simultaneous measurement of different parameters by a single miniaturised sensor, e.g. total mass flow or total pressure and gas concentrations. Another innovative aspect is the new production technique for the miniaturised sensor elements, based on thick-film screen-printing, providing extreme reproducibility and low-cost elements.

Engineering models and different prototypes are available. The company is interested in all kinds of co-operations to develop sensor systems for different applications.

Gear System for High-speed Reduction Ratios (ref. 419)

Many everyday appliances, such as video recorders, car window winders and seat adjusters, tape drives and CD players rely upon small electric motors. Often the required shaft speed of the motor is quite low but, in order to provide significant power, high speeds are used. To reduce the speed of rotation and so gain an increase in output torque, or twisting power, a gearbox is needed.

If the difference between the speed of the motor and its load is great, conventional gears may need several stages of speed reduction. This leads to power loss, noise and expense. Unfortunately, large increases in output torque also cause large forces on the teeth of conventional gears, so larger teeth and better materials are required.



This technology provides a new form of gearbox that overcomes these disadvantages. The mathematical concept of nutation is coupled with the use of bevelled gears. The device was developed for use in satellites and uses an arrangement in which one bevel gear nutates with another instead of rotating. The gear ratio is determined by the difference in the number of teeth of the fixed and moving gears and not, as with

Smart PAssive Damping Device (SPADD) (ref. 315)

SPADD was developed to protect satellites and space structures from vibrations during launch. The natural damping of a structure is increased by the addition of a light energy-dissipating device without altering the mechanical characteristics of the structure. Vibration is transformed into other forms of energy, thereby generating a large increase in the structural damping. Finite-element analysis is used to determine the zones of the structure that need treating and produce the design of the damping device. The technology's performance is superior to many traditional dissipation devices, and benefits include ease of execution and low recurring costs. SPADD also provides a wideband damping capacity and can be used in harsh environments where traditional systems often suffer.

SPADD is a generic technology that can be used in systems where levels of vibration and/or noise need to be reduced. Early applications have been made, for example in concrete mixers, tennis racquets and electronic circuit boards. There are clearly many opportunities for the technology to be used in sectors such as automotive and transport where the reduced vibration of equipment and fittings leads to additional benefits including lower maintenance costs and increased passenger comfort.

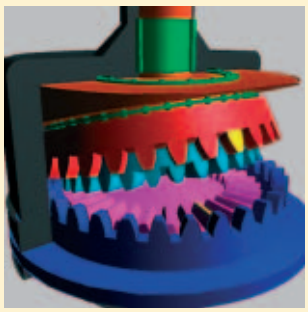
The technology is available for license and distributors and partners are being sought.

Nickel-Hydride Batteries (ref. 442)

High energy densities and low self-discharge are primary requirements for batteries used to power low-orbit geostationary satellites. An NiH_2 battery has been developed which operates using a negative hydrogen electrode and a positive nickel electrode. These batteries have high energy densities (50-60 Wh/kg) with low self-discharge. In addition, the power level of the battery can easily be observed by monitoring the pressure. Hydrogen is formed on the negative electrode when the battery is being charged, with a subsequent increase in pressure. When the battery is being used the internal pressure reduces. The properties of NiH_2 batteries make them ideal for use as the power source for electric vehicles, hospitals, industrial sites, airports and remote sites. Battery recharging can be carried out using renewable energy sources such as solar and wind power.

The tehcnology supplier is looking at all forms of collaboration on developing the system for commercial applications.

conventional gears, on the ratio of their circumferences. By applying the principle of nutation twice, very high reduction ratios can be achieved.



The design, which combines two pairs of gears, makes possible any ratio with the same simple configuration. Because the design ensures that at least two teeth are in contact at any one time, loadings are reduced and materials of lower strength may be used. The system therefore has the advantages of a simple configuration (small number of parts), multiple tooth engagement (low-strength gear material and high reliability), and higher efficiency (reduction of energy consumption) compared with traditional systems.

This gear system could have application in many sectors where the transmission of mechanical power is required. It is particularly suited to electrically driven components where high reduction ratios are required but space is at a premium. Using nutator technology, smaller, faster electric motors can provide the same level of mechanical power as their conventional counterparts.

The device is currently in the prototype phase and the developer is interested in collaborations and joint ventures that lead to its further development.

If you are interested in any of the technologies featured on these pages please contact the Technology Transfer Network Member nearest to you. The contact details for the Network Members are listed on the back page of this publication. These organisations are committed to responding to your enquiry as soon as possible.

The technologies featured here are also published in an annual catalogue of European space technologies. Produced in five languages and distributed to over 40,000 non-space companies, it is now in its seventh year. Contact your national Network Member if you would like to be sent a copy.

Space technologies offered by the Technology Transfer Programme are also available at http:/www-technology-forum.com. This is a free-to-use market place offering you the ability to:

- **Search for technologies**
- **Submit requests for technologies (not appearing in the market place)**
- **Offer solutions for technical requests**
- **Promote your own technologies, services or know-how.**

Focus on the UK

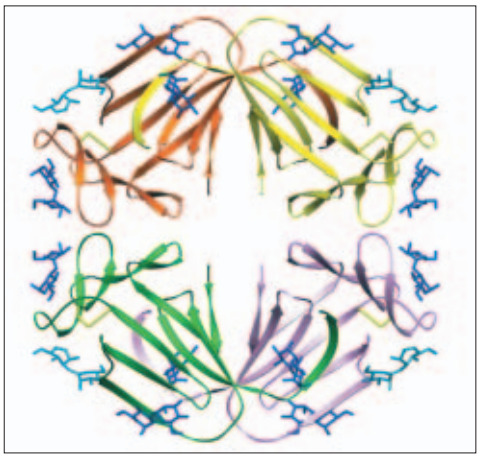
From the start of its Technology Transfer Programme in 1990, ESA has been assisted by a multi-national network of technology-transfer professionals. One of the founder members of the Group is JRA Technology Ltd. based in Marlow in the UK.

JRA is a technology transfer consultancy specialising in supporting the commercialisation of technology-based intellectual property (IP).

JRA's involvement with the ESA TPP goes back to early 1990 when the first pilot initiative was launched. JRA also facilitated the first transfer from ESTEC in 1991, when novel imaging software (from ESTEC's work on the Hubble Space Telescope) was licensed to a UK company making highly sensitive photon-counting imaging devices for biomedical research purposes. As an indication of the chain of events that can be started by a single transfer – and the extended time scales involved – a professor at a UK university is now setting up a company to commercialise the bioimaging technologies he developed with the aid of that improved imaging device.

The UK's active involvement in the ESA earth observation and space science programmes is also reflected in the types of 'spin-off' produced. Considerable effort has been put into the design and development of new sensors and instrumentation for the detection of low light levels, microwaves and nuclear emissions and for the imaging and analysis of data received.

This instrumentation is being adapted for use with medical and life-sciences research. MRPB Research is a small company set up to use space-based microwave instrumentation to investigate the non-thermal effects of microwaves on living cells – something that could assist both medical diagnosis and production biological processes. Southampton University Professor David Ramsden has set up a spin-off company, Radiation Solutions Ltd., to develop cancer treatment devices stemming from his research into gamma-ray imaging for astronomy.

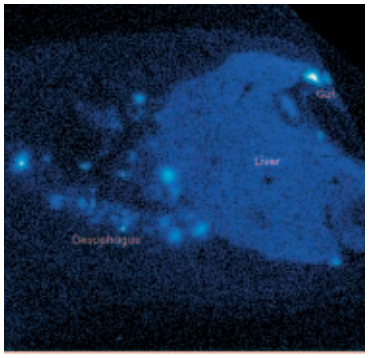


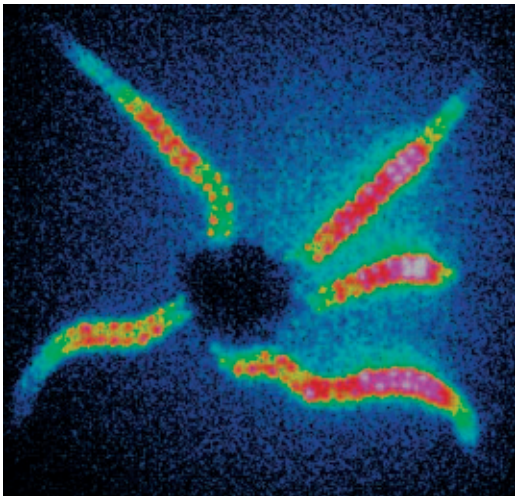
X-ray imaging is used to determine protein structures such as that shown on the right

Both these initiatives had the benefit of receiving support from the ESA TTP. Another such example is the Space Research Centre (SRC) at the University of Leicester where JRA is jointly sponsoring a technology transfer post to assist with the commercialisation of Leicester's renowned expertise in space astronomy imaging technologies. The company is currently supporting the University's applications for funding for a spin-off company to develop and manufacture devices for biomedical research purposes.

In many ways the UK is embracing the IP exploitation boom with enthusiasm. Its Venture Capital and Business Angel Networks – the source of most of the initial investment capital – are still the most active in Europe and many of the country's leading technology developers have active Corporate Venturing or out-licensing programmes. Recent government initiatives are encouraging SME investment in technology R&D, so the future looks equally bright.

Radiograph of tissue from a rat using SRC's system, showing beta isotope uptake





Bioluminescent protein extracted from glow-worms can be used to observe chemical signalling in plants and animals

Your Technology –

It may be novel, but is it exploitable?

In the first of a series of articles on best-practice in technology transfer, JRA's Operations Director, Graham Thomas, addresses what is often the first step – how to spot a truly commercially exploitable technology.

Graham Thomas

Identifying a technology that is innovative is usually relatively straightforward. Determining whether the same technology is commercially exploitable is less easy. The two do not always go together.

Whilst assisting a large UK research agency to spot possible 'winners' from amongst its portfolio of 400 plus patents, we developed a simple, quick, and low-cost test. We narrowed down 5 key attributes that have most influence on whether a technology can be made a commercial success or not.

They are:

• **Innovation** – It is important to confirm that a technology provides added benefits and offers competitive advantage. This may be determined by expert assessment, a patent search or use of a Technology Watch Internet site, or indeed all three. 'Me-too' technologies can, however, be exploitable as they can provide companies with a short-cut route to catching up with the opposition.

• **Presentability** – How ready for the market is the technology? Does a prototype or production model exist, or is it just a design, patent or a concept? If it is software, has it been designed to a specification with full documentation and test – in a common language? Also it is necessary to confirm that the time (including support staff time) and money it will take to bring the technology to market can be recovered and that you can afford the investment.

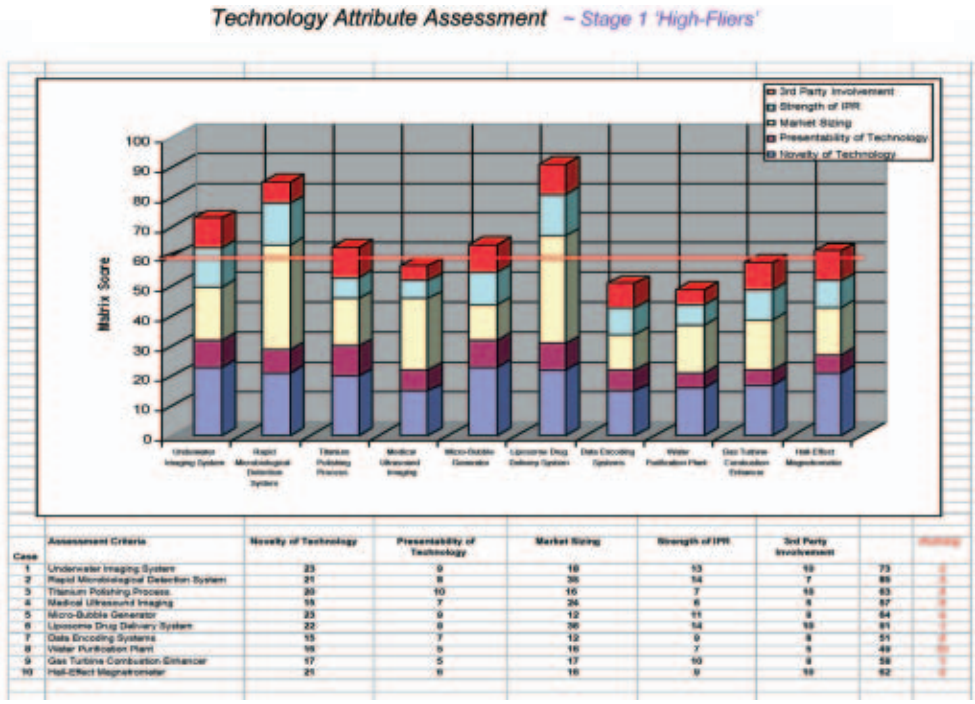
• **Intellectual Property Protection** – A technology does not have to be patented to make it exploitable, but it is a great advantage. Here an initial look at the strength of the claims, number of competing patents, also countries covered by the patent and the time to run before expiry is needed. A potential licensee, for example, would not want to pay much for a patent valid in only one country and with just 2 years to run!

• **Market** – Without doing too much in depth analysis, we do need to know that a market exists, that it is substantial, with a respectable growth rate and accepts new technologies. One also has to think laterally. The most lucrative market for your technology may not be the most obvious one.

• **Third Party Issues** – The problem of multi-ownership of IP can obstruct successful exploitation. The important point here is to always identify, quantify and address third-party issues that may affect exploitation early in any commercialisation exercise.

JRA combines these 5 key attributes in a simple single spreadsheet, and each attribute is given a 'weighted' mark to enable a total exploitability factor to be deduced. A low mark does not always mean a technology is not exploitable. A higher mark similarly does not guarantee exploitability, but this relatively simple test can help to identify the technologies where commercialisation efforts should be concentrated.

In the next issue of Spacelink we will address how to 'benchmark' technology and identify the optimum market for it.



Case	Assessment Criteria	Novelty of Technology	Presentability of Technology	Market Sizing	Strength of IPR	3rd Party Involvement		Ranking
1	Underwater Imaging System	23	9	18	13	10	73	4
2	Rapid Microbiological Detection System	21	8	20	14	7	69	5
3	Titanium Polishing Process	20	10	16	7	10	63	6
4	Medical Ultrasound Imaging	15	7	20	6	9	57	8
5	Micro-Bubble Generator	23	9	12	11	9	64	3
6	Liposome Drug Delivery System	22	8	20	14	10	81	1
7	Data Encoding Systems	15	7	12	9	8	51	9
8	Water Purification Plant	16	5	16	7	5	49	10
9	Gas Turbine Combustion Enhancer	17	5	17	10	9	58	7
10	Hall-Effect Magnetometer	21	8	16	9	10	62	6

The results of assessments are presented graphically to allow easy comparison

ASLINK – A Record of Success

The TTP is using European funding to support aerospace related technology transfers

The development of systems for unmanned vehicles such as airships is set to get a boost from a pan-European research and development project led by Remote Services Limited in the UK.

The links between the space and aerospace sectors have traditionally been strong. This is founded on a common need for technologies able to cope with the most challenging environments, yet which deliver unparalleled safety and predictability in operation. This first issue of Spacelink has described some of the tools, techniques and initiatives that are being used to transfer technologies from the space to the non-space sectors. But space companies are not the only ones to benefit from such support. An initiative called ASLINK is bringing the same opportunities to companies from the aerospace sector.

The service works by reviewing technologies developed by such companies and identifying those that could have applications in other industries. Consortia of small and medium-sized businesses are then established and an application is typically made to the EU to support the cost of developing and adapting the technology.

ASLINK is run by the Members of ESA's existing Technology Transfer Network. The European Union's Framework Programme for Research and Technological Development funds the service, and the first two years of operation have been remarkably successful. Against a target of 30 proposals, 50 were actually submitted. At the point of the last deadline 32 of the 50 proposals had been evaluated and a 53% success rate has been achieved, resulting in around 18 MEuro being raised.

To find out how your company can benefit from ASLINK, contact one of the ESA TTP Network Partners listed left or visit:

http://www.aslinkonline.com.

Providing the Link

Technology transfer can take numerous forms. All of the mechanisms tend to have their complexities and specialists are often required to guide companies through the various stages necessary to secure a technology transfer agreement.

To assist you in these areas ESA has set up an international network of technology transfer specialists and brokers. Each of the Network Members promotes the identification and exploitation of space technology spin-offs and can provide support to both potential donor and receiving organisations.

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