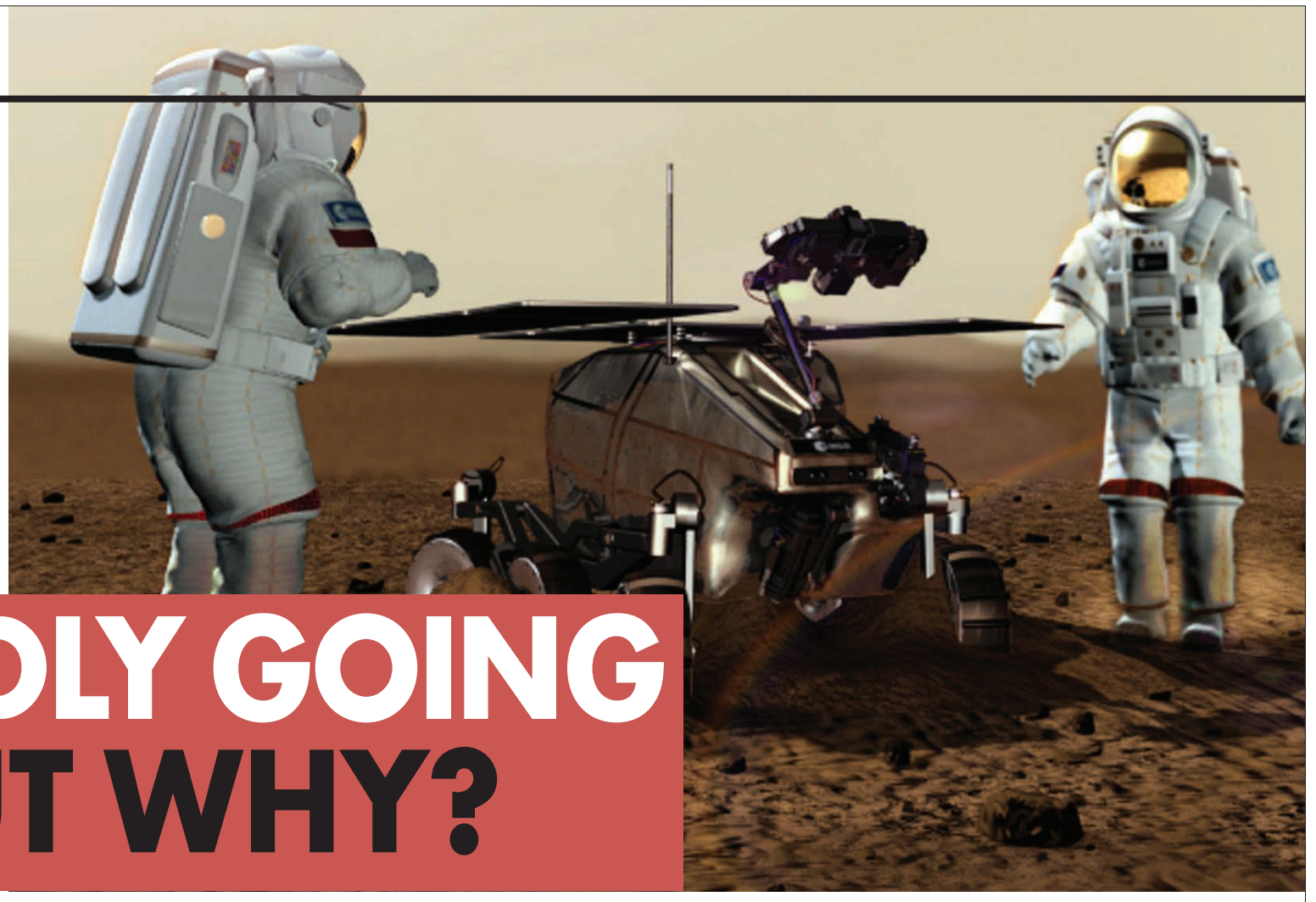
SPACE

It's expensive, dangerous and to many people a complete waste of time. So what exactly are the benefits to the human race of space exploration? As today is space day at Farnborough 2006 Steve Nichols gives some answers.



BOLDLY GOING ...BUT WHY?

The first benefit is that apparently we need to find somewhere new to live.

Physicist Professor Stephen Hawking says the survival of the human race depends on our ability to find new homes elsewhere in the universe before a disaster destroys the Earth.

He recently told a news conference in Hong Kong that humans could have a permanent base on the Moon in 20 years and a colony on Mars in the next 40 years.

"We won't find anywhere as nice as Earth unless we go to another star system," added Hawking, who was in Hong Kong to deliver a lecture.

"It is important for the human race to spread out into space for the survival of the species," Hawking said. "Life on Earth is at the ever-increasing risk of being wiped out by a disaster, such as sudden global warming, nuclear war, a genetically-engineered virus or other dangers we have not yet thought of."

Sense

But if we ignore the need to find a new home, the industry still makes a strong claim that space makes good economic sense.

A recent British National Space Centre survey showed that 16,200 people are employed in the space industry in the UK. The number rises to more than 70,000 in the UK if you take into account people working in associated industries, an independent analysis conducted by Oxford Economic concludes.

Lord Sainsbury, the UK's science minister, said at a recent Case for Space conference: "I think few people realise the essential role space plays in all of our daily lives. Too often I think people take for granted the satellite technology that helps to provide many of the services on which we rely.

"The move towards the commercialisation and exploitation of space has been a real revolution. A whole range of modern technologies such as telecommunications, navigation, monitoring global climate change and the internet depend on it." EADS agrees and says that space is a "hugely fertile technology stimulator".

It says that spin-offs have found their way into a vast array of innovative industrial and commercial applications. For example, the construction engineering industry makes use of anti-vibration technology derived from satellite platforms and ground-penetrating radar for fault detection.

New 'greener' and less polluting forms of energy first applied on spacecraft, such as hydrogen-powered fuel cells, are also attracting interest for terrestrial vehicles.

The benefits to the medical industry are regularly quoted. EADS says highly-sensitive instruments originally designed for use in space have been adapted to assist the medical profession, and the results of physiological experiments to which astronauts are subjected are contributing to advances in medical techniques.

Our clothes have apparently benefited from the space race. Babies' pyjamas that help prevent cot deaths have been developed from the technology used in an astronaut's training suit.

Even the small explosive charge that activates the airbag in our cars was derived from the technology developed to separate a rocket launcher's propulsion stages.

US space experts estimate that for every dollar the US spends on research and development in the space programme, it receives $7 back in corporate and personal income taxes from increased jobs and economic growth.

But the space industry is expensive, as NASA administrator Michael Griffin knows only too well. At the height of the Apollo programme, NASA employed more than 400,000 contractors, civil servants, scientists, technicians and engineers. Today, it employs about 75,000 people.

But Griffin argues that the US has no choice but to continue its programme for space exploration.

"Imagine, if you will, a world of some future time – whether it be 2020 or 2040 or whenever – when some other nations or alliances are capable of reaching and exploring the Moon, or voyaging to Mars, and the United States cannot," he says.

"Is it even conceivable that in such a world America would still be regarded as a leader among nations, never mind the leader?

"And if not, what might be the consequences of this for the global balance of economic and strategic power? "Are we willing to accept those consequences?

Holiday flights out of this world

Looking for somewhere a little different for your holiday? How about a round-the-world trip – at 15,000kt (28,000km/h)?

That's the speed of suborbital flight, and if analysts are to be believed, there's a huge number of space tourists waiting to suit up for the experience.

A survey by US consulting firm Futron says that by 2021, space tourism could be worth $700 million annually as it launches 14,000 tourists a year. The research was based on interviews with hundreds of high net-worth individuals.

"The customer is normally 55 years old and, for suborbital flight, 72% of them are male," Janice Starzyk, Futron space and telecommunications programme manager, told the Royal Aeronautical Society's recent space tourism conference in London.

Four people (all male) have already paid an estimated $20 million each for the privilege of a rocket trip to the International Space Station (ISS), courtesy of US-based Space Adventures.

And Virgin Galactic has taken 40,000 registrations from individuals in 120 countries for its suborbital flights, which it plans to start in 2009.

Eric Anderson, president of US-based Space Adventures, says: "Countries around the world are only just realising the enormous commercial possibilities of space tourism."

He adds that the market for suborbital flights is estimated at $1 billion a year.

Space Adventures currently offers orbital trips into space at $20 million apiece via the Russian space programme. Japanese entrepreneur Daisuke 'Dice-K' Enomoto will be next up from the Baikonur Cosmodrome in Kazakhstan, launching on 14 September.

Tourists

Previous tourists to the space station, all brokered by Space Adventures, include Dennis Tito, Mark Shuttleworth and Greg Olsen.

But Space Adventures also see a future in lower-cost, suborbital flights.

The company recently agreed to acquire California-based Space Launch, which is working on aircraft-based launch systems. Space launch has been at the forefront of developing a mass injected precompressor cooling system (MIPSS) that will be used to maintain the thrust of the high-altitude conventional jet aircraft needed to launch the suborbital vehicle.

Earlier this year, the company also announced a deal with investment firm Prodea to develop a fleet of commercial suborbital spacecraft, which will be designed by Myasishchev.

The five-seat rocket-powered Explorer will be air-launched from a modified Myasishchev M-FF high-altitude aircraft. The initial plans are for the flights to launch from the United Arab Emirates (UAE), Singapore and eventually the USA.

Space Adventures announced a scheme in February to develop a commercial spaceport in the UAE emirate of Ras Al Khaimah, with plans to expand globally. The total estimated cost of the global spaceport development project is at least $265 million.

Virgin chairman Sir Richard Branson is also said to be in talks with the authorities at Ras Al Khaimah about a similar venture.

On 20 February, Space Adventures announced plans for a $115 million spaceport near Singapore's Changi airport.

UK entrepreneur Branson, along with Burt Rutan of Scaled Composites, is also progressing its spaceships for the suborbital personal spaceflight industry.

ESA beams down space-age technology

The potential benefits of transferring technology from space to earth-based businesses are out of this world, according to a presentation given by the European Space Agency (ESA) on the first day of the show.

ESA's Niels Eldering explained how the space agency's Technology Transfer Programme (TTP) is helping create profitable start-up companies from space spin-offs.

He showed how its Technology Forum (www.technology-forum.com) is supporting ESA's initiative, helping companies, universities and research organisations share information.

Sensors

Delegates heard two success stories at the show. Professor George Fraser of the University of Leicester also runs Bioastral – a company that is using the same sensors as the William Hershel telescope to help biologists discover what is going on inside cells.

His company uses sophisticated Superconducting Tunnel Junction (STJ) sensors to look for fluorescence in DNA. Fraser says: "We are currently looking for £250,000 ($456,000) worth of funding – we're convinced that biologists need this technology, they just don't know it yet."

ESA helps start-up enterprises gain access to finance, advised them on Intellectual Property Rights (IPR), networking, marketing and legal matters, and provides consulting services.

Tourists sign on dotted line for Virgin Galactic

Virgin Galactic has now registered interest from more than 60,000 people who want to become space tourists.

The company has taken $15.6 million in full ticket sales and various levels of deposits and operations will begin in 2008 from Mojave spaceport, moving to Spaceport America in late 2009 or early 2010.

Speaking at the show, Will Whitehorn, president of Virgin Galactic, says enquiries keep coming in – the company has just signed up Bryan Singer, the director of the new Superman Returns movie.

Burt Rutan of Scaled Composites in Mojave is also progressing the spaceships for the suborbital flights. Virgin Galactic has placed an order with the Spaceship Company for five SpaceShipTwo vehicles and twin White Knight Two motherships, with options on further systems.

Richard Branson and SpaceShipOne, the inspiration for his space tourism business.

Whitehorn says they aim to unveil a mock-up of the cabin of SpaceShipTwo at the Wired Nextfest event in New York City at the end of September. The cabin is said to be about the same size as one of passenger pods on the London Eye.

He also says that SpaceShipTwo could be unveiled at the Farnborough show in 2008.

SpaceShipTwo will propel six passengers and two pilots to an apogee of 140km (87.5 miles) when its new hybrid rocket motor is fired. After a 4g ascent passengers will experience 5min of weightlessness before a 7g re-entry.

Virgin Galactic says the craft will allow 50,000 customers to experience personal spaceflight over a 10-year period up to 2019. The price per seat on each flight, which will include at least three days of preflight training, is expected to start at around £115,000 ($190,000). Virgin Galactic's first accredited travel agency will be announced soon.

Whitehorn adds that Virgin Galactic is in the space industry for the long term, hinting that it isn't just about suborbital space tourism – taking payloads into low Earth orbit is also on the agenda.

Selling space: Virgin Galactic marketing head Susan Newsam is backing the Spaceport.

It's official – it's Spaceport America

New Mexico economic development secretary Rick Homans has unveiled Spaceport America – the new name for the state's commercial spaceflight centre, which he announced at the show.

Plans are now under way for the start of commercial space launches from the $225 million site with Virgin Galactic being one of the key players.

Homans says: "New Mexico's Spaceport America will launch the world's second space age. We are proud to be the home of aerospace visionaries, such as Virgin Galactic, Eclipse, X Prize Cup, Rocket Racing League UP Aerospace and Starchaser Industries."

Speaking at the show, Will Whitehorn, president of Virgin Galactic, says: "New Mexico is a great state, with great weather and restricted airspace adjacent to White Sands Missile Range. We look forward to building our new facility at Spaceport America."

Safe landing for Space Shuttle

Space Shuttle Discovery is safely back on terra firma after landing at the Kennedy Space Centre at 2.14pm UK time on Monday.

The orbiter touched down after its 13-day, 5.3 million mile mission, which included a nine-day stay at the International Space Station (ISS).

NASA staff held their breath as the Shuttle made a fiery re-entry following its de-orbit burn. It was at this point that Columbia broke up over the USA in February 2003.