



## interview to **Pedro Duque**

General Manager of Deimos Imaging  
and astronaut on reserve leave of the  
ESA (European Space Agency)



Launching of the Atlantis Space Shuttle [25/9/1997]. NASA/courtesy of nasaimages.org

Pedro Duque was born in Madrid on 14<sup>th</sup> March 1963. He graduated from the Polytechnic University of Madrid (Higher College of Aeronautical Engineering) with a Degree in Aeronautical Engineering in 1986. It was at this point that his career became meteoric. He started working as an intern in GMV (Flight Mechanics Group) and was appointed to the European Centre of Space Operations (ESOC) of the European Space Agency (ESA) in Darmstadt (Germany) shortly afterwards. He worked in the Precise Orbit Determination Group, participating in the flight control team for two ESA satellites, until 1992.

In May 1992, he was selected for the ESA's Astronaut Corps. He underwent Basic Training at the European Astronaut Centre (EAC) in Cologne (Germany) and then attended another course at the Russian TSPK astronaut-training centre, in Star City, as part of a project designed to establish open cooperation between the ESA and the MIR Russian space station. Upon his return from Russia in 1993, he began to prepare for the joint ESA-Russia Space Mission called "EUROMIR 94", receiving the official qualification of Scientist-Astronaut for the Soyuz and MIR spacecraft. He was selected as a member of the reserve crew and ground communications coordinator liaising with Russia for the EUROMIR 94 space mission in May 1994. In 1995, he trained in Star City to support the joint ESA-Russia "EUROMIR 95" space mission. He was appointed Reserve Scientist-Astronaut for the Life and Microgravity Spacelab mission that same year.

In 1996, Pedro Duque trained as a NASA Flight Engineer and began working at the Johnson Space Centre. In early 1998, he was appointed member of the crew of the STS-95 Space Shuttle Flight, in a joint mission for NASA, the ESA and the Japanese Agency NASDA. On 29<sup>th</sup> October 1998, Pedro Duque went into space for the first time, as a Flight Engineer of the "Discovery" Space Shuttle. Between 1999 and 2003, he worked on the European components of the International Space Station, in the European Space Research and Technology Centre (ESTEC) situated in Noordwijk (Holland). He was among the first set of European Astronauts to qualify with advanced training in 2001 and he was Flight Engineer for the Cervantes Space Mission between 18<sup>th</sup> and 28<sup>th</sup> October 2003.

Pedro Duque has participated in four spaceflights, all related to scientific research, which makes him an expert in adapted space experiments. After his last spaceflight, the ESA appointed him Operations Director of the Spanish User Support Operations Centre for the International Space Station, which is part of the "Ignacio da Riva" Microgravity Institute of the Polytechnic University of Madrid.

Pedro Duque has been on leave of absence from the ESA since October 2006, although he remains on standby should he be needed. Among other special honours, he has received the Russian Federation's "Order of Friendship" from President Yeltsin (March 1995) and the Great Cross to Aeronautical Merit from HM the King of Spain (1999). He has been a Member of the Royal Engineering Academy of Spain since April 1999. Along with another three astronauts, he received the Prince of Asturias Award for International Cooperation in October 2009.



ISS (International Space Station) NASA/courtesy of nasaimages.org

*“There is a great accumulation of risks in the space”*

Pedro Duque, the first Spanish astronaut to visit space and employee of the European Space Agency (ESA), reveals himself to be a person of simple pleasures, who is passionate about space and adept at overcoming great challenges. Here, we join him to review some of the milestones and myths of the space race and learn more about the international aeronautics and space industry, in which Spain has been playing a role for more than 20 years, thanks to its involvement with the ESA. As General Manager of the first completely private European company to put its own satellite into orbit and sell its Earth imaging services, he provides us with some interesting facts.

**How did you first develop an interest in space and when did you first feel the desire to become an astronaut?**

I've always had an interest in aeronautics, even from my childhood. The reason is simple: my father was an air traffic controller and we have always shared an interest in aeroplanes. He used to take us to the control tower, in the airport. I even tried the flight simulator once, one of those that pilots use to train. Undoubtedly, this spurred my interest in aeronautics and encouraged me to become an aeronautical engineer and it was a small step from there to developing an interest in space.

**How did you first get the chance to become an astronaut?**

When I was finishing my degree, the government approved a new Law on Science, under which Spain would begin to take part in inter-

national R&D (Research and Development) projects and become more involved in international programmes and agencies. One of these organisations was the European Space Agency (ESA) and one of the selected laboratories was the one at the university where I was working as a research fellow. We formed a group that began formalising contracts with the ESA. The opportunity came about because the Spanish Government began to allocate more resources to international projects from that moment onwards, which would come back in the form of contracts with the industry; some of the other aeronautical engineers and I became converts to aerospace engineering.

**How were you selected from the different candidates wanting to work at the European Space Agency?**

Let me tell you a story: when the results of the

**The first time you look through the window and see Earth, with its dark horizon and the Sun, is indescribable.**





ISS (International Space Station). NASA/courtesy of nasaimages.org

selection process were about to be published I began to receive calls from all the radio stations and TV channels, even before anyone contacted me officially. The authorities in charge of the selection process inform the government first and afterwards the candidates. But there are so many people involved in the process that any news always gets leaked.

**When did you first travel to space?**

I first travelled to space on 29<sup>th</sup> October 1998. I spent a year in Russia before that. I lived in Star City, a small village with only 5,000 residents and the location of the space training and research facility, with its technicians and engineers. The place has restaurants, schools, cinemas, everything you might need to make life pleasant for the people living there, because



Barajas Airport, Madrid

**A private satellite that makes history**

**As an astronaut turned businessman, how does the corporate world compare with your experiences of physical risk in space?**

There are similarities. Though I must emphasize that the company is not mine, I am only the Managing Director. In space programmes, the astronaut is up there, at the top of the system, which means that everyone looks to you for advice. However, the experience of being an astronaut, of living in space, gives you a certain approach, where you are more prepared to listen to others than to establish strict chains of command.

**Tell us about Deimos Imaging and where the capital came from.**

Deimos Imaging is the first fully private European company to operate its own Earth Observation space satellite. The share capital came from a Spanish corporate group, called Elecnor. The group founded a company 7 years ago, called Deimos Space, which employs young engineers from Spain and carries out work for the European Space Agency. Deimos Imaging is an offshoot of that initial company.

**Given that the Deimos project creates added value through R&D&I (Research, Development and Innovation), how far would you say Spain has come? How strong is the Spanish aerospace industry?**

Spain first began to contribute to the European Space Agency about 23 years ago. Since then, the country has built and consolidated an aerospace industry. Initially, our share in the project was only 5%. It is currently 7% and will reach 10% in the future. It would be almost impossible to have a 100% share. Spain fits in well in certain niches. We have between 2,000 and 3,000 employees who are 100% dedicated to space work. There is a lot of uncertainty at the moment, because it is difficult to predict how things will develop or determine whether it is best to cut spending in the light of the financial crisis or to boost investment in R&D&I on the supposition that it will help us come out of the crisis sooner. Nevertheless, the aerospace industry could find itself in a better position.

**Can the European Galileo project help Spain's aerospace industry?**

It is helping. Spain has a share of 10% or more in the project. In fact, our company manufactures the most critical computers within the whole Galileo system. They are built in Tres Cantos, on the outskirts of Madrid. Some extremely difficult and critical tasks are allocated to Spain, which is proof of our enormous potential.

**Obviously, Deimos Imaging has carried out its viability studies, knowing that it will be compe-**

Star City was the product of Soviet planning, which, at least where questions of space were concerned, was autarchic.

**Where else can ESA astronauts receive training?**

The International Space Station is run by the USA, Russia, Japan, Canada and the ESA, representing many European countries. All these countries have centres for training astronauts. Right now, anyone who is going to spend any time in the Space Station has to learn how it works, and each centre specialises in one field, which means that the trainee has to pass through all of them. This means that they spend their lives travelling.

**Moving on to sensations, how does it feel to see the Earth from space?**

It is incredibly overwhelming, even though we all receive training and are fully prepared for it. Obviously, we have seen the photographs and videos before we embark on a mission and we receive training so that we are prepared for the fast movements onboard the spacecraft. And if there is anything to see below, the onboard computer will tell you exactly where it is. Even so, it is awe-inspiring. The first time you look through the window and see Earth, with its dark horizon and the Sun, an indelible memory is left.

**What do you think of during those moments?**

I do not know what to say, to be honest. All the preparation and training teaches you to detach yourself from the situation, to feel as little as possible. I usually compare it to people who climb mountains: they make a titanic effort to

**ting with other companies that provide similar services. What would you say constitutes Deimos Imaging's competitive advantage?**

Obviously, there are already Earth Observation Satellites in space, but these are used for experiments, as prototypes. What we have done is design a satellite that can take images that are much larger, but more importantly, that can take them much more frequently. This creates more opportunities as we can monitor Earth more intensively. The satellite was launched in mid-July 2009, using a Russian rocket called the Dnieper, which is an intercontinental ballistic missile adapted for these purposes, which has been used and tested extensively.

Everyone is waiting to see the quality of our images before signing any contracts. Our satellite Deimos-1 rotates around Earth, from pole to pole, at a height of 600 kilometres. The satellite has a guaranteed life of 5 years, but satellites from the same series have lasted longer, between 8 and 10 years. It all depends on how we treat it. I must clarify that we purchased this satellite as a capital good and that the added value comes from the applications that we have developed and the quality of these applications. The monitoring base is situated in Boecillo, Valladolid. We have invested approximately 30 million euros in the whole project.

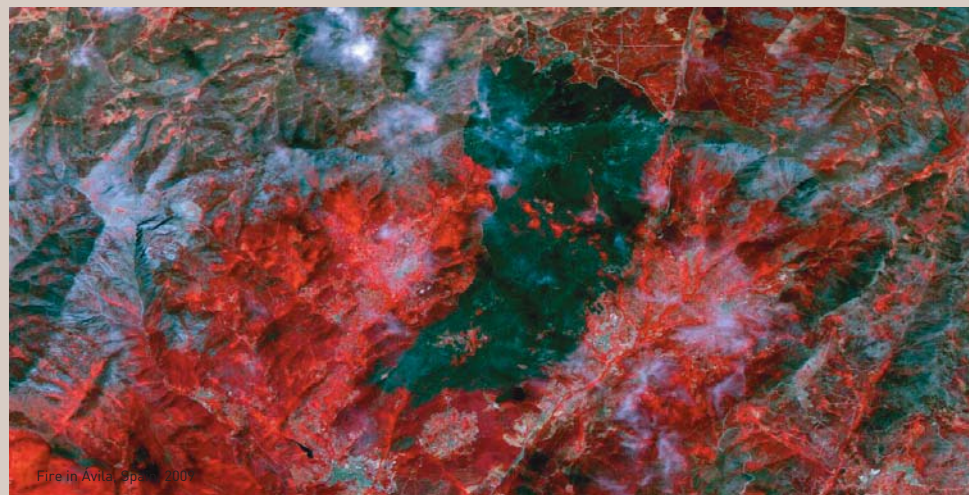
**What is the expected ROI?**

If it is positive, it will be a great achievement.

**What can you tell us about the insurance schemes that are developed for these space programmes?**

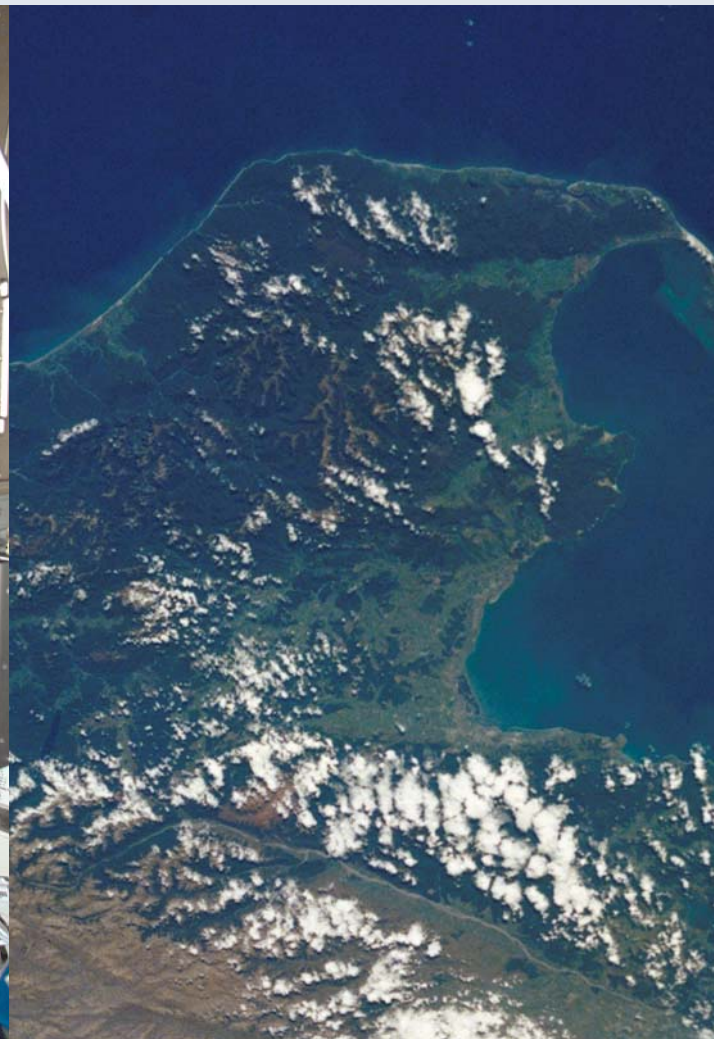
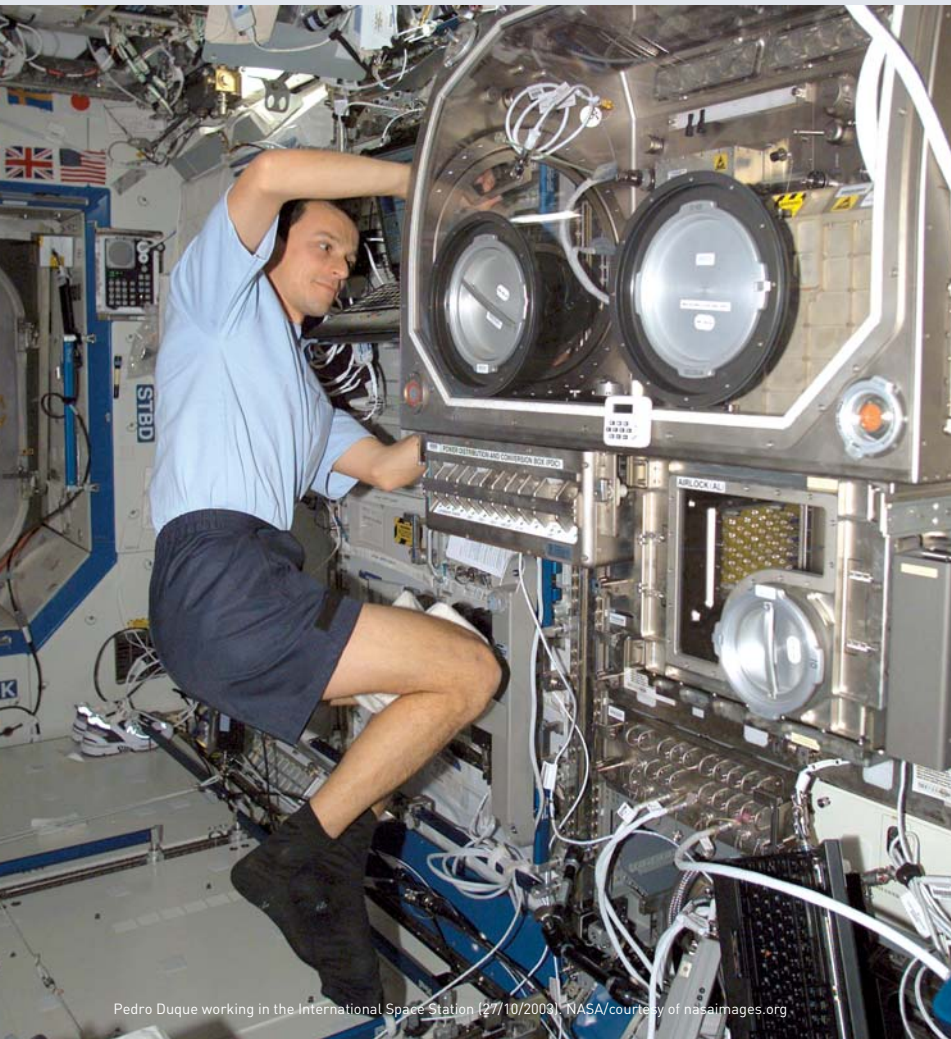
There is a great accumulation of risks in space, obviously, because you are pushing technology to its maximum limits. The margins of error in our designs are very narrow, less than 5%. Evidently, we need insurance. It is essential whenever you embark on a space project and it is great that we can find insurers that specialise in insuring space projects in Spain.

**Deimos Imaging is the first private European company to operate its own Earth Observation Satellite.**



Fire in Avila, Spain, 2009





reach the peak, they look around, do whatever it is they have to do there and come back down and they do not think about it too much.

### **What should humanity's immediate objectives in space be?**

I don't see any specific objectives as such. But it is all justified by the desire to explore, to transcend the barriers of knowledge, by the step forward that it represents for the human race, for a country or for a society. This is a special year because on 21<sup>st</sup> of July, we celebrated the 40<sup>th</sup> anniversary of man's landing on the Moon. At the time of the landing, there was a lot of momentum behind the exploration of space, for various reasons. One of them was that the US wanted to be the first country to reach the Moon and so there were numerous experiments on weightlessness or zero gravity, involving many different fields: physics, medicine, biology. There was a whole series of experiments on the effects of gravity. Because of these experiments, we

began to research how cells relate to each other, how life comes about, how we have evolved, how materials behave. And there are many other benefits that we take for granted now that would not have been possible without space exploration and research. As an example, we now have satellites that transmit information practically in real time; in other words, any news or any developments are disseminated instantaneously and this gives us an overall view of the world, which has revolutionised the way in which we understand the world and relate to one another. We are no longer as isolated as we were. We know that any event happening at any time, anywhere in the world, can be reported on the news in a matter of hours and we take this for granted. The same applies to travelling using GPS. We can act as though navigation is no longer a problem. Why? Because we have managed to create a system, a network of 48 satellites in space. And we have also managed to carry large and heavy cargo into space.



MIR Space Station from the Atlantis. NASA/courtesy of nasaimages.org

### **What is it like living with other astronauts in space?**

It is difficult, because you are in a very small space and you have to share everything. It is like crossing the Atlantic in a small sailing boat. You would be short of space. There are specific needs that have to be met when you are living so close together and everyone has to adapt to each other.

### **What do you think about tourism in space for those that can afford the trip?**

It is like everything else in life. Initially, only people with a lot of money could afford to buy a ticket to board a plane. As the industry grew and received finance, it began to design more efficient and comfortable planes, finally creating a form of mass transportation. The same has happened with many of humanity's inventions. The first cars were only available to the wealthier upper classes. Thanks to the large amounts of money paid for these cars, the factories were

able to invest money in R&D, allowing them to make more efficient vehicles that were then accessible to more people.

### **Which countries are currently the dominant players in space?**

The US is still the superpower in space, at least for the moment, followed by Russia, which specialises in the construction of rockets that can carry very heavy cargo into space. Progress in Europe is not as efficient and very difficult, but that is to be expected, as ten times less public money is allocated to space programmes in Europe. We do stand out in the areas in which we specialise and we are on a par with the US or Russia in that sense. For instance, the European cargo rocket easily competes with the American or Russian, although the Russian cargo rocket is probably more cost-efficient.

I was at the last International Astronautical Congress and learnt that India is only waiting for the Authorities to sign the necessary documents before it implements its own astronaut training programme and anything else that is needed. The only problem in the US is that space exploration budgets began to decline in real economic terms months before Armstrong even stepped on the Moon and they have been falling steadily ever since.

### **Perhaps that is because there are more pressing problems on Earth, such as fighting hunger, disease or providing education, for example.**

Of course, I agree, but the only way to solve many of these problems is through R&D. As an example, I would cite the extensive research into climate change and the fact that we now know a lot more about it thanks to the observation of the planet from space. It is also true that the current lack of funding in the western sphere has meant that other great powers, such as China, have been able to catch up and meet the challenges of space exploration with very little funding, but this is also thanks to the fact that they have had access to the knowledge and skills that other countries developed beforehand through experimentation and research.

The USA and Russia have been investing in space exploration and research for the last 50 years, under the belief that it ultimately boosts the self-confidence of a nation. It constitutes an enormous stimulus to education and training. People perceive that their country is at the cutting edge of something as thought provoking and

**Space tourism is no different to what humanity has experienced with other inventions.**



## Milestones in the Conquest of Space



a. Sputnik Satellite  
 b. Front Page: Yuri Gagarin, fist human in space  
 c. Buzz Aldrin's footprint on the moon  
 d. Skylab Space Station

NASA/courtesy of nasaimages.org

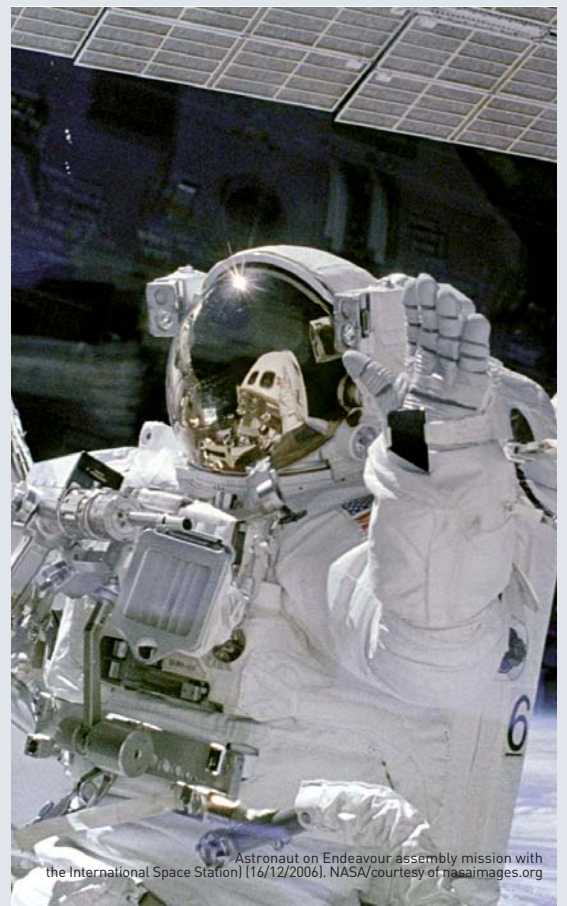
- ▶ 4<sup>th</sup> October 1957. The USSR launches the first Earth-orbiting artificial satellite, called Sputnik I. It remains in orbit for three months, circling the earth every 96 minutes. Sputnik II would later take the dog Laika into space.
- ▶ April 1961. The Russian cosmonaut Yuri A. Gagarin is the first man to see Earth from space, on board the Vostok 1 spaceship.
- ▶ March 1965. The Russian cosmonaut Alexey A. Leonov is the first human to conduct a space walk.
- ▶ 1966. The Russian spacecraft Luna 10 lands on the Moon.
- ▶ 20<sup>th</sup> July 1969. Man walks on the moon. The feat is achieved by American Astronauts Neil A. Armstrong, E.E. Aldrin and M. Collins, as part of NASA'S Apollo 11 mission.
- ▶ 1971. The first manned orbital space station, the Russian Salyut 1, is launched. The crew spends three weeks in space but perishes on re-entry to Earth.
- ▶ May 1973. The US puts the first space laboratory, called the Skylab, into orbit; three different crews will visit the station.
- ▶ 1986. The first module of the Russian MIR (Peace) space station is put into orbit; the station will remain operative for 15 years.
- ▶ 1995. The Russian cosmonaut Valeri Polyakov breaks the record for the longest period spent in space by man. He spends 438 days in the MIR space station, between January 1994 and March 1995.
- ▶ November 1998. The first module of the International Space Station, in which 17 countries are involved, is put into orbit.
- ▶ 9 space missions take place between 2000 and 2004. The new century sees the space race accelerate, with numerous space missions. At the same time, new projects with ambitious objectives are developed, such as the installation of a permanent base on the Moon or a manned space mission to Mars.

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awe-inspiring as outer space. The US is a world power because it dominates space. China and India have taken note of this.

### What would you say is the key to the USA's dominance of the space race?

The USA is sufficiently open to public debates as a country. Where space exploration is concerned, we have yet to see what President Obama's approach will be. Nevertheless, the US is the most technologically advanced country in the world and should be able to put a man on Mars in coming years. It is also a question of budgets: NASA received only 0.5% of the US's Federal Budget this year, which is not very much, but it is still 10 times more than the sum invested in Europe. If there is something that needs to be done industrially, it can be done in the US, which is currently the benchmark country. Until 20th January, the US refused to partner or collaborate with any other nation for the project of establishing a permanent base on the Moon by 2020. Now it is all up in the air. Clearly, the US's policy with regard to space is to consolidate its dominant position, although it is open to cooperation where certain matters are concerned.



Astronaut on Endeavour assembly mission with the International Space Station (16/12/2006). NASA/courtesy of nasaimages.org