**Character 1: Benefits and spin-offs from space**

Economic Benefit to the UK:

* The space industry in the UK directly employs more than 19,000 people and contributes £6.5billion to the economy of which £3.6billion directly to GDP (2008 figures).
* Scotland has a number of companies involved in the space industry, producing everything from batteries to nano-satellites. A number of universities have research groups which either develop technology for use in space or use the data coming from space telescopes or earth observation satellites. There is even a satellite receiving station at Dundee University which receives data directly from a number of earth observation satellites.

Technology Spin-offs (technologies developed for use in space now being applied in other areas:

* Kinotex: A tactile sensor technology which, like human skin, registers pressure and differences in pressure and gives feedback. It was developed by the Canadian Space Agency to stop the robotic arm on the international space Station from crashing into the hull but is now being used by car companies for crash sensing to improve pedestrian safety.
* Cryoconnect: The UK Astronomy Technology Centre in Edinburgh developed a special kind of wiring that works at the cryogenic temperatures found inside an astronomy camera used to look into the furthest regions of space. (SCUBA instrument on the James Clerk Maxwell Telescope). Tekdata-Interconnect Ltd, a UK company, now sell the "Cryoconnect" wires for use in space telescopes and other big-science projects.
* ThruVision: British scientists and engineers developed the worlds first 2-colour camera which works in the terahertz region of the spectrum during a European Space Agency "StarTiger" project. The camera can "see through" many common materials which makes it very useful for seeing objects hidden in lorries or under clothes. Thruvision is now selling the camera to airports to improve their security screening.
* Althlete with carbon-fibre reinforced plastic prosthesis breaks Paralympic long-jump record. German Paralympian Wojtek Czyz smashed the long jump record with the help of a leg prosthesis using special carbon fibre reinforced plastic. The material was initially developed for use in the Alpha Magnetic Spectrometer, a cosmic ray detector which will be mounted on the international space station and used to study antimatter by German company MST Aerospace.

Sources:

"Down to Earth" <http://esamultimedia.esa.int/multimedia/publications/BR-280/pageflip.html>

<http://www.sdi.co.uk/sectors/aerospace-defence-marine/adm-sub-sectors/space/space-key-facts.aspx>

UK National Space Technology Strategy: <https://ktn.innovateuk.org/web/national-space-technology-strategy/document-library?p_p_id=20&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_count=1&ns_20_struts_action=%2Fdocument_library%2Fview&ns_20_folderId=3521558> (membership required to download- join for free)

**Character 2: some eye popping facts about the wonder of Space**

* Iron & Rocky Meteorites come from Asteroids, Moons and Rocky Planets and are 4.5 billion years old. The same age as our Solar System!
* With a diameter of 1,400,000km the Sun is 109 times bigger than the Earth and 10 times bigger than even our Solar System’s biggest Planet the Gas Giant Jupiter!
* Under the ice on Europa, one of Jupiter’s Moons is a huge Ocean which may harbour life!
* Saturn’s Moon Titan is the only moon so far discovered in our Solar System to have an atmosphere, rather than oxygen it is comprised of Methane!
* Comets are giant city sized snowballs with a rocky core; imagine making a snowball the size of Glasgow!
* If you attempted to count all the stars in a galaxy at a rate of one every second it would take around 3,000 years to count them all.
* Olympus Mons, a volcano found on Mars, is the largest volcano found in our solar system. It is 370 miles across and rises up for 15 miles.
* To date, more than 450 Exo-Planets orbiting Stars other than our Sun have been discovered by astronomers.

**Character 3: Space budgets**

This article from Wired Magazine is a good place to start, although incomplete:  
  
[http://www.wired.com/science/space/magazine/16-06/st\_spacerace](https://webmail.stfc.ac.uk/OWA/redir.aspx?C=02ad0d6207554b6198cafd3611757673&URL=http%3a%2f%2fwww.wired.com%2fscience%2fspace%2fmagazine%2f16-06%2fst_spacerace)  
The wikipedia page 'List of space agencies' is more exhaustive, with current budget for all major countries. It is wikipedia, so reliability is not guaranteed, but it has links to more reliable references (at least for the bigger players).  
[http://en.wikipedia.org/wiki/List\_of\_space\_agencies](https://webmail.stfc.ac.uk/OWA/redir.aspx?C=02ad0d6207554b6198cafd3611757673&URL=http%3a%2f%2fen.wikipedia.org%2fwiki%2fList_of_space_agencies)  
  
As for 'what they intend to spend', future budgets are much harder to find...

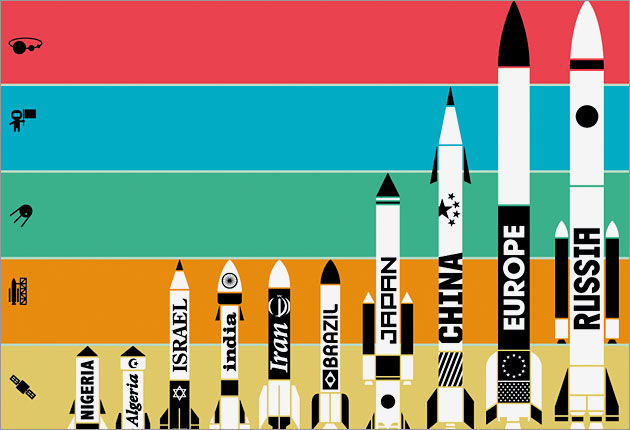
**Character 4: Statistics about Space junk, what has fallen to earth etc**

* The oldest known piece of orbital debris is the 1958 United States Navy operated Vanguard 1 research satellite, which ceased all functions in 1964.
* Discarded space debris circles Earth in orbits that range from as near as 150 miles (240 kilometers) to 22,500 miles (36,200 kilometers) away.
* There are over 300,000 fragments of artificial space debris of a size between 10 – 100mm in orbit around the Earth, and 12,000 pieces bigger than 100mm.
* The chance of being hit by space junk on Earth is 20 billion to one. Fortunately, most debris burns up during reentry, and no one has ever been killed.
* Orbiting Space debris can be anything, from old satellites, to hatches from spacecraft, and flecks of paint. In 2005, at least 13 nuclear fuel cores, eight thermoelectric generators and 32 spacecraft nuclear reactors were in Earth orbit!
* In the past 40 years, about 12 million pounds of manmade space junk has survived re-entering Earth's atmosphere.
* Weighing around 135 tons, the Russian owned Mir Space Station was one of the largest pieces of manmade space junk ever to fall to Earth, landing in the South Pacific Ocean on March 23rd 2001
* In 1965 during the first American Space walk, Gemini 4 Astronaut Edward White lost a spare glove which floated out of a hatch. For a month the glove stayed in orbit with a speed of 28,000 kph, becoming the most dangerous garment in history!

|  |  |  |
| --- | --- | --- |
| Country | Agency | Budget (USD) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/a/a4/Flag_of_the_United_States.svg/22px-Flag_of_the_United_States.svg.png[United States](http://en.wikipedia.org/wiki/United_States) | [NASA](http://en.wikipedia.org/wiki/NASA) (National Aeronautics and Space Administration) | $19,000 million[[61]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-60) |
| ESA[[show]](javascript:toggleNavigationBar(8);)  http://upload.wikimedia.org/wikipedia/commons/thumb/4/41/Flag_of_Austria.svg/22px-Flag_of_Austria.svg.png[Austria](http://en.wikipedia.org/wiki/Austria) http://upload.wikimedia.org/wikipedia/commons/thumb/9/92/Flag_of_Belgium_%28civil%29.svg/22px-Flag_of_Belgium_%28civil%29.svg.png[Belgium](http://en.wikipedia.org/wiki/Belgium) http://upload.wikimedia.org/wikipedia/commons/thumb/c/cb/Flag_of_the_Czech_Republic.svg/22px-Flag_of_the_Czech_Republic.svg.png[Czech Republic](http://en.wikipedia.org/wiki/Czech_Republic) http://upload.wikimedia.org/wikipedia/commons/thumb/9/9c/Flag_of_Denmark.svg/22px-Flag_of_Denmark.svg.png[Denmark](http://en.wikipedia.org/wiki/Denmark) http://upload.wikimedia.org/wikipedia/commons/thumb/b/bc/Flag_of_Finland.svg/22px-Flag_of_Finland.svg.png[Finland](http://en.wikipedia.org/wiki/Finland) http://upload.wikimedia.org/wikipedia/commons/thumb/c/c3/Flag_of_France.svg/22px-Flag_of_France.svg.png[France](http://en.wikipedia.org/wiki/France) http://upload.wikimedia.org/wikipedia/commons/thumb/b/ba/Flag_of_Germany.svg/22px-Flag_of_Germany.svg.png[Germany](http://en.wikipedia.org/wiki/Germany) http://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag_of_Greece.svg/22px-Flag_of_Greece.svg.png[Greece](http://en.wikipedia.org/wiki/Greece) http://upload.wikimedia.org/wikipedia/commons/thumb/4/45/Flag_of_Ireland.svg/22px-Flag_of_Ireland.svg.png[Ireland](http://en.wikipedia.org/wiki/Republic_of_Ireland) http://upload.wikimedia.org/wikipedia/commons/thumb/0/03/Flag_of_Italy.svg/22px-Flag_of_Italy.svg.png[Italy](http://en.wikipedia.org/wiki/Italy) http://upload.wikimedia.org/wikipedia/commons/thumb/d/da/Flag_of_Luxembourg.svg/22px-Flag_of_Luxembourg.svg.png[Luxembourg](http://en.wikipedia.org/wiki/Luxembourg) http://upload.wikimedia.org/wikipedia/commons/thumb/2/20/Flag_of_the_Netherlands.svg/22px-Flag_of_the_Netherlands.svg.png[Netherlands](http://en.wikipedia.org/wiki/Netherlands) http://upload.wikimedia.org/wikipedia/commons/thumb/d/d9/Flag_of_Norway.svg/22px-Flag_of_Norway.svg.png[Norway](http://en.wikipedia.org/wiki/Norway) http://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/Flag_of_Portugal.svg/22px-Flag_of_Portugal.svg.png[Portugal](http://en.wikipedia.org/wiki/Portugal) http://upload.wikimedia.org/wikipedia/commons/thumb/9/9a/Flag_of_Spain.svg/22px-Flag_of_Spain.svg.png[Spain](http://en.wikipedia.org/wiki/Spain) http://upload.wikimedia.org/wikipedia/commons/thumb/4/4c/Flag_of_Sweden.svg/22px-Flag_of_Sweden.svg.png[Sweden](http://en.wikipedia.org/wiki/Sweden) http://upload.wikimedia.org/wikipedia/commons/thumb/f/f3/Flag_of_Switzerland.svg/17px-Flag_of_Switzerland.svg.png[Switzerland](http://en.wikipedia.org/wiki/Switzerland) http://upload.wikimedia.org/wikipedia/commons/thumb/a/ae/Flag_of_the_United_Kingdom.svg/22px-Flag_of_the_United_Kingdom.svg.png[United Kingdom](http://en.wikipedia.org/wiki/United_Kingdom) | [ESA](http://en.wikipedia.org/wiki/European_Space_Agency) (European Space Agency) | $5,430 million (2011)[[62]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-61) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/f/f3/Flag_of_Russia.svg/22px-Flag_of_Russia.svg.png[Russia](http://en.wikipedia.org/wiki/Russia) | [ROSCOSMOS](http://en.wikipedia.org/wiki/Russian_Federal_Space_Agency) (Russian Federal Space Agency) | $3,800 million (2011)[[63]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-62) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/c/c3/Flag_of_France.svg/22px-Flag_of_France.svg.png[France](http://en.wikipedia.org/wiki/France) | [CNES](http://en.wikipedia.org/wiki/CNES) (French Space Agency) | $2,822 million (2010)[[64]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-63) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/9/9e/Flag_of_Japan.svg/22px-Flag_of_Japan.svg.png[Japan](http://en.wikipedia.org/wiki/Japan) | [JAXA](http://en.wikipedia.org/wiki/Japan_Aerospace_Exploration_Agency) (Japan Aerospace Exploration Agency) | $2,460 million[[65]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-64) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/b/ba/Flag_of_Germany.svg/22px-Flag_of_Germany.svg.png[Germany](http://en.wikipedia.org/wiki/Germany) | [DLR](http://en.wikipedia.org/wiki/German_Aerospace_Center) (German Aerospace Center) | $2,000 million[[66]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-65) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/f/fa/Flag_of_the_People%27s_Republic_of_China.svg/22px-Flag_of_the_People%27s_Republic_of_China.svg.png[China](http://en.wikipedia.org/wiki/People%27s_Republic_of_China) | [CNSA](http://en.wikipedia.org/wiki/China_National_Space_Administration) (China National Space Administration) | $1,300 million[[67]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-66) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/4/41/Flag_of_India.svg/22px-Flag_of_India.svg.png[India](http://en.wikipedia.org/wiki/India) | [ISRO](http://en.wikipedia.org/wiki/Indian_Space_Research_Organisation) (Indian Space Research Organization) | $1,268 million[[68]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-67) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/0/03/Flag_of_Italy.svg/22px-Flag_of_Italy.svg.png[Italy](http://en.wikipedia.org/wiki/Italy) | [ASI](http://en.wikipedia.org/wiki/Agenzia_Spaziale_Italiana) (Italian Space Agency) | $1,000 million[[69]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-68) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/c/ca/Flag_of_Iran.svg/22px-Flag_of_Iran.svg.png[Iran](http://en.wikipedia.org/wiki/Iran) | [ISA](http://en.wikipedia.org/wiki/Iranian_Space_Agency) (Iranian Space Agency) | $500 million[[70]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-69) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/a/ae/Flag_of_the_United_Kingdom.svg/22px-Flag_of_the_United_Kingdom.svg.png[United Kingdom](http://en.wikipedia.org/wiki/United_Kingdom) | [UKSA](http://en.wikipedia.org/wiki/UK_Space_Agency) (UK Space Agency) | $414 million[[71]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-70) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/0/05/Flag_of_Brazil.svg/22px-Flag_of_Brazil.svg.png[Brazil](http://en.wikipedia.org/wiki/Brazil) | [AEB](http://en.wikipedia.org/wiki/Brazilian_Space_Agency) (Brazilian Space Agency) | $343 million[[72]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-71) |
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| http://upload.wikimedia.org/wikipedia/commons/thumb/4/49/Flag_of_Ukraine.svg/22px-Flag_of_Ukraine.svg.png[Ukraine](http://en.wikipedia.org/wiki/Ukraine) | [NSAU](http://en.wikipedia.org/wiki/NSAU) (National Space Agency of Ukraine) | $250 million[[75]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-74) |
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| http://upload.wikimedia.org/wikipedia/commons/thumb/3/32/Flag_of_Pakistan.svg/22px-Flag_of_Pakistan.svg.png[Pakistan](http://en.wikipedia.org/wiki/Pakistan) | [SUPARCO](http://en.wikipedia.org/wiki/Space_and_Upper_Atmosphere_Research_Commission) (Space and Upper Atmosphere Research Commission) | $82 million[[80]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-79) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/2/20/Flag_of_the_Netherlands.svg/22px-Flag_of_the_Netherlands.svg.png[Netherlands](http://en.wikipedia.org/wiki/Netherlands) | [SRON](http://en.wikipedia.org/wiki/SRON) (Netherlands Institute for Space Research) | $26 million[[81]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-80) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/f/f3/Flag_of_Switzerland.svg/17px-Flag_of_Switzerland.svg.png[Switzerland](http://en.wikipedia.org/wiki/Switzerland) | [SSO](http://en.wikipedia.org/wiki/Swiss_Space_Office) (Swiss Space Office) | $10 million[[82]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-81) |
| http://upload.wikimedia.org/wikipedia/commons/thumb/f/fc/Flag_of_Mexico.svg/22px-Flag_of_Mexico.svg.png[Mexico](http://en.wikipedia.org/wiki/Mexico) | [AEM](http://en.wikipedia.org/wiki/Agencia_Espacial_Mexicana) (Mexican Space Agency) | $8.34 million[[83]](http://en.wikipedia.org/wiki/List_of_space_agencies#cite_note-82) |

**Is There Any Country That Doesn't Have a Space Program?**

By Ben Perreau [Email](http://www.wired.com/services/feedback/letterstoeditor)05.19.08

[](http://www.wired.com/science/space/magazine/16-06/st_spacerace)

[http://www.wired.com/images/zoom.gif](http://www.wired.com/science/space/magazine/16-06/st_spacerace)

*Illustration: Visit Office*

start

Previous: [15th Anniversary: A New Analysis of the New Economy's New Rules](http://www.wired.com/techbiz/media/magazine/16-06/st_15th_newrules)

Next: [Clive Thompson on How Man-Made Noise May Be Altering Earths Ecology](http://www.wired.com/science/planetearth/magazine/16-06/st_thompson)

**As technology makes** the world smaller, it's also helping more countries escape to the heavens. (Ground control to Major Olawale!) But don't start daydreaming of UN meetings on Mars and space walks for peace: These space programs are all about blasting surveillance tech, comet chasers, super telescopes, and celestial probes into the (increasingly crowded) cosmos.

**Nigeria**   
**Program Founded:** 1998   
**Budget:** $93 million (initial funding)   
Yes, Nigeria actually has its own space agency. The organization sent up its first satellite, a weather unit, back in 2003. In May 2007, China assisted in the launch of NigComSat-1, which helps provide Internet access to rural areas of the country.

**Algeria**   
**Program Founded:** 2002   
**Budget:** Unknown   
France helped establish a constellation of desert launch sites more than 60 years ago. In 2002, the newly formed Agence Spatiale Algerienne blasted up Alsat-1, a 200-pound cube that has beamed back more than 1,000 photos as well as intel for disaster relief.

**Israel**   
**Program Founded:** 1983   
**Budget:** $50 million (est.)   
Israel's Shavit launch vehicle is used primarily for communications, imaging, and research satellites — always over the Mediterranean to avoid flying above hostile neighbors. The first Israeli astronaut, Ilan Ramon, died aboard the NASA shuttle Columbia.

**India**   
**Program Founded:** 1972   
**Budget:** $1 billion   
India's space agency is racing to be the sixth program to reach the moon (after Russia, the US, Europe, Japan, and China) with Chandrayaan-1 — an $83 million lunar orbiter carrying NASA and ESA instruments. India aims to send up its own manned lunar mission by 2020.

**Iran**   
**Program Founded:** 2003   
**Budget:** $100 million   
In October 2005, Iran launched its first satellite, Sina-1, aboard a Russian rocket. Earlier this year, the country fired its own rocket, Kavoshgar-1, designed to scout future orbital paths. By 2010, Tehran expects to deploy four additional satellites.

**Brazil**   
**Program Founded:** 1994   
**Budget:** $125 million   
In 2003, an explosion on the launch pad took 21 lives. But Brazil rebounded the next year, when a VSB-30 rocket reached an altitude of 160 miles. In 2006, Marcos Pontes became the first Brazilian in space, floating aboard the International Space Station for eight days.

**Japan**   
**Program Founded:** 2003   
**Budget:** $2.5 billion   
Japan has yet to build a spacecraft fit for humans. But it did send the first journalist into space: 18 years ago, Toyohiro Akiyama spent a week on the Russian space station Mir. The Japanese are eyeing a lunar landing in 2020 and hoping to build a base on the moon by 2030.

**China**   
**Program Founded:** 1993   
**Budget:** $2 billion (est.)   
From the Gobi Desert, China sent its first human into orbit in 2003 — becoming the fourth agency to do so. Today, manned missions are taking off on a regular basis. Officials are planning China's first space walk this fall and expect to launch a moon rover by 2012.

**European Space Agency**   
**Program Founded:** 1975   
**Budget:** $5 billion   
On the ESA's plate: launching the James Webb Space Telescope (with NASA and Canada) in 2013. The following year, its Rosetta spacecraft will meet up with 67P/Churyumov-Gerasimenko for the first long-term analysis of a comet.

**Russia**   
**Program Founded:** 1920s   
**Budget:** $1.5 billion   
Russia helps fund its space program by licensing its rocket tech and assisting other countries' initiatives. (South Korea paid $25 million to send up its first citizen.) A joint effort with China aims to launch a soil-collecting satellite to the Martian moon Phobos in 2009.

\* Wired apologizes to those countries funding space exploration that we did not mention, such as Argentina, Australia, Bulgaria, Chile, Colombia, the Czech Republic, Denmark, Egypt, Germany, Greece, Indonesia, Italy, Kazakhstan, Luxembourg, Malaysia, Mexico, the Netherlands, Norway, Pakistan, Poland, Portugal, Saudi Arabia, South Africa, Spain, Sweden, Thailand, Turkey, the UAE, the UK, and, likely, North Korea and Iraq.

**Nigeria**   
**Program Founded:** 1998   
**Budget:** $93 million (initial funding)   
Yes, Nigeria actually has its own space agency. The organization sent up its first satellite, a weather unit in 2003. In May 2007, China assisted in the launch of NigComSat-1, which helps provide Internet access to rural areas of the country