



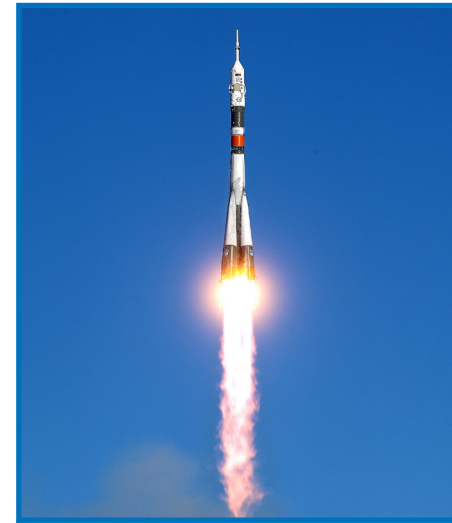
SHOULD SPACE TRAVEL BE LEFT TO PRIVATE COMPANIES?

THE DILEMMA

Missions into space are a very expensive business. As the European Space Agency (ESA) says, “high technology on the space frontier is not cheap”.

For example, the cost of preparing and launching NASA’s Curiosity Mars rover in 2011 reached \$2.5 billion (£1.7 billion). To date, the International Space Station has cost more than \$160 billion (£115 billion) to maintain. Approximately \$100 billion (£70 billion) of that was put in by the USA. The budget for NASA, the USA’s space agency, is around \$18 billion (£13 billion) a year. That money comes from taxes, which are paid to the US government by ordinary people from their earnings and on most goods they buy. The ESA’s yearly budget is around €5 billion (£4.4 billion).

For many years, only very powerful governments could afford to fund major space travel. The USA and Soviet Union were the big players during the space race and they spent a lot to beat each other to major space achievements. However, private companies have long been involved. Back in 1962, NASA launched the first privately-built satellite. But more recently, private companies – usually owned by very wealthy individuals – have started planning, funding and executing entire missions.



A Soyuz-FG booster rocket carrying a spacecraft



President Trump shows his space directive

Perhaps the most famous of these is American company SpaceX, owned by billionaire Elon Musk. They recently sent a car and a mannequin into space on a powerful rocket. Meanwhile, Richard Branson’s Virgin Galactic are developing spaceships to take tourists into space on brief trips.

US President Donald Trump has recently proposed increasing funding for space travel by encouraging partnerships with private companies. More controversially, he has also said he would like to end US government funding for the ISS by 2025. NASA currently spends between \$3-4 billion (£2.15bn-2.8bn) each year on the ISS. If the USA stops providing money – and no suitable arrangements are made with private companies to carry on funding it – the ISS may have to close down.

But with so many pressing needs here on planet Earth, such as healthcare, education and looking after a growing elderly population, should governments really be spending billions on space travel? Wouldn’t it be better left to private companies, so that governments can focus on their citizens?

PUBLIC OWNERSHIP & PRIVATE ENTERPRISE

Public ownership means something that is entirely owned by the public because they pay for its upkeep through their taxes. It usually refers to government-run organisations such as NASA, the police, armed forces or, in some countries, the railways. In the UK, many industries have been privatised. This means they were sold by the Government to private companies, who usually operate them at a profit (making more money than they spend). For example, 25 years ago, all the railway companies, tracks and

stations were under public ownership. In the late 1990s, they were all separated and sold off to private companies. Richard Branson's Virgin is one of several firms to own a chunk of the UK railway network.

But it isn't always straightforward. Some privately run enterprises, such as the railway network, still receive public money from the Government. So taxes are still helping to fund private companies, which angers some people.



NASA is a public body in America



A graffitied sign for Carillion

PUBLIC-PRIVATE PARTNERSHIP (PPP)

In the last 20 years, there has been an increase in partnerships between the state (public) and private companies. In these arrangements, public bodies, such as local councils or the national government, collaborate with private companies. Politicians who support PPPs argue that private companies are more efficient than the public sector. But when PPPs go wrong, they can be disastrous. One example of an epic PPP failure is the Mexican road programme, which left drivers there with some of the most expensive road tolls

in the world. The Mexican government ended up having to take 23 projects back into public sector control – and pay off £3.6 billion of debt.

More recently, a PPP between the UK Government and a company called Carillion ended in catastrophe. Carillion were trusted with various projects, including building hospitals and roads. But earlier this year the company collapsed with huge debts of £900 million, leading to job losses, and several important projects left unfinished.

FACTS & FIGURES



Yuri Gagarin

- Soviet cosmonaut, Yuri Gagarin, became the first human to go into outer space in **1961**
- American astronaut, Neil Armstrong, became the first human to walk on the moon in **1969**
- NASA's Apollo lunar landing program cost **\$24 billion** in **1960s** dollars
- More than **18,000** people work for NASA

- Today's NASA budget is **10 times less** than what it was in the **1960s**
- The European Space Agency employs about **2,000 people** worldwide
- According to the UK Space Agency, the British space sector contributes **£9.1 billion** a year to the UK economy and directly employs **28,900 people**
- The European Space Agency (ESA) was founded in **1975**. Collaboration between European states on space projects has been taking place since **1964**

- **1** British astronaut, Tim Peake, has worked on the International Space Station



Tim Peake

THE SPACE RACE



There was a time when exploring space wasn't just important for science and a sense of human adventure, but also for global politics.

While Britain has never been a major player in the space industry, the USA and Soviet Union reigned supreme in the 20th century. The so-called "space race" between them began in August 1955, when the Soviet Union announced it would launch a satellite in direct response to the USA's announcement of a launch a few days earlier. The Soviets got there first in October 1957, when the Sputnik 1 satellite went into orbit. The Americans were the first to take a person to the moon, in July 1969, but the Soviets put the first human being into space eight years previously, when Yuri Gagarin took part in the first human spaceflight in history and first orbital flight of a manned vehicle, on Vostok 1. The first

animal to orbit the Earth was Laika, a dog launched by the Soviets in the spacecraft Sputnik 2 in November 1957, while the Americans successfully completed six missions that put men on the moon between 1969 and 1972. All of these incredible achievements were at a time when space was a priority for the American and Soviet governments. The Cold War, which put the two countries against each other from the 1940s until the collapse of the Soviet Union in the early 1990s, meant that both the Americans and the Soviets wanted to show their strength, ambition and power through daring space missions. These missions caught the public's imagination as people sought to learn more about our planet and our place in the universe. The space race and its achievements were only possible thanks to huge investment and support from the two countries' governments.

NASA BUDGETS

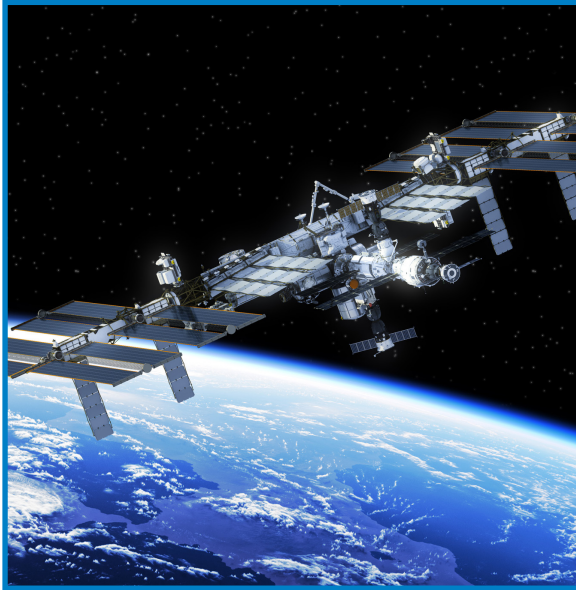
The biggest and most successful space agency in the world, NASA, has a huge budget. But it used to be a lot bigger. Here's how much money NASA has been awarded by various US governments since its creation in 1958 – and what that represents as a percentage of total US government spending:



Year	Budget	% of total govt spending
1958	\$89 million	0.1%
1965	\$5 billion	4.31%
1970	\$3.7 billion	1.92%
1980	\$4.9 billion	0.84%
1988	\$9 billion	0.85%
1993	\$14.3 billion	1.01%
2001	\$14 billion	0.76%
2009	\$19.1 billion	0.54%
2017	\$19.3 billion	0.47%

“Mars is the next... frontier for human exploration, and it's an achievable goal. There are challenges to pioneering Mars, but we know they are solvable. We are well on our way to getting there, landing there and living there.” – NASA

THE ISS



The International Space Station is a space laboratory in Earth's orbit and the largest artificial satellite that has ever orbited Earth. It has been inhabited by over 200 people since the year 2000, including Britain's Tim Peake. It travels at an altitude of 400km, at 28,160 km per hour, and it orbits the Earth every 90 minutes. Experiments and research that take place on board the ISS are designed to help with our understanding of planets, comets, asteroids and Earth, as well as the effects of space travel on human health. The ISS is a truly global project; the main participants are NASA, the ESA, Roscosmos (Russia), the Japan Aerospace Exploration Agency and the Canadian Space Agency.

THE ESA: BRINGING COUNTRIES TOGETHER



As the ISS has demonstrated, space travel isn't just about the missions. It's also about bringing people and countries together for a common goal.

The ESA was established in 1975, and brings together 20 European states with the common goal of exploring space. The single biggest contributor is the EU, which gives some €900 million (£739 million) a year, with Germany, France, Italy and the UK being the next biggest donors. The total budget is less than a third of the size of NASA's. The ESA website states that, "ESA's programmes are designed to find out more about Earth, its immediate space environment, our solar system and the universe, as well as to develop satellite-based technologies and services, and to promote European industries." Are we better off pooling our resources and talent with other countries to work on space projects, rather than relying on private companies?

UPCOMING MISSIONS



The Juno spacecraft is probing Jupiter, the Spirit and Opportunity rovers are on Mars, and the BepiColombo probe is set to leave for Mercury later this year. But where will astronauts go next – and how much might it cost?

We haven't set foot on the moon since 1972, but late last year Donald Trump ordered NASA to focus on returning humans to the moon. He said: "This time we will not only plant our flag and leave our footprint — we will establish a foundation for an eventual mission to Mars and perhaps someday to many worlds beyond."

NASA reckons they can put a human on Mars by the 2030s. The private Mars One project, which says it will establish a human colony on the Red Planet, has faced a huge amount of criticism from scientists and astronauts for being unrealistic. The mission is already well behind schedule. Do major projects like a trip to Mars need the might of a national organisation like NASA, or are the costs so high that the private sector should take the lead?

YES, SPACE TRAVEL SHOULD BE LEFT TO PRIVATE COMPANIES



- 1. IT'S TOO EXPENSIVE** – Missions to the moon and Mars will cost billions. It makes sense that these expensive projects are paid for by wealthy individuals and co-ordinated by private companies. It's not right to use public money on such huge, costly missions.
- 2. PRIVATE COMPANIES ARE ALREADY LEADING THE WAY** – Elon Musk is showing how good the private sector can be in paving the way for future space missions. His SpaceX company's Falcon 9 rocket has already delivered and returned cargo from the ISS for NASA.
- 3. THEY CAN RAISE THE MONEY MORE QUICKLY** – On a practical level, super-wealthy billionaires like Musk and Branson can raise the necessary money for major space travel far more quickly than a government that has to fund lots of commitments, such as healthcare and education.

NO, SPACE TRAVEL SHOULD NOT BE LEFT TO PRIVATE COMPANIES



- 1. IT SHOULD BE THE NATION'S ACHIEVEMENT** – Space travel should be a proud achievement for the country and its citizens. By keeping space programmes under public ownership, everybody owns a bit of the mission and can share in its success. It isn't the achievement of one wealthy person; it's the achievement of every citizen.
- 2. PRIVATE COMPANIES CANNOT BE TRUSTED WITH IT** – Private companies exist to make money. We cannot trust them with major projects such as a mission to Mars, because they might put money ahead of safety. Also, if the private company falls into financial problems, the entire project could collapse.
- 3. MAJOR PROJECTS NEED THE BACKING OF GOVERNMENTS** – Just as it took thousands of Soviet scientists to get Yuri Gagarin into space, and it took thousands of American scientists to get men on the moon, big space projects need big support. Governments can attract the brightest and the best minds and are experienced at spending huge amounts of money.

DISCUSS 

How important is space exploration to you?

DISCUSS 

What are the benefits of space exploration?

DISCUSS 

What are the drawbacks to space exploration?

DISCUSS 

Is it important that we learn more about our planet, the solar system and the galaxy?

DISCUSS 

Should space travel be entirely funded by the public through taxes?

DISCUSS 

Should space travel be entirely funded by private companies?

DISCUSS 

Or should space travel be funded by a mix of public and private money?

DISCUSS 

Would you like to see the UK spend more on space missions?

DISCUSS 

Should more money be spent on space exploration, or are there too many problems here on Earth that need funding?