

Derek's Replies to Questions

Dear Year 5,

Thank you for your interest in space travel. I also am very interested in space travel and will try to answer some of your questions which your teacher sent to me. Keep studying, and you, too, might someday be able to work in the space business!

Best wishes,

Derek Webber, Maine, USA 29th November, 2019

1. How long would it take you to travel to the Moon in a rocket? (Fatimah C9)

Hello Fatimah,

Thank you for starting me off with an easy question. This one I do know! It took the Apollo astronauts three days to reach the Moon, and another three days to return to Earth. The Apollo capsule which took them was just about the size of a big car. Can you imagine being inside a car (with its own toilet) for six days or more with two of your best friends, and not being able to open the door or window? I bet it got rather uncomfortable inside, don't you think? I hope they were all tidy.

2. How much fuel would it take to get to the Moon and back? (Yahya C8)

Hello Yahya,

Now the question is so hard that I do not know the answer! But I do know how *to find* the answer for you. I can look it up in a book. Or maybe I can find it using Google. I do remember that they went to the Moon using a Saturn 5 rocket, so let's check in a book what it used for fuel. And the answer is:

1st Stage 214,000 gallons of kerosene and 346,000 gallons of liquid oxygen, that makes 567,000 gallons of fuel altogether for the 1st stage.

2nd Stage 267,000 gallons of liquid hydrogen and 87,000 gallons of liquid oxygen, that makes 354,000 gallons of fuel altogether for the second stage.

3rd Stage 67,000 gallons of liquid hydrogen and 20,000 gallons of liquid oxygen, so that makes 87,000 gallons of fuel altogether for the third stage.

I leave it to you to work out in total how many gallons of kerosene, liquid oxygen and liquid hydrogen were needed for the whole 3-stage Saturn 5 rocket for the Moon mission. How many gallons does your car take to fill it up? How can oxygen and hydrogen be liquid – maybe you can find out and tell your teacher.

3. How much money would people have to pay to travel to the Moon (or into space) (Simra & Qaim C8)

Hello Simra and Qaim,

In the old days, only government astronauts could go into space, and so you could not go for all the money in the world! But now, things are changing, and there is something called space tourism, so if you save very hard you can pay to go into space for a holiday. There are three different ways, and you need a lot of money for each of them right now, but prices will get cheaper in the future. Let's start with the most expensive way:

Going to the Moon, and circling around it, and coming back to Earth. You already know how long this holiday would take. This has not yet been done by a space tourist, but the price ticket would be \$ 150 million, and two firms are waiting for the first customers who can afford the ticket. From the Moon, looking back, the Earth

would look like a small blue and white marble, slowly spinning.

Going into orbit around the Earth. This has already been done by a few space tourists, and they each paid around \$20 million and stayed in orbit for a week or two before returning to Earth. They all thought it was worth it to be able to look down and see everywhere on Earth as they orbited once every 90 minutes seeing 16 sunrises and sunsets each day. When it was night-time down below they could see the cities all lit up.

Going on a **short straight-up-and-down job** into space. This is called sub-orbital space tourism, and is going to start happening maybe next year, so look out for seeing it on TV when it starts to happen. This flight will only last for about an hour or so, and will be very much cheaper. There will be about 4 minutes of weightlessness at the highest point, and you will see the black sky, even in daytime, and begin to see the curvature of the horizon – which you always think of as straight and flat here on the surface. It will only cost you about \$200,000. Did I say “only”?! It is still too expensive for me. I wish I had started saving when I was much younger.

4. How much would it cost to get to Mars and is it worth it? (C7)

At the moment there are no available tickets for flights to Mars, although that will happen eventually. It is a very long mission, and not really a holiday at all, because the journey takes six months each way. It would be more like going camping in Antarctica, but colder. So, the first visitors will not be tourists, but explorers. They will have to figure out a lot of things about living on Mars, before tourists can do the journey. They need to figure out how to make food, and how to make air to breathe, and how to make water to drink. There are folks right now who are working on trying to solve these problems, and they will be needing new recruits to help them. Maybe you could join them once you have passed your exams.

The second part of your question is tougher to answer. It is always amazing to make explorations and discover new places. And it would be neat to be the first woman or man on Mars, don't you think? But it will be a very costly venture. And we all need to decide on which things to spend our money on. So, at least during the remainder of my life (I am now 74) I am not expecting to see this happen when I switch on TV. But it is likely that all of you *will* see it happen, and it will be as exciting for you as it was for me when I watched the first Moon landings on TV in 1969.

In the very long term (I'm talking millions of years, so no need to panic!) humans will need to find somewhere else to live farther away from our Sun in the solar system, because scientists tell us the Sun will eventually expand making life on Earth impossible. So, we need to continue our work of space travel and exploration so that future generations will be able to take advantage. Don't you agree? This is *not* to be confused with global warming, which you may have heard about, and which is a much smaller effect that we humans can fix here on Earth in the near term.

5. How long have you lived in America and why did you move there? (Aadam C8)

Hello Aadam,

I came to America 26 years ago. I was born in Jarrow in 1945, and went to school, and university, with your teacher's dad from 1956 to 1966.

My wife died, and my daughter went off to university, and I wanted to do something new about space, and America is a good place for that, so I came here in 1993. There is plenty of space work in England, too, but I wanted to try something completely different, and as a result I helped make the space tourism industry get going!

Do you know where you can do space work in England? That could be a good project, to find out!

6. Did anyone inspire you to work in the space industry and if yes who? (Aminah C8)

Hello Aminah,

My parents encouraged my early interest in aviation, and **my school physics teacher** Robert R Hopwood helped me to enjoy science projects.

World events happened which caught my attention. I was about your age when the space age started with the launching of the first satellite Sputnik 1. Can you find out when that happened? Then the first astronauts were launched – Gagarin, Shepard, Glenn – and I followed all their achievements on radio and newspapers. I used to collect foreign postage stamps, and found some postage stamps which celebrated space achievements. You may still be able to find some today. I also used to make model rocket kits.

I decided that, if I could pass my exams and get to university to study physics and maths, then I could maybe get a job in the space industry.

7. How did you become involved in the space industry? (C7)

I went to Newcastle University and studied Physics and Mathematics, and ended up getting a B.Sc Degree. After I graduated, there were job interviews with a number of companies who came to the University to meet with potential new recruits. I was offered, and accepted, a job as an engineer with a company which was then called Hawker Siddeley Dynamics, but is now part of Airbus. I had to leave my home, in the North East of England, and go down to the London area to do the work, and my parents were sad, but understood that I had to do this work. I worked on rockets and satellites while I was there. Later on, I moved to another firm, called Inmarsat, where I eventually was in charge of buying satellites, and the rockets for launching them. Then, as I told Aadam, I came to the US and have been working on space tourism.

8. How long have you been working in the space industry? (Hafizah C9)

Hello Hafizah,

It is easy to give you a short answer, and just say “50 years”, but it really depends on a lot of things. For instance, I am now retired, but I still do some work. I find it hard to separate “work” from the rest of my life, because I enjoy it so much. It is my hobby, too. Nowadays I enjoy writing books about my experiences in the space business, and it is hard to think of that as “work” – it is more like “fun” to me!

9. What do you like about your work? (Inayah C8)

Hello Inayah,

I like the fact that it helps humankind. I like the fact that it involves exploration and new discoveries. I like the fact that it uses stuff that I learned when I was your age, and continued to learn all the way through university. I like the fact that it gets me in touch with people from all over the world.

Because of my work I have had some wonderful experiences. I took my wife to see a rocket launch, for instance, and that was very special. I shook hands with the first man to walk on the Moon, and still think that was very special. He did it 50 years ago this year. Do you know his name? I also met the second man to walk on the Moon. What was he called? I bet you do not know the name of the third man to walk on the Moon!

10. Which planet would you choose to visit and why? (C7)

I think you know, from earlier answers that I gave, that I am not expecting to visit any planets any time soon! Which planets would *you* want to visit? There is nowhere in the solar system that is half as good as Earth for supporting human life, so it is very important that we all take good care of it. The nearest planets are Venus and Mars. Venus is too hot and Mars is too cold, and neither of them have breathable atmospheres right now.

Maybe by the time your own children are working in the space business, or even earlier, we may have made enough progress, so that you can watch on TV. I think Mars will be first. It is the closest thing to Earth in many respects, including the length of its day. Have you ever thought about what a day is? It is the time a planet takes to spin around once. Our bodies are used to living on Earth and having day and night adding up to 24 hours, so it would be a help in exploring further to find places where the day is about the same length as ours here on Earth.

11. What is your opinion of the Rare Earth theory? Do you agree or do you think that there are likely to be many other worlds with life on? (C7)

First of all, it is important to realize that *no-one knows*. No-one knows if there is any kind of life at all – even little bacteria – anywhere else but on Earth. Isn't that astonishing? We know that there are billions and billions of stars out there, and we know that planets circulate around stars. So there must be even more billions of planets. Even in our own solar system, we have not been able to discover any life elsewhere than on Earth. But we have not given up looking, and NASA has some projects happening which will explore some of the Moons of our outer planets, looking for evidence of any kind of life. I wonder what they may find?

Meanwhile, we study life on Earth, and try to figure out how it developed from the start. For instance, did you know that when there were dinosaurs on Earth, we humans had not yet arrived on the scene? So, even if we discover some primitive life elsewhere, it will be much harder to find intelligent life. So far, scientists have discovered that primitive life can survive on Earth in the most amazingly challenging places, like deep under the ocean, or near volcanoes spouting lava, so this raises hope that some form of primitive life might have arisen in some unappetising places in the outer reaches of our solar system. Keep watching for news of these new space probes, to see what they find.

12. Why do you think that it is so important that we continue to explore space?

OK, Class,

So by now I think you can answer this question yourself!

I want you to give your teacher your best 2 reasons which she can send me, so that I can check if you were listening! Also, please ask any more questions if you would like to, and I will answer them if I find that you have been listening!

Be good students. Do your best work. Be kind to your friends and teachers.

Derek