

PUPILS 2 PARLIAMENT

RESPONSE TO THE UK SPACE AGENCY

CONSULTATION ON

Orbital Liabilities, Insurance, Charging and Space Sustainability

School pupils' views

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on behalf of Pupils 2 Parliament

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Pupils 2 Parliament is an independent charity-run project working with schools in England and Wales to gather and submit school pupils' views and votes on current Government consultations and Parliamentary Select Committee inquiries. The project has permission from the Clerks of both Houses of Parliament to use the term "Parliament" in its title.

Our response presents the views and votes of 78 children aged 9 to 11, from three discussion groups held at Eardisley CofE Primary School, , Knighton Church in Wales Primary School, and Presteigne Primary School.

INTRODUCTION

1. Pupils were asked for their views on Section 3 of the consultation, regarding UK leadership on space sustainability in the longer term. Children have a strong commitment and clear investment in the future. Their views give a valid perspective from a key sector of the population, and they bring both fresh thinking and a keen sense of fairness to complex policy issues. They can give an 'unadulterated' baseline of public perceptions on an issue. What they have to say is direct, to the point, and deserves serious consideration.
2. We put questions and issues to the children from the consultation document, without bias or 'leading' their responses. Pupils' views are reported without selection, representing as far as possible the views of children and nothing but the views of children.
3. Each of the sections below links with the stated question in Section 3 of the consultation document.

Consultation Question 41:

Could the UK do more, or perhaps less, in the area of space sustainability?

4. We asked children what they already knew about orbital debris ('space junk'). They provided an accurate account from existing knowledge of the nature of orbital debris, although many included meteorites as elements they thought present amongst the human-made orbiting debris.
5. Before we gave them any further information, we asked 49 of the children to rate how much of a problem they thought it is, on a 5-point scale from 'a very big problem', through 'quite a big problem', 'in the middle' and 'only a small problem' to 'not really a problem at all'
6. The children's median rating was that orbital debris is "quite a big problem".
7. After discussing the issues and possible solutions (from the consultation document), we asked the same children to rate the problem of orbital debris again. This time, the median rating was "a very big problem". With further information and after discussing the

issues, the children had increased their rating of the size of the problem by 22%.

8. Further information and awareness of orbital debris was associated with an increase in perception of it as a substantial problem – and something the UK could do more to address.

Consultation Question 44:

What should be the UK Government's priorities to address space sustainability?

9. All three groups of children rated the priority of each of 17 actions to deal with orbital debris and space sustainability, put to them and explained from the consultation document.

10. The six actions they rated as the highest priorities for the UK to take were, in descending order of priority:

1st Active Debris Removal

2nd Reducing carbon emissions from space launches

3rd Tracking satellites and debris in orbit

4th Enable future satellites to be dropped out of orbit

5th Enable future satellites to manoeuvre to different orbits

6th In-Orbit Servicing

11. Active Debris Removal came a very clear first in the children's priority ratings. But they were also aware of some of the challenges and problems: "this is a thing that hasn't worked before", so there is a risk that the attempt "is going to be a waste of time". There was also a concern that retrieved items of debris "can't be reused".
12. Moving defunct satellites into an outer 'graveyard' orbit did not receive a great deal of support, coming 15th out of the 17 options. As one child put it "it's still up there". Another objected that it would essentially "create two layers of junk in orbit".
13. While passivation was seen as a sensible measure, likely to reduce the risk of explosions, it was not widely supported as a means of dealing with orbital debris. As one child summarised it, "it's still there to smash into something else".
14. Building new satellites capable of controlled re-entry was seen as an important way of avoiding debris surviving re-entry from hitting land.

15. Apart from concerns about impacting human-inhabited areas, there was much concern about debris causing injury to animals in many more land areas than those.
16. Children were also concerned about the polluting effects and potential damage to marine life by re-entry debris falling into oceans, unless they were retrieved and recycled.
17. The idea of reducing the reflectivity of future satellites is described in the consultation document as a means of reducing a problem for astronomy, in pursuit of dark skies. **One child however raised the issue that an increasing mass of shiny satellites and debris orbiting Earth could reflect back heat which would otherwise escape from the planet, and therefore contribute to global warming.**
18. This concern greatly increased the priority the pupils in that group then gave to reducing the reflectivity of future satellites and equipment that may end up in orbit.
19. There was support for reviewing the materials used to build future satellites with the objective of reducing the risk of shattering in collisions or explosions.
20. It is worth reporting that as we started to work orally through the list of items to prioritise, and before we had mentioned Active Debris Removal, **one child asked whether it would be possible to invent a 'grabber satellite' that could be put into orbit to chase, capture and bring defunct satellites back to Earth.** She had not previously heard of this being a possibility.
21. That a primary school child spontaneously and accurately anticipated Active Debris Removal as the way ahead for dealing with orbital debris is a strong message for the UK roadmap for space sustainability.

Consultation Question 45:

What other actions could be included in the roadmap to address space sustainability?

22. A pupil in one of our groups proposed that the UK Government should try to negotiate **an international limit on the number of satellites in orbit.** This was amended by a second pupil to include

the provision that **this limit should regularly be adjusted in the light of the volume of space debris in orbit, and the amount of debris successfully removed by ADR.**

23. The amended proposal was carried by the group by 25 votes to one. I therefore pass it on for consideration to the UK Space Agency.
24. Another proposed action for the roadmap was to **tighten up the requirements for thorough investigation of rocket and spacecraft failures and crashes, to contribute to future design.**
25. A further children's proposal was for the **development of specialist missiles with rubber flat or plunger-shaped (rather than pointed) noses, to impact defunct and satellites and debris at low approach speeds to push them out of orbit without shattering them. These would be built so that if anything did shatter on impact, it would be pieces of soft rubber from the nose of the missile, rather than metal from the target, which would be added to the orbiting debris.**

Consultation Question 48:

Do you agree that aspects of Earth sustainability should be included in this definition? Which aspects should be covered in the proposed roadmap?

26. The children saw sustainability of Earth's resources as important to include.
27. They were particularly concerned at precious materials being converted to atmospheric and oceanic pollution by the heat of re-entry, and at any failure to recycle items falling as debris into the ocean or left when defunct on the surface of the Moon or other planets.

Consultation Question 55:

Is there any other regulatory action needed to facilitate ADR and IOS services?

28. Children in two of our groups spontaneously and independently proposed that **ADR should be used, together with control of those satellites that are manoeuvrable, in order to clear safe paths ("junk free tunnels") through orbiting debris for manned**

and other space craft to travel through on the way to the Moon, Mars and elsewhere.

29. Another proposal was that **“you should have to retrieve your junk [from orbit] before you can send up your new rocket”**.

Consultation Question 57:

Do you have any views as to whether governments should have a role in debris removal?

30. One of our three groups of children voted on who they thought should pay the cost of debris removal. The options offered to them were placing the responsibility on the launch companies or organisations, on the governments of the countries who had launched the satellites, or alternatively establishing a global ADR fund.
31. Payment by the governments who were responsible for the relevant satellite or other launches received the most votes, by a narrow margin. Some however were concerned that this option would inevitably mean many people having to bear the cost by an increase in taxes.
32. Least votes went to expecting launch companies and organisations actually to meet the cost.

Consultation Question 58:

Would you support the establishment of a global ADR fund, even if UK industry was not the primary beneficiary of such a fund?

33. The establishment of a global ADR fund came second in the above vote on payment for the cost of ADR, with just under four in ten of the votes.

Consultation Question 62:

Do you have any thoughts on specific actions that can be taken to protect the lunar environment and that of other planets and solar system bodies?

34. The children, without adult suggestions, proposed the following specific actions:

- Agree a limit on how many rockets any country can send to the Moon, Mars or other planets
- “Do not dump a rocket” on any of these bodies. Work towards all rockets and space craft being “returnable”
- Make bigger single launch and thrust vehicles, rather than several smaller ones, to reduce the number of defunct items on or around the Moon or other bodies
- Work on electric, hydrogen and hybrid electric/hydrogen launch vehicles and space craft thrusters, to reduce pollution on and around other bodies (and the Earth too). One child however commented that “we like the idea of using electricity, but can’t imagine it having enough power”
- Make satellites and space craft smaller and more effective, to reduce the volume of debris going into space – placing a limit on the *volume* of craft and other items that can be launched
- Don’t take items that aren’t needed to the Moon or elsewhere in space, to reduce litter and debris
- Bring back all litter to Earth for disposal, rather than leaving it elsewhere in space.

Consultation Question 63:

What do you consider to be the priority areas for action to protect the Earth’s and low Earth orbital environments?

35. Children spontaneously put forward their own priorities for protection of the Earth’s and orbital environments.
36. These priorities are **avoid pollution of Earth’s atmosphere from burning up during re-entry, retrieve debris from ocean target areas, reduce debris and pollution left in the ocean, reduce risk to land and marine animal life as well as human life, reclaim and recycle materials, and reduce CO2 production from launches, the manufacture of space craft and the “whole process” of the space industry.**
37. Pupils strongly advocated recycling and avoiding waste of materials used in space travel and exploration. “Space junk is like littering. It’s

wasteful. We should be recycling.” However, “this is a huge process if we are intent on recycling our [space] waste – but the effect on the environment is considerable”.

I am grateful to the Heads and staff of the three schools, and especially grateful to the pupils themselves for their thinking and thoughtful views and proposals.

Roger Morgan
on behalf of Pupils 2 Parliament

7th October 2023