

Virgin Orbit and Spaceport Cornwall Joint Assessment of Environmental Effects Public Consultation Responses

The Cornwall Airport Limited (Spaceport Cornwall) (**SPC**) and Virgin Orbit, LLC (**VO**) joint Assessment of Environmental Effects v2 dated July 2022 (**AEE**) has been publicised and consulted upon in accordance with the UK Civil Aviation Authority's (**CAA**) guidance on the public consultation of AEEs ([CAP2352](#)). This annex summarises the consultation responses received and how the CAA has taken them into account and ensured any relevant matters have been appropriately addressed in the AEE or as licence conditions, if a licence is granted.

The AEE was advertised and made available to view online on the CAA Citizen's Space website: <https://consultations.caa.co.uk/corporate-communications/aee-consultation-virgin-orbit-spaceport-cornwall/>. The consultation opened on the 22 July 2022 and closed on the 19 August 2022.

Summary of responses

We received a total of 72 consultation responses. 69 of those were individual respondents representing their own views. Three of the comments were from individuals responding on behalf of an organisation to give its views.

In this consultation, we considered comments which were relevant to the environmental effects from the specific licence proposals which the AEE is based on. This included matters such as:

- the potential environmental effects identified on the environmental topics assessed and the assessment of those effects
- whether any proposed mitigation measures for significant effects are appropriate or, if missing, where mitigation may be required
- any potential gaps, improvements or corrections to the AEE

We received a number of comments that raised matters which did not relate to the environmental effects arising from the specific licence proposals which the AEE is based on. These matters were outside of the scope of this consultation and therefore have not been considered in this response document. Safety, national security, national interest and other matters are dealt with separately by the CAA in the licensing process in accordance with the relevant requirements of the Space Industry Act 2018 and its regulations.

As part of the consultation, we sought views to the following questions:

- Have Virgin Orbit and Spaceport Cornwall identified all possible environmental effects and assessed the significance of these effects?
39 of the respondents said yes and 30 said no.
- Have Virgin Orbit and Spaceport Cornwall identified the ways in which any significant effects can be mitigated, or if missing, where mitigation may be required?
39 of the respondents said yes and 30 said no.

A summary of the key matters raised by respondents to the consultation and how they have been addressed in the AEE or as licence conditions (where relevant) is provided below. The information in the right-hand column is based on the AEE itself, additional information obtained from the applicants in response to matters raised during the consultations and from other public bodies (such as the Marine Management Organisation (**MMO**)).

Summary of matters raised	Summary of how the matter has been addressed in the AEE and/or licence conditions
<p><u>Impacts on climate change</u> Matters raised on the climate emergency and the impacts that aviation has on increased global CO₂ emissions which must be reduced. Concerns that VO and SPC's proposals are contrary to this outcome and should not be allowed to proceed due to the harm that will be caused to the environment.</p> <p>The harm caused by the additional flights cannot be mitigated against.</p> <p>The radiative forcing impacts of Cosmic Girl and LauncherOne activities at such high altitude have not been calculated.</p> <p>Concerns that no consideration of the CO₂ that will be expended to extract the metal used to construct LauncherOne and that parts will be discarded into the ocean and burnt up on re-entry into the Earth's atmosphere.</p>	<p>Potential climate change effects associated with the proposals have been assessed within the AEE. A climate resilience assessment was also undertaken to assess the vulnerability of SPC and its operations to climate change impacts.</p> <p>The climate resilience assessment was carried out in accordance with the Institute of Environmental Management Assessment (IEMA) best practice GHG emission assessment guidance. The impact of future climate change on the spaceport operations without mitigation was found to be not significant.</p> <p>The AEE also assessed the impacts on climate change as a result of greenhouse gas emissions from the proposed VO and SPC operations. The radiative forcing impacts have been included in all calculations – see Table 5.2-1 and paragraph 5.2.22 of the AEE. The impact assessment was carried out in accordance with the IEMA and European Investment Bank best practice GHG emission assessment guidance.</p> <p>The assessment identified that, pre-mitigation, there would be significant adverse effects. Following mitigation, residual effects were identified as negligible and not significant.</p> <p>Mitigation measures include moving vehicle and material handling equipment to electric drive, offsetting emissions, and commitments to be carbon neutral by 2030, which is 20 years before the UK's legally binding obligation to be Net Zero. The implementation of these measures will be supported by licensing conditions and CAA compliance monitoring. For example, a licence condition is included which requires VO to demonstrate that they have purchased verified credits from a recognised offset provider that are sufficient to offset the calculated greenhouse gas emissions after each launch. A licence condition is also included requiring SPC to use best</p>

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	<p>endeavours to achieve its target of being a carbon neutral spaceport by 2030.</p> <p>A full lifecycle analysis and whole life carbon assessment was undertaken separately, and referenced in the AEE, for all activities relating to SPC (including the proposed launches and associated activities) by the University of Exeter. The assessment is available to view at: https://spaceportcornwall.com/sustainability.</p>
<p><u>Carbon neutral versus net zero terminology</u> One respondent agreed with the overall intent of the commitment to being carbon neutral by 2030 and target ambition of being net zero beyond this. However, they were concerned that the terms ‘carbon neutral’ and ‘net zero’ are interpreted differently. SPC should be aiming to be net zero by 2030 not just carbon neutral.</p>	<p>As there is currently no net zero standard, SPC is planning to use the carbon neutrality standard, PAS 2060 (specification for the demonstration of carbon neutrality). The intent is that when a recognised standard for net zero becomes available that this will be adopted by SPC. PAS 2060 does not rely solely on offsetting but is instead the final measure once other avoidance and reduction measures have been adopted.</p> <p>A licence condition is included requiring SPC to use best endeavours to achieve its target of being a carbon neutral spaceport by 2030. This is 20 years before the UK’s legally binding obligation to be Net Zero. SPC will also target an ambition of being Net Zero beyond this through a <i>Road to Net Zero Strategy</i> released this year.</p>
<p><u>Workings for the absolute greenhouse gas (GHG) emissions</u> Table 5.2-5 shows the absolute GHG emissions (tCO₂e) from SPC and VO operations with mitigation measures implemented. However, concerns were raised that the workings for the mitigation measures used in the appendices have not been provided. These would be useful to see to understand how they relate to table 5.2-4.</p>	<p>Appendix G of the AEE details the expected emissions for each activity before and after mitigation for each year of operation. By comparing the two, it can be identified what the predicted reductions will be following implementation of the mitigation measure. For example, after 2022, emissions from onsite transport drop to zero compared to 10,185kg CO₂e as this will be carried out using electric vehicles rather than petrol or diesel vehicles.</p>
<p><u>Greenhouse gas mitigation measures proposed</u> Concerns raised that the mitigation measures proposed (blue carbon sequestration via Kernow Sat 1 mission outputs and the Centre for Space Technologies opens for research and development into biofuels) are</p>	<p>The greenhouse gas mitigation table provides indicative measures that will be considered. VO and SPC will be continuously reviewing what the most appropriate and effective measures are that can be implemented to ensure SPC achieves carbon neutrality by 2030. The carbon neutral strategy will be</p>

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<p>misleading and could be overselling the carbon mitigation measures. The measures should be caveated and not included with the other measures which have higher certainty and to which the applicants have direct control.</p> <p>Concerns that offsetting is the only mitigation proposed and is a deeply flawed approach to mitigating climate change.</p> <p>There is an overall lack of detail in reference to carbon offsetting and if VO or SPC will be responsible for it.</p>	<p>updated annually in line with current plans and technologies. A licence condition is also included requiring SPC to use best endeavours to achieve its target of being a carbon neutral spaceport by 2030. In complying with this condition, the CAA would expect SPC and VO to adopt a combination of carbon reduction technologies, operations and other changes as they become available.</p> <p>Offsetting forms an option within the carbon reduction framework (Figure 5.2-1). Alternative fuels are being considered by VO for future launches particularly as the technologies become more available and their full lifecycle of impacts known (see table 5.2-4).</p> <p>The carbon offsetting referred to in AEE will be undertaken by the launch operator, VO. VO will use UK Woodland Scheme which is a scheme by the Environment Agency. A licence condition is included requiring VO to demonstrate that they have purchased verified credits from a recognised offset provider that have been certified to a UK accredited offsetting code and are sufficient to offset the calculated greenhouse gas emissions after each launch.</p> <p>SPC has said that a full <i>Road to Net Zero Strategy</i> with areas that SPC are investing in to lower the impact across the life cycle will be made public later this year.</p>
<p><u>No impacts on climate change</u> One respondent considered that the proposals will have no impact on changing the climate.</p>	<p>Climate change impacts have been addressed as appropriate within the AEE.</p>
<p><u>Emissions from transfer of the carrier aircraft</u> Concerns that the emissions of the transfer of the carrier aircraft (Cosmic Girl) to Cornwall Airport Newquay have not been considered.</p>	<p>In accordance with the AEE Guidance (CAP 2215), the activities of carrier aircraft only need to be assessed when used in direct connection with a launch (paragraph 4.45). An AEE does not need to cover carrier aircraft operations where no launch is intended. This includes where an aircraft</p>

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	<p>flies to a spaceport to facilitate a later launch from the spaceport. This is known as a 'ferry flight' and does not need to be assessed in the AEE.</p> <p>A full lifecycle analysis and whole life carbon assessment was undertaken separately, and referenced in the AEE, for all activities relating to SPC (including the emissions of the carrier aircraft) by the University of Exeter. The assessment is available to view at: https://spaceportcornwall.com/sustainability.</p>
<p><u>Impact on socio-economic receptors</u> One respondent disagrees with the finding that the proposed activities will have a significant beneficial effect on the Cornwall population in terms of climate. If the spaceport becomes carbon neutral and/or net zero by 2030 this will have a neutral impact on the Cornwall population.</p> <p>How will the use of climate monitoring satellites or satellites with environmentally positive functions have a significant positive benefit for Cornwall population?</p>	<p>An economic impact assessment, <i>Spaceport Cornwall Economic Impact Assessment</i> (Cornwall Council et al. 2020d), was undertaken separately and referenced in the AEE. In addition to the direct and indirect economic impacts, the economic impact assessment also identified categories where beneficial effects could occur including climate. The benefits to climate are described as being a sustainable spaceport and operations and creating opportunity to launch satellites proven to help monitor climate change impacts. The significance assessment findings in tables 5.5-7 and 5.5-8 show the socio-economic impact of SPC to be moderate beneficial and significant. This is based on the medium and high likelihood of effects leading to moderate beneficial magnitude of effect.</p> <p>Access to space and use of space technology brings many benefits to the environment. Earth observation using satellites is fundamental for improving our understanding of climate change and efforts to tackle it. Space technology also provides valuable data and information such as observing weather patterns, natural resources management and monitoring harmful activities such as illegal fishing and deforestation.</p> <p>As discussed in the AEE, SPC and VO will create the capacity to launch low-cost satellites which could have benefits for Cornwall, and on a wider geographical scale, such as through climate and environmental monitoring. Virgin Orbit have stated that they will be launching an environmental</p>

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	satellite on their first launch. Kernow Sat 1 will be used to monitor the coasts around Cornwall to identify areas for sea grass restoration, monitor kelp forests and pollution levels as well as fishing activity.'
<p><u>Sleep disturbance from launches at night</u> Concerns raised on sleep disturbance to nearby residents caused by night-time launches and the noise generated from the carrier aircraft movements.</p>	<p>Cornwall Airport Newquay (CAN) is an existing operational airport. The proposals (aircraft movements) at CAN and their effects will not be dissimilar to the activities already permissible at the airport and fall under existing licensed activities. This includes CAN being permitted to undertake aircraft movements at night.</p> <p>Based on the most current pre-pandemic data summarising flight operations by aircraft type, CAN supported an average of 41,300 aircraft movements, or approximately 113 operations per day. The Cornwall Air Ambulance and Coastguard operate from the site 24/7 and other flights also currently operate at night, including military aircraft.</p> <p>Due to this and the frequency of which these activities will occur (maximum of two launches per year) the proposals will not result in a measurable impact to local residents in the vicinity of CAN (see paragraphs 3.1.9 & 3.1.10).</p> <p>In addition, the ignition of the LauncherOne rocket at an altitude >10,700 m (35,000 ft) and approximately 60 nautical miles from land would not be perceptible to any land- or ocean-based receptor due to the altitude (see paragraph 5.4.52 and Figure 5.4-3).</p>
<p><u>Impacts from aircraft training</u> Concerns raised that the impacts of carrier aircraft in training have not been considered.</p>	No carrier aircraft (Cosmic Girl) training is planned to take place at CAN.
<p><u>Noise and vibration impacts to local residents and their properties</u> Large aircraft operating from CAN vibrating nearby buildings which could cause structural damage.</p>	CAN is an existing operational airport. Large aircraft already operate from CAN including Boeing B737-300 and B737-800; Airbus A319 and A320; military aircraft associated with the RAF (e.g. C-130 and C-17 cargo aircraft); as well as Boeing 747 aircraft which is VO's carrier aircraft for the

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<p>General concerns raised that the carrier aircraft will further add disturbance, noise and pollution above those which already occur from the airport.</p>	<p>proposed operations (see paragraph 3.1.10). Therefore, the proposals (aircraft movements) at CAN and their effects will not be dissimilar to the activities already permissible at the airport and fall under existing licensed activities.</p> <p>Based on the most current pre-pandemic data summarising flight operations by aircraft type, CAN supported an average of 41,300 aircraft movements, or approximately 113 operations per day. The addition of two proposed VO carrier aircraft operations per year would be imperceptible with respect to noise, visual and pollution effects, as they will represent 0.02% of all flights annually at CAN (see paragraph 4.2.39).</p> <p>In addition, all noise and vibration impacts, including sonic boom impacts, associated with the launch vehicle will occur above the sea and will not impact terrestrial receptors.</p>
<p><u>Unsure if all effects have been identified and that effects on the environment will be negative</u> A few respondents stated that they were unsure if all possible environmental effects have been identified and assessed. Some respondents did not provide detailed responses but stated that the proposed activities will have negative/destructive impacts on the environment.</p>	<p>The AEE must identify, describe and assess the potential significant environmental effects of the proposed activities on certain environmental features, in accordance with the AEE Guidance (CAP 2215). Effects which have little or no significance only require a brief analysis to demonstrate that they have been considered.</p> <p>We have reviewed and assessed the AEE as part of the licence determination. VO and SPC have followed the AEE guidance and have adequately addressed the environmental topics where there is likely to be a significant effect. Where significant effects were identified (which were effects in relation to climate only), mitigation measures have been identified.</p> <p>Environmental topics where VO and SPC considered there would be no potential significant effects were scoped out of the assessment and</p>

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	justification provided (based on source-pathway-receptor analysis ¹). We consider VO and SPC's approach to scoping is both logical and justified.
<p><u>Terminology meaning</u> Concerns raised on the terms 'moderate' and 'insignificant' having no meaning without data.</p>	<p>For each environmental topic scoped in, a sub-section has been provided on the assessment methodology, including the significance criteria used (based on established best practice, where available).</p> <p>Definitions have also been provided in Chapter 4, section 4.1.7.</p>
<p><u>Impacts on biodiversity</u> Concerns raised that the effects on biodiversity collapse from the proposals haven't been considered.</p>	<p>Potential impacts on terrestrial biodiversity from the proposals were scoped out with discussion and justification provided (based on source-pathway-receptor analysis).</p> <p>The impacts at CAN associated with the carrier aircraft are similar in nature and/or existing activities permissible to be undertaken at the airport i.e. take-off and landing of the carrier aircraft.</p> <p>Marine ecological receptors have been considered as part of the marine environment assessment. The assessment considers potential strikes of marine species from dropped stages, unspent fuel and in-air and underwater acoustic impacts from sonic boom. The assessment identified there to be no significant effects.</p> <p>In addition, we have undertaken a Habitats Regulation Assessment Screening (Stage 1) which concluded that likely significant effects will not be experienced at any of the identified European sites. The Joint Nature Conservation Committee (JNCC), the statutory nature conservation body, agreed with those findings and the conclusion of no likely significant effects either alone or in-combination.</p>

¹ This model is a recognised scientific model for assessing environmental risk which looks at the source, pathways and receptors for impacts. It starts with the source, i.e. where impacts can come from. The next step is to think about how the pollution can travel through the environment, the pathway. Finally, the model considers the receptor of the pollution, who or what could be affected. This covers both human and environmental receptors.

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<p><u>Use of fossil fuels</u> Concerns over the use of fossil fuels and that the proposals should not take place until it can be done using genuine renewable energy.</p>	<p>VO and SPC have undertaken a climate change assessment which looks at the proposal's greenhouse gas emission contributions, including from fuel burn from the launch vehicle and ancillary activities.</p> <p>The assessment identified that pre-mitigation there would be significant adverse effects. With mitigation measures in place, including commitments to be carbon neutral by 2030 and use of electric vehicles and ground support equipment, the residual effects were identified as not significant.</p> <p>As cleaner fuels and technologies are developed, the sector will be encouraged to consider and compare the options and their potential effects. A licence condition is included requiring SPC to use best endeavours to achieve its target of being a carbon neutral spaceport by 2030. In complying with this condition, the CAA would expect SPC and VO to adopt a combination of carbon reduction technologies, operations and other changes as they become available.</p>
<p><u>Misleading emission rates</u> Concerns raised that the emission rates are omitted, misleading and underestimated.</p>	<p>It is unclear from this response which emission rates the respondent considers to be omitted, misleading and underestimated.</p> <p>The AEE has been carried out using competent experts in accordance with the AEE Guidance (CAP 2215). VO and SPC have stated in the introduction to Chapter 5 of the AEE that they have based the evaluation on the significance of effects using the best available scientific evidence.</p> <p>Emissions have been calculated using detailed operational data and nationally published emission factors (see Appendix G). Only licensable activities within scope have been included. A full lifecycle analysis and whole life carbon assessment was undertaken separately, and referenced in the AEE, for all activities relating to SPC (including the proposed launches and associated activities) by the University of Exeter. The assessment is available to view at: https://spaceportcornwall.com/sustainability.</p>

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<p><u>Impacts from visitors and increased traffic</u> Concerns raised that the AEE underestimates the effects from increased traffic and air traffic could have to the area.</p> <p>Local roads will be affected and there will be very few viewing areas.</p>	<p>Noise and air quality impacts associated with visitors coming to observe the take-off of the carrier aircraft with launch vehicle attached have been considered. However, these topics were scoped out due to the numbers being limited compared to the baseline current visitor and traveller numbers that occur in the area.</p> <p>Chapter 4 of the AEE states that it predicts that the first launch operation would attract up to 200 people to CAN. Successive launches, particularly those at night, are expected to attract fewer visitors. VO's operations in the United States attract very few visitors (approximately 110 people) due to the activity visible being a Boeing 747 aircraft take-off and not the launch of the rocket. VO and SPC have scaled the number of visitors up to 200 people to represent worst-case based upon known experience. The Safety Case for the spaceport deals with the management of visitors with visitors being directed to a dedicated area which will be patrolled by security guards.</p> <p>Consideration is given to the short-term noise impacts from increased road traffic noise in the vicinity of the airport. However, it was concluded that the visitor vehicles will be for a limited period and infrequent (maximum two per year) therefore the overall impact is considered to have low significance.</p>
<p><u>Lack of communication from SPC and VO</u> A couple of respondents raised their concerns that no communication has been made from the applicants with nearby residents.</p>	<p>In publicising the consultation on the AEE, the CAA notified local and national media, Cornwall Council, local councillors and Members of Parliament. Information was also placed on social media platforms, focused on the Newquay area. In addition, details of the CAA's consultation were also included in a public notice, for VO's marine licence application, published in Western Morning News and Cornish Guardian.</p>

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	<p>The SPC website has a full set of frequently asked questions and answers which is kept up to date. This is available to view at: https://spaceportcornwall.com/contact/.</p> <p>It is understood that the spaceport project was part of the Airport Masterplan public consultation. Further public forums in the local area, including Newquay town Council, Mawgan Porth and St Mawgan village have also taken place. In addition, the project went through a full council process in 2019 where Q&A's were held for members of the public.</p>
<p><u>Use of climate monitoring satellites</u> Concerns raised that the AEE states that there will be significant long-term benefits to the climate due to proposed climate-monitoring satellites being deployed on some payloads. However, there is no guarantee that these satellites will be used.</p>	<p>SPC and VO will create the capacity to launch climate monitoring satellites. VO has previously launched climate-related payloads and it is anticipated that they will continue to propose launches for future climate monitoring satellites.</p>
<p><u>No tracking equipment on the dropped stages</u> Concerns that there will be no tracking equipment attached to the dropped stages, as the flight path includes aircraft and ship hazard areas. Furthermore, the equipment may help investigate accidents should they occur.</p>	<p>The air and ship hazard areas are defined by VO and SPC. Advance notices to aircrew and notices to mariners will be made to provide notice of temporary changes or hazards in airspace and navigable waterways.</p> <p>The Marine Management Organisation and the Maritime and Coastguard Agency provided clarity on VO's proposed monitoring of the shipping hazard area. VO will carry out downrange monitoring of high-risk areas (e.g. the defined shipping hazard areas) to ensure that no vessels enter the hazard area during the launch activity.</p> <p>VO analysis is intended to provide real-time data which will predict the location of where components will land and replaces the need for tracking. Furthermore, a guidance, navigation and control package is proposed on the launch vehicle. This guidance system sends telemetry back to the ground about the vehicles location and would provide datasets in the event of an accident.</p>

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<p><u>The proposals should not go ahead</u> Some respondents expressed concerns that the proposals should not go ahead due to the impacts on the environment and the existing condition of the planet.</p>	<p>We have reviewed and assessed the AEE as part of the licence determination. The applicants have followed the AEE guidance and have adequately addressed the environmental topics where there is likely to be a significant effect. Where significant effects were identified (which were effects in relation to climate only), mitigation measures have been identified.</p>
<p><u>AEE doesn't address danger to human life</u> Concerns raised that the AEE doesn't adequately address the risks of death or injury to persons.</p>	<p>Under section 2 of the Space Industry Act 2018, the regulator (in this case the CAA) must carry out its functions relating to spaceflight activities with a view to securing the health and safety of members of the public and the safety of their property. This duty has primacy over the other matters that the regulator must take into account in exercising its functions.</p> <p>The purpose of the AEE is to ensure that applicants for either a spaceport or launch operator licence have considered the potential environmental effects of their proposed activities and, if necessary, taken (or identified) proportionate steps to avoid, mitigate or offset the risks and their potential effects.</p> <p>The matters relating to risks of death or injury to persons fall outside the scope of the AEE but are considered by the CAA as part of the safety case in the licensing process.</p>
<p><u>Requirements for an Environmental Impact Assessment (EIA)</u> Concerns that an Environmental Impact Assessment hasn't been undertaken, particularly for the physical infrastructure such as hangars and ramp buildings.</p>	<p>The Space Industry Act 2018 sets the requirement for an assessment of environmental effects to be submitted with a spaceport and launch operator licence application. The AEE is only required to cover the operational phases of the proposed operations. The construction phases are not required to be covered by the AEE. The environmental effects of these activities would be assessed during the planning permission stage, where planning permission is required.</p> <p>VO and SPC have stated that the proposed activities will utilise existing facilities and infrastructure at CAN. No additional buildings or</p>

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	infrastructure are required. Previous planning and consent systems at CAN would have covered the impacts associated with any previous construction (see paragraph 4.1.1).