Can a Galactic Britain Contribute to Space Sustainability and Security?

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Abstract: Increasing numbers of state and non-state actors are conducting activities in space, causing the ongoing sustainability of the space environment and the security of space as an operating domain to be challenged. The UK's first National Space Strategy, published in 2021, proclaimed the country would take a leading international role in promoting the responsible use of space. This article examines whether the UK has the experience, interest and ability to make an effective contribution to space sustainability and security. By looking at official publications, topical commentary and other literature, it examines the British space programme, from its early days to the latest announcements, and reviews the UK's past and contemporary engagements with the international community. Based on this, it is shown the UK can make a continued, substantial contribution to space sustainability and security in support of a modern, global society that is dependent on space for its way of life.

In the foreword of the UK's 2021 National Space Strategy (NSS), Prime Minister Boris Johnson played on his nation's Global Britain brand by writing that the strategy was "a plan that will see [the UK] take a leading role on the international stage, Global Britain becoming Galactic Britain".[1] While some disregarded Mr Johnson's eye-catching comment, suggesting the UK government should focus on the day-to-day issues affecting the British public, others were more measured in their commentary of the Premier's words, citing the country's bold ambition to be a leading "science superpower" in the renewed global space race.[2] The strategy sets five goals, namely to "grow and level up our space economy, promote the values of Global Britain, lead pioneering scientific discovery and inspire the nation, protect and defend our national interests in and through space, and use space to deliver for UK citizens and the world".[3]

This article reflects on the UK's space programme to ask if the country has the historic experience, current interest and ongoing ability to contribute to space sustainability and security. It will study 1950s-70s space age activity that saw British investment rise and then wane, the rejuvenation of the UK civil space programme in the last decade, and some of the challenges the country faces today. Further, it will look at recently announced British military space developments, as well as the country's global engagement, to see if the UK remains able to positively influence international change. Based on those findings, and on the premises that a sustainable space environment should not negatively affect the potential benefits derivable from its future use and that space security relates to the freedom to access and to exploit space, the article will conclude that the UK can make a continued, effective contribution to global space sustainability and security.[4]

[1] UK Cabinet Office, *National Space Strategy* (London: Cabinet Office, 2021), 2.

[2] Kate Nicholson, "Boris Johnson wants to create, wait for it, 'Galactic Britain'. People are furious," *HuffPost UK*, September 28, 2021; Chris Smyth, "Britain will launch rockets next year, vows Boris Johnson," *The Times*, September 28, 2021.

[3] UK, *National Space Strategy*, 6.

[4] Space sustainability: M Palmroth et al., "Toward Sustainable Use of Space: Economic, Technological, and Legal Perspectives," *Space Policy* 57, no. 101428 (2021), 6; Space security: Michael Sheehan, "Defining Space Security," in *Handbook of Space Security*, ed. KU Schrogl et al, 7-21 (New York, NY: Springer, 2015).

Bold beginnings for the British space programme

When the original space age began in the 1950s, the UK was in a strong position to harness its World War II technological advances to regrow its skills base, stimulate its industries and advance its military capabilities. As early as 1957, the country was launching high-altitude rockets into space with its Skylark programme. Skylark was originally intended to gather atmospheric data but grew during its 21-year life to conduct pioneering astronomical research that set the basis for the UK's current expertise in space systems.[5] Skylark was later joined by other British space programmes: Ariel, which saw the UK become the third nation after the USSR and the USA to place a satellite into orbit; Skynet, which launched the UK's first communications satellite and which continues to this day; and Prospero, a wholly British built and launched mission with a stated intention of helping to maintain the competitive position of the UK's space industry. [6,7]

The UK cooperated with related American programmes such as the Ballistic Missile Early Warning System, which saw a radar site built in England that still contributes to space situational awareness, and through Project Emily, which provided the UK with intermediate-range ballistic missiles and which influenced both NASA's Apollo programme and later generations of international space engineers.[8] While the tight fiscal environment of the 1970s constrained the British government's spending on space sector development until the mid-1980s, these programmes nevertheless grew a strong base of UK space expertise because of an ambition to be a world leader in science and technology.

The UK was also instrumental in engaging with the international community to set initial principles for the use of space. The UK joined 23 other countries in recognising the value of global cooperation by forming the UN Committee on the Peaceful Uses of Outer Space (COPUOS) in

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[5] CN Hill, *A Vertical Empire: History of the British Rocketry Programme*, 2nd ed (London: Imperial College Press, 2012), 57.

[6] Emma Thorpe, "History of Ariel-1, The First British Satellite Launch & UK's Future Space Potential," *Orbital Today*, October 31, 2021.

[7] HJH Sketch et al., "The Prospero satellite," *Proceedings of the Royal Society* 343, no. 1633 (April 1975), 265.

[8] Parker Temple and Peter Portanova, "Project Emily and Thor IRBM Readiness in the United Kingdom, 1955-1960," *Air Power History* 56, no. 3 (2009), 44.

1958, which became a permanent UN body and has grown to 95 members since.[9] Conscious of prevailing Cold War fears among countries, COPUOS strove for consensus and developed the Outer Space Treaty (OST), of which the UK was a founding signatory in 1967.[10,11] It was acknowledged that the OST would have limitations and would not categorically address all scenarios in the use of space; notwithstanding, it remains the centrepiece of international space law.[12] The OST was the basis for subsequent agreements on the rescue of astronauts, the liability for damage caused by space objects and the registration of space objects.[13]

This thought leadership by the UK and other nations, plus a willingness to seek constructive dialogue with allies and adversaries, brought experiences that remain relevant today. Coupled with its developed scientific and engineering expertise, the UK has historic strength in both space technological knowledge and space policy experience that set the conditions to support modern growth.

Capturing the global space market

It is the prospect of growth that has helped stimulate the recent rejuvenation of British interest in space. The UK government proposed that space industry growth would help it recover from the 2008 financial crisis and in 2014 it endorsed a joint proposal with industry and academia, agreeing the goal of increasing the UK's share of the global space market to 10% by 2030.[14,15] While the recent NSS appears to have moved beyond this 10% goal, as it was not restated, UK space growth initiatives have nonetheless blossomed since 2014, stimulated by an enthusiastic

[9] UN COPUOS, "COPUOS History," UN Office for Outer Space Affairs, https://www.unoosa.org/oosa/en/ourwork/copuos/history.html.

[10] Adam G Quinn, "The New Age of Space Law: The Outer Space Treaty and the Weaponization of Space," *Minnesota Journal of International Law* 17, no. 63 (2008), 479.

[11] UN COPUOS, "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies," UN Office for Outer Space Affairs, http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html.

[12] Christopher Daniel Johnson, "The Outer Space Treaty," *Oxford Research Encyclopaedia of Planetary Science*, January 24, 2018.

[13] UN COPUOS, "Space Law Treaties and Principles," UN Office for Outer Space Affairs, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html.

[14] HM Treasury, *The Plan for Growth* (London: HM Treasury, 2011), 119.

[15] UK Space Agency, *Government Response to the UK Space Innovation and Growth Strategy 2014 – 2030: Space Growth Action Plan* (London: UK Space Agency, 2014), 4.

commercial sector. Most prominent has been a competition between companies representing seven different consortia of launch providers and sites vying to become the UK's first spaceport and aiming to help the UK secure the lucrative European launch market.

The consortia's efforts have been supported by promotional material released by the UK Space Agency and comments from the Agency's leaders noting the logistical benefit of launching from Scotland, where more satellites are built than in California, close to SpaceX or Virgin Orbit [16,17.] While other European launch initiatives are underway, the UK government's forward-leaning approach seems to be gaining traction. This is also reflected with its support to the development and expansion of the "Space Cluster" at Harwell, a campus hosting over 100 space-focussed businesses, as well as the research grants the government continues to offer, harking back to the scientific investment made in the 1960s and 70s.[18,19]

This rapid expansion in the UK is not without challenges, including a workforce shortage that has left over half of British space businesses experiencing a skills gap.[20] This has led to questions being asked of academia, suggesting that British universities are not teaching specific or relevant skills, and recognizing that improvements are needed for the space industry to improve the representation of women, ethnic minorities and disabled people, which would bring beneficial diversity of thought and experience.[21]

Further, while space offers an important way to further grow the UK's economy and technological skills base, the government has noted that reliance on space-based assets by modern telecommunications and other digital systems means the UK now has a critical dependence on space to make the country function effectively.[22] A 2017 report concluded that a five-day loss of

[16] UK Space Agency, *A guide to the UK's commercial spaceports* (London: UK Space Agency, 2021).

[17] Andrew Jones, "Commercial spaceports seen as the future for European launch," *SpaceNews*, November 17, 2021.

[18] Harwell Campus, "Space Cluster", Harwell Campus, https://www.harwellcampus.com/space-cluster/.

[19] UK Research and Innovation, "Funding finder: Science and Technology Facilities Council," UK Research and Innovation, https://www.ukri.org/opportunity/?filter_council%5B%5D=830.

[20] UK Space Agency, *Space Sector Skills Survey 2020* (London: UK Space Agency, 2021), 4.

[21] Catarina Baldaia et al., "The UK space skills gap," *Aerospace* 48, no. 5 (May 2021), 27.

[22] UK Space Agency, *National Space Policy* (London: UK Space Agency, 2015), 7.

access to global navigation satellite systems would cause over £5.2 billion ($7.1 billion) worth of harm to the British economy.[23] It is clear that the UK has put space to the heart of its strategic economic considerations.

The country has developed the national drive to prioritise government thinking towards space sector investment and to drive a more comprehensive approach to space skills development, as evidenced by the NSS's launch and the establishment of a National Space Council.[24] At the same time, while space has not become an overriding security concern for the UK, the increased civil focus on space development has been also matched by the military.

New military investment

In addition to the NSS's publication, 2021 saw the formation of UK Space Command: a major new organisation within the British armed forces established to "encourage coherence across defence space capability delivery and operations."[25] This followed on from 2020's establishment of a Space Directorate within the Ministry of Defence (MOD), marking an acceleration in British military space thinking compared to previous years and reflecting similar changes by allies. As worldwide militaries began to internally align their space thinking and in the wake of the 2019 establishment of the US Space Force, the UK evidently took the opportunity to again be a leader of the international trend for such organisations, alongside Australia, France, Canada, India and Japan.[26]

The employment of space power as a potent component of wider military power is not new but, as late as 2008, was still being regarded by some as "nascent."[27] This was despite its potential having been demonstrated during the 1991 Iraq War when a high proportion of Western allied communications had been by satellite and the American Global Positioning System had played a

[23] London Economics, *Economic impact to the UK of a disruption to GNSS* (London: London Economics, 2017), iii.

[24] UK, *National Space Strategy*, 48.

[25] UK, *National Space Strategy*, 37.

[26] Phil Mercer, "Australia Appoints Its First Space Commander," *VOANews*, May 10, 2021.

[27] David Jordan, "Air and Space Power," in *Understanding Modern Warfare*, ed. David Jordan et al., 178-223 (Cambridge: Cambridge University Press, 2008), 212.

major part in guiding coalition forces to their targets.[28] Commensurate with the increased civil dependency on space technology since the 1990s, militaries have become reliant on space to support their outputs and have recognised the associated threat of losing access to orbital systems at a critical moment while generating their space-enabled combat effects.[29]

There has also been a recent recognition that 'sub-threshold warfare' could lead to, for instance, a nation's digital networks being degraded or denied as a precursor - or even alternative - to physical combat: a viable result of an attack on space systems.[30] It was amid this conceptual evolution that the MOD's Space Directorate and then UK Space Command was launched, with its inaugural commander noting that "the UK needs the ability to contest actions that may threaten the UK, across all domains including space."[31] This highlights the UK's recognition that the freedoms of access *to* space and of action *within* space have become core components of its national interest.

The 2021 NSS highlighted areas for defence investment, including development of sovereign awareness capabilities to protect British spacecraft, the next generation of the Skynet communications satellites and "other new initiatives to protect and defend the UK."[32] The critical proof of the UK government's ambition will be whether it is matched by adequate funding for the proposals. Space featured prominently in an integrated review of defence and security released earlier in 2021.[33] It was expanded upon in a dedicated Defence Space Strategy published in February 2022, which also provided funding values that indicated the priority and depth of the investments being made.[34] Commentators have nevertheless questioned whether the spending will be sufficient: Bowen, a leading UK space power academic, was optimistic if the list could be

[28] Geoffrey L Canton, "Joint Warfare and Military Dependence on Space," *Joint Forces Quarterly* 10 (Winter 1995/1996), 49.

[29] For instance: US Department of Defense, *Defense Space Strategy: Summary* (Washington, DC: Department of Defense, 2020), 7.

[30] Sidharth Kaushal, *Operationalising the Constrain Concept: Competing Below the Threshold* (London: Royal United Services Institute, 2021), 30.

[31] Quoted in: Aerospace, "Plane Speaking with Air Vice Marshal Paul Godfrey," *Aerospace* 48, no. 5 (May 2021), 30.

[32] UK, *National Space Strategy*, 43.

[33] UK Cabinet Office, *Global Britain in a Competitive Age: The Integrated Review of Security, Defence, Development and Foreign Policy* (London: Cabinet Office, 2021).

[34] UK Ministry of Defence, *Defence Space Strategy: Operationalising the Space Domain* (London: Ministry of Defence, 2022).

"whittled down into a smaller number of priorities" although Walmsley, from the UK's Royal United Services Institute, suggested "the UK does not have the kind of money needed to fulfil all its aspirations."[35]

That stated, the UK does have the military experience and development intentions to make a meaningful contribution to a "coalition of the willing" in space, echoing back to the 2002 American search for like-minded nations prepared to take action against Iraq.[36] If not through directly coercive means, this is apparent through its aim to generate a comprehensive, shared awareness of the space operating domain and its ability to provide military thought leadership through its relationships, such as with NATO and with partners in the Combined Space Operations initiative.[37] The strengthening of the UK's space relationships is also continuing beyond the military environment.

Leading international change

There is general international consensus that actors must consider the interests of all when operating in space, as evidenced through the ratification of the OST by most countries. The UK Space Command website even remarks "no one nation can do it alone" regarding space activity, meaning a significant issue in space for one actor is potentially catastrophic for all.[38] This reflection matches those of commentators: Johnson-Freese cited the untenable risk of the loss of near-earth space as an operating environment, noting that all space actors have a responsibility to consciously mitigate against this.[39]

Recent reporting has recognised that the rapidly increasing number of space actors is leading to the exploration of opportunities and the uncovering of new economic value but is "simultaneously opening the door to chaos and competition."[40] At the same time, the effectiveness

[35] Theresa Hitchens. "Defense Lags Behind Commerce in UK 'Galactic' Space Power Goals," *Breaking Defense*, September 30, 2021.

[36] CNN, "Bush: Join 'coalition of willing'," *CNN.com*, November 20, 2002.

[37] RAF News, "Combined Space Operations Initiative leaders meet in Cape Canaveral," *RAF News*, December 14, 2021.

[38] UK Space Command, "UK Space Command," UK Space Command, https://www.raf.mod.uk/what-we-do/uk-space-command/.

[39] Joan Johnson-Freese, *Space as a Strategic Asset* (New York: Columbia University Press, 2007), 18.

[40] Atlantic Council, "The future of security in space: A thirty-year US strategy," Atlantic Council, https://www.atlanticcouncil.org/content-series/atlantic-council-strategy-paper-series/the-future-of-security-in-space/.

of the 1967 OST has been questioned, given it was written during an era of bipolar great power competition and was unable to envisage the development of mega-constellations of satellites, the broad involvement of non-state actors, the potential for exploiting space-based mineral resources and the presence of substantial space debris.[41]

It is on this basis that the UK has been leading fresh efforts to re-examine and enhance the space regulatory environment. The idea is not new, given Russia and China headed a 2008 initiative which proposed outlawing space-based weapons; that failed for a variety of reasons, not least the suggestion that it was principally political posturing by the Russians and Chinese as opposed to a more serious, cooperative effort.[42] Likewise, a 2009 EU-proposed code of conduct stalled under criticism of its lack of broad international engagement.[43] The UK appears to have learned from these recent experiences and is using its international leadership role, with its permanent seat on the UN Security Council and membership of the G7, to build global consensus through a deliberately 'ground up' approach.

In 2019 COPUOS adopted the Guidelines for the Long-Term Sustainability of Outer Space Activities, based on the understanding that space should remain a "stable and safe environment that is maintained for peaceful purposes and open for exploration, use and international cooperation."[44] With UK backing, the guidelines formed the basis of a resolution approved by an overwhelming proportion of the UN General Assembly's committee on Disarmament and International Security in late 2021. This has led to a new working group that will meet in 2022 and 2023 and will consider how to reduce threats to the sustainability of space through "norms, rules and principles of responsible behaviours."[45]

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[41] Johnson, "The Outer Space Treaty".

[42] Ram Jakhu et al., *The Need for an Integrated Regulatory Regime for Aviation and Space: ICAO for Space?* (Vienna: Springer, 2011), 20.

[43] David Koplow, "The Fault Is Not in Our Stars," *Harvard International Law Journal* 59, no.2 (Summer 2018), 353.

[44] UN Office for Outer Space Affairs, *Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space* (Vienna: United Nations, 2021), 1-2.

[45] UN, "Delegates Approve 5 Draft Resolutions, as First Committee Takes Action on Peaceful Use, Non-Weaponization of Outer Space, Chemical Weapons," *United Nations Meetings Coverage*, November 1, 2021.

The future of this UK-led work looks promising, despite Russia taking the opportunity only 14 days after the resolution's approval to conduct a space debris-creating demonstration of an anti-satellite weapon. Paikowsky, an expert on the links between space and geopolitics, even suggested Russia had to act because it believes new regulations are indeed coming, which would ban future tests.[46] The initiative shows the UK continues to possess and use its influence on the world stage to encourage the sustainable use of space by all, promoting an approach to space operations that will allow current activities to continue without detriment to future plans or aspirations.

Conclusion

As the post-Second World War global order emerged and the UK's relative position declined, the country nevertheless established an important role within the space race. Building on its scientific and engineering prowess, the country made important contributions to the development of space technology. It also took a keen interest by leading international fora that established the enduring principles of space law.

This British enthusiasm for space has grown, stimulated by recent governments that have set ambitious goals to harness the modern global reliance on space, thus driving economic growth and the expansion of a space-skilled workforce. Civil development has been matched by similarly eager military ambition, despite the question of if both the UK's military and civil space programmes will receive the investment needed to achieve all their goals. The MOD and wider government have also been working hard to broaden relationships and promote the responsible use of space by global actors, leading to a promising outlook for international space regulation.

The 2021 NSS shows encouraging signs for the global use of space. It is evident the UK wishes to ensure today's actions in space do not detract from the fulfilment of future aspirations, providing assurance of the sustainability of space activities. It is also evident that the UK's intention to be able to derive a clear understanding of *who* is doing *what* in space, backed by internationally

[46] Deganit Paikowsky, "Analysis: Why Russia Tested Its Anti-Satellite Weapon," *Foreign Policy*, December 26, 2021.

endorsed norms of behaviour and an ability to influence wayward attitudes, should lead to a more stable and predictable security environment despite the risk introduced by the rapidly increasing numbers of space actors.

Therefore, the UK – soon to be Galactic Britain – *does* have the capacity to make a substantial contribution to the advancement of space sustainability and security. The country is still showing the international leadership it has become renowned for and it has the long-forged relationships to stimulate success. It has also tapped into a prevailing mood that the once-bipolar global order, which led to American and Russian dominance in space, no longer serves the needs of a modern world society that depends on space for its technologically enabled way of life.

This article has reflected on the UK's space programme, examining early advances, a dip in investment and then a resurgence of late. It has acknowledged that the programme faces challenges but that recent developments and global engagement see the UK still able to lead international change and to make a continued, effective contribution to worldwide space sustainability and security.

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