

Cold comfort: the challenges facing the RAF's return to the Arctic

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Abstract

A year after the British government's Integrated Review and its proclaimed 'Indo-Pacific Tilt', the events presently unfolding in Ukraine underscore the fragility of the Euro-Atlantic region and the imperative to focus on a 360° view of defence. Within this context, Britain's 2022 publication of its inaugural Defence Arctic Strategy is an opportune moment to reflect on the United Kingdom's contribution to the defence of Europe's northern flank. This paper assesses whether the Royal Air Force is fit for that task and, where appropriate, suggests how defence planners might rectify deficiencies in air and space power within a rapidly closing timeframe.¹

Britain: the 'Arctic's nearest neighbour'

March 2022 saw the United Kingdom (UK) publish a Defence Arctic Strategy (DAS) for the first time.² Such a statement of military intent, concerning a region ordinarily afforded some exceptionalism in world politics, will raise eyebrows. Yet it is recognition that what was once a 'zone of peace'³ is slowly yet inexorably transforming into a martial landscape, and in so doing, placing at stake the vital national interests of the 'Arctic's nearest neighbour'.⁴ This paper will assess the challenges facing the Royal Air Force's (RAF) ability to 'deliver decisive air [and space] power effect'⁵ in defence of these interests.

Formally titled *The UK's Defence Contribution in the High North*, the DAS is not so much a deviation as a resurrection in strategic outlook. Since at least the Napoleonic Wars,⁶ the British armed forces have operated in the Arctic, with the Second World War (WWII) bringing the RAF's first tests in this domain. Defence of the Greenland-Iceland-UK (GIUK) Gap was seen as a crucial UK responsibility to the North Atlantic Treaty Organisation (NATO) throughout the Cold War, but the Soviet Union's dissolution and Middle Eastern entanglements thereafter soon saw the de-prioritisation of RAF cold-weather capabilities. These changes in the political climate have until now had little relation to changes in the Arctic climate. It is the interaction of the two which differs today.

Despite the region's history of military confrontation, coordinating British policy towards the post-Cold War Arctic has hitherto been a Foreign Office competence.⁷ This has resulted since 2013 in two Frameworks calling for the preservation of 'stability and security'⁸ at high latitudes but neither providing explicit direction to the military instrument. The same is true of the 2010 and 2015 defence reviews. While the 2021 Integrated Review and accompanying Defence Command Paper include limited language centred around the UK's leadership of the Joint Expeditionary Force (JEF) and Northern Group, the decision of the Ministry of Defence (MoD) to place 'the Arctic and the High North central to the security of the United Kingdom'⁹ through the DAS marks the explicit shift in policy emphasis needed for the UK, as some have argued, 'to become serious players in the region, including economically.'¹⁰ With most of the rhetoric focused on the maritime domain,¹¹ however, what might be the demands on, and challenges faced by, British air and space power in its return to the Arctic?

In terms of demands, the DAS provides a four-fold answer,¹² based on the High North's 'importan[ce] to the UK's environment, prosperity, energy supply, and security.'¹³ The first objective for the MoD is the protection of Critical National Infrastructure (CNI), understood to include the subsea cables which channel 97% of global communications and some \$10 trillion worth of financial transactions daily.¹⁴ This network, which is particularly dense around North Atlantic waters, is considered 'inherently vulnerable' given their publicly known yet isolated location, the minimal technical expertise needed to damage them, and the extent to which plausible deniability can shroud sub-threshold attacks.¹⁵ As former prime ministerial hopeful, Rishi Sunak, argued in a 2017 report: 'Short of nuclear or biological warfare, it is difficult to think of a threat that could be more justifiably described as existential than that posed by the catastrophic failure of undersea cable networks as a result of hostile action.'¹⁶

As much was echoed by the Chief of the Defence Staff in January this year, two months after potential sabotage shut down a network of subsea sensors off the coast of Norway.¹⁷ Days after Admiral Radakin's warning, 'human activity' severed one of two cables connecting the Norwegian mainland to Svalbard¹⁸ and its ground station – the world's largest – which Russia suspects of having dual-use.¹⁹ Equipped with the *Yantar*-class intelligence vessel and the newly-commissioned *Belgorod* submarine (both motherships to a flotilla of auxiliary submersibles), Russia's Northern Fleet likely has the means of debilitating High North CNI.²⁰

From a UK standpoint, additional vulnerabilities may arise from the electrical grid's extension to offshore wind farms and Russia's weaponisation of energy dependence. Amid the twin perils of reduced acoustic signatures and increasing ambient noise, the RAF's fleet of Poseidon P-8A maritime patrol aircraft (MPA) will play an ever-vital role in protecting this CNI from hostile submarines, in addition to its ongoing defence of the nuclear deterrent. The integrity of precision, navigation and timing (PNT) and command and control (C2) infrastructure in the High North and elsewhere must also shape RAF capability development and training. 'On the new sub-threshold battlefield,' the Integrated Operating Concept (IOC) notes, 'assuring societal resilience constitutes deterrence by denial,' and is a 'non-discretionary' component of the UK defence mission.²¹

Second amongst the DAS's objectives is freedom of navigation (FON). The opening of the Northwest Passage and Northern Sea Route (NSR) by receding ice reveals both vulnerabilities and opportunities for a nation which receives 96% of its goods trade through seaports. Russia's militarised view of NSR traffic, in contravention of international norms, is increasingly concerning. Domestic legislation enacted in 2013 mandates Russian icebreaker escort for foreign vessels and advanced notification of passage.²² Given that FON in the region may become a 'use it or lose it' right, intensification of aerial and naval FON exercises seems prudent. Such demonstrations of UK reach, responsiveness and resolve would challenge unilateral assertions of sovereignty and constrain fait accompli strategies, while minimising escalation risks through the 'safe and professional behaviours' codified in the UK-Russia Incidents at Sea Treaty.²³ Any RAF policing or escort effort would, however, need tankers or long-range assets considering the distances involved.

Stricter rules on NSR transit since 2013 require all commercial ships to be Russian-built and Russian-piloted (the pilot requirement applies also to foreign military vessels) with only Russian-flagged icebreakers authorised to render assistance.²⁴ Given the magnitude of British embarkation ports and cruise companies, the number of UK nationals travelling on Arctic voyages is likely to increase, thereby amplifying concern for the region's inadequate search and rescue (SAR) capabilities.²⁵ Whereas the government previously considered this responsibility to 'rest squarely with the Arctic States'²⁶ (Canada, the Kingdom of Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden and the United States (US)), the public may expect the RAF to render some assistance in the event of a large-scale relief operation involving British citizens. In fact, the DAS goes further in expressly committing the MoD to the safety of Arctic inhabitants.²⁷ Fulfilling this commitment has risks, especially if it necessitates infringing the FON restrictions asserted by Russia. To be sure, with the world's largest share of maritime insurance premiums and shipbroking,²⁸ impeded FON in the High North also threatens UK prosperity. But more fundamentally, operational freedom in these waters – especially in and around the GIUK Gap – is imperative to the reinforcement of Europe (see the fourth objective below).

Strengthening the rules-based international order constitutes the DAS's third objective, given the almost primal competition induced by global warming.²⁹ Receding ice has confirmed vast mineral deposits, but so too has it raised tantalising prospects for military and commercial shipping, Arctic tourism, and fisheries. Accompanying this has been an intensification of ongoing territorial disputes between the Arctic States (not least overlapping claims to the North Pole seabed³⁰), militarisation of the region, and economic pressure such as the FON restrictions discussed above. For now, conflicted parties have agreed to resolve their disputes within the framework of the United Nations Convention on the Law of the Sea (UNCLOS) and as the DAS advises, 'there have been no serious problems arising from resource competition as yet.'³¹

That said, the suspension of the Arctic Council (the usual forum for regional decision-making) following the invasion of Ukraine by its presiding member questions the faith states have in institutions. Similarly, the effective collapse of the Treaty on Open Skies following the withdrawal of the US and Russia severely hampers efforts to monitor military activity in the High North. In the absence of aerial surveillance, countries may resort to satellite-based observation for intelligence. Indeed, the DAS explicitly calls for improved understanding of the region.³²

This reinforces the RAF's need both to bolster its space capabilities and to promote international norms in that operational domain. Now that all Arctic States bar Russia are, or will be, NATO members, greater opportunities exist to expand RAF activities in the region, bilaterally, through constructs like the JEF and Northern Group, and on an Alliance-wide basis. Operating alongside allies adds legitimacy to the RAF's efforts to strengthen the rules-based system. Nevertheless, a sophisticated information campaign will be necessary to minimise the contribution this will make to Russian narratives of encirclement.



Figure 1: Map of Arctic military installations. Darker shade of Bastion indicates Russian ambition of control; lighter shade indicates ambition of denial.³⁵

While it is doubtful military confrontation will originate from Arctic disputes, the risk remains that aggressions elsewhere will spill into the High North, therefore contesting de-stabilising and malign behaviour is the final DAS objective. The priority is to ensure the region does not emerge as a contested domain capable of endangering national interests, much as the South China Sea has become for littoral states there.³⁴ Aside from its invasion of Ukraine, Russia, identified as ‘the [UK’s] most acute threat’,³⁵ has simulated air attacks on NATO installations, violated Allied airspace, and jammed GPS signals,³⁶ its defence minister has pledged to continue ‘employing fighter aviation from [Arctic] airfields,’ of which at least 13 now exist.³⁷ These activities constitute a broader, overt revival in the country’s capacity for theatre-scale warfare in the High North, which in 2021 saw the redesignation of the Northern Fleet’s Joint Strategic Command as a full Military District.³⁸ In its ‘Bastion’ defence of sea-based nuclear assets, the Federation has developed capabilities designed to deny or contest NATO’s

freedom of action at least as far as the GIUK Gap, and perhaps even the transatlantic sea lines of communication (SLOCs) which lie beyond. The number of Russian submarines patrolling North Atlantic waters has already increased tenfold.³⁹ Essential as they are to the movement of personnel and materiel from North America, control of these SLOCs is a key pillar of Alliance warfighting plans for the defence of Europe, and therefore features prominently in the DAS.⁴⁰ NATO’s exposure to these destabilising behaviours is expected to increase with soon-to-be allies Finland and Sweden adding the equivalent of 3.5 UKs to the Alliance’s landmass and doubling its land border with Russia.

In this context, the MoD is tasked with developing a ‘sustainable, modernised, and proportionate defence capability for the region.’⁴¹ A welcome contribution is made by the Royal Navy’s Littoral Response Group (North) (LRG(N)) which could be key to retaining control of Nordic airfields. Even so, the lack of air- and

space-mindedness undermines progress. For example, permanent hangar facilities are lacking on both the *Albion*- and *Bay*-class amphibious vessels which comprise the Group, to say nothing of their destroyer and frigate escorts. Instead, littoral strike duties within LRG(N) will be assigned to a refitted RFA *Argus*. Whether she can fulfil this front-line role given her age (the oldest ship in Royal Navy service) and the limited availability of Wildcats and Merlins is questionable.⁴² Mass may be compensated by uncrewed systems to an extent, but the demand for airpower to increase the 'strike, surveillance and logistical options' for deployed commandos⁴³ may see RAF assets unexpectedly committed to LRG(N) operations. If that is the case, swift and seamless integration will maximise strategic ambiguity, enemy decision friction, and operational manoeuvrability. Such advantages may also accrue on an Alliance-wide basis if the alignment of 'policy, activity and capability'⁴⁴ maximises the opportunities for flexible groupings.

Inescapably, however, capability requirements for the High North must compete against other priorities in the Global Britain agenda, most notably the 'Indo-Pacific Tilt'.⁴⁵ The risk for a numerically-limited albeit technically-proficient force like the RAF is the small tolerance in strategic credibility. In the hostility of its environment and the severity of the mission which would mandate a British presence there, the ability of the RAF to operate in the High North represents for defence planners one of the most challenging applications of air and space power.

Yet the DAS, which aspires to outlive two defence reviews, falls short in acknowledging this. A welcome sign though it is of MoD attention returning northwards, by summarising recent investments it fails to provide the strategic direction necessary to achieve the Future Force, beyond unhelpfully broad strokes. Absent this, '[i]t is hard to see how [the DAS amounts to] any meaningful renewal of UK defence commitment to the High North'.⁴⁶ Whether the silence on capability development is in deference to the Foreign Office, ongoing uncertainty over Russia, or simply that the DAS's capacity to reshape Defence is constrained by the conclusions of last year's Integrated Review, is left to the reader's speculation. What is clear is that, as a seapower-centric strategy, air-mindedness is lacking. Language on the RAF continues extant commitments or tentatively suggests areas for investment, even as it warns that '[t]he era of Arctic exceptionalism is ending'.⁴⁷ Nor is it apparent who will take ownership for operationalising the Strategy across the services or the metrics proposed to evaluate success.

Mindful of these unresolved questions, this paper charts the specific challenges impeding the ability of UK air and space power to make a defence contribution in the High North. This does not include detailed analysis on the region's likely adversaries, a subject which has been dealt with elsewhere in recent months.⁴⁸ Instead, it critically evaluates for each Defence Line of Development (training, equipment, personnel, infrastructure, doctrine and concepts, organisation, information and logistics)⁴⁹ what the RAF should be addressing now if the DAS is to align ends with means.

Training

Primarily because of recent Middle Eastern campaigns, expertise in cold-weather warfare has been permitted to atrophy in the three decades following the Cold War. Untrained aviators and groundcrew operating in this uniquely unforgiving environment would sooner become liabilities than assets. Moreover, if the UK government is to strengthen deterrence of its South Atlantic territories, the resumption of polar warfare in the training regime would signal much credibility.

Flying conditions in the High North can be treacherous even without the chaos of air combat. In this year's Exercise COLD RESPONSE, for instance, inclement weather across Norway claimed the lives of four American Marines and their MV-22B Osprey.⁵⁰ Several hazards stand out. The whipping up of fine Arctic snow by surface winds or rotor downdraft can cause 'white-out', reducing visibility to zero. Whereas the spatial disorientation this induces is akin to the 'brown-out' of sandy conditions, preparing for these phenomena in the Arctic is safer since it limits sand-induced erosion of airframes.⁵¹ Additionally, the prolonged fog and cloud cover in this theatre⁵² dims infrared contrast and laser ranges, impeding in turn the ability to find ground targets. The polar night meanwhile gives the advantage to aircrew with superior Night Vision Goggles training. Achieving sufficient night flying hours has proved a challenge for the RAF in recent years but is a competence crucial to the 24-hour availability of air assets.⁵³ Arctic training could help more aircrew achieve night currency with little anti-social impact.

Finally, longitudinal convergence at the North Pole, together with geomagnetic effects, poses additional challenges. A seamless transition between, and fusion of, diverse navigational aids will be key. For example, when PNT systems like GPS fail, are outside range, or sabotaged, radio-, astro- or inertial navigation (INS) can help re-orientate aircrew.⁵⁴ Of course, neither of these methods are in themselves sufficient (see the 'Information' section for more details) but aircrew training should emphasise how they can best be leveraged to support continued operations. Overcoming these intrinsic, environmental challenges reinforces the airmanship and captaincy skills necessary for successful operations in less hostile domains.

The military operations anticipated in this realm must also shape training. Most clearly, the region's expanse demands proficiency in air-to-air refuelling (AAR) and maritime patrol (including anti-submarine warfare (ASW) and SAR). Moreover, as recent events bear out, operating in proximity to Anti-Access/Area-Denial (A2/AD) capabilities can significantly impair freedom of action. The antidote – Suppression and/or Destruction of Enemy Air Defences (SEAD/DEAD) – requires pilot training in mixed, tactical formations under fire, supported by penetrating and stand-off ISTAR⁵⁵ and AAR assets. But on a pan-European basis, this requirement has been insufficiently resourced in recent years, reflecting the low aerial threat in Iraq and Afghanistan.⁵⁶ Short of accomplishing a sufficient SEAD/DEAD competency in the near term, resorting to threat evasion tactics such as low-level flying can have unintended consequences, to say nothing of diminished battlefield effectiveness.⁵⁷

A2/AD requirements aside, it is furthermore necessary to trial novel concepts such as 'hot-pit' refuelling and Agile Combat Employment (ACE).⁵⁸ The RAF, to its credit, is beginning to do this. The emphasis in these exercises rightly seems to be on aircrew *and* groundcrew competence, for without experience changing an engine or protecting an austere airfield at sub-zero temperatures, cold-weather airmanship and novel concepts are moot. These ground challenges are covered in detail within the 'Personnel' section of this paper.

Quite apart from the technical, High North training is a political challenge, too. Exercising may induce Moscow to claim that the RAF's activities are escalatory: the former has opposed any 'reawakening' of the Arctic.⁵⁹ Moreover, whereas Allies regularly invite Russian observers to its exercises, reciprocal invitations are rarely issued as the Kremlin claims its training falls below the personnel threshold mandating this.⁶⁰ This knowledge asymmetry could undermine RAF operations in the High North.⁶¹ Given that they constitute uncommitted defence expenditure, neither are exercises immune from the currency fluctuations, inflation and perennial fiscal constraints on the domestic side. Pressures to economise are so acute that frontline commands have consistently faced shortfalls in aircrew, the Flying Training System having failed to fulfil even the minimum requirements it was designed for, let alone having the headroom to absorb shocks like Covid and the war in Ukraine.⁶² To illustrate, in May 2022, more than half of the UK military's trainee aviators were in holding, either waiting for their first flying course or a refresher.⁶³ If even basic flying training is deficient, questions may rightfully be raised about whether High North exercises are a luxury the MoD can ill-afford.

The RAF's reliance on an ever-diminishing pool of pilots to deploy and instruct – only a subset of whom are proficient in cold-weather warfare – may emerge as a single point of failure in its delivery of High North missions. Those who point to the increased tempo of Arctic exercising in recent years overlook the RAF's modest contribution in comparison to the Fleet Air Arm (FAA) and Army Air Corps (AAA), less still the Nordic air forces.⁶⁴ 3 Commando Brigade Royal Marines and the constituent squadrons of the FAA's Commando Helicopter Force have centred their Arctic training since 1969 on the Royal Norwegian Air Force (RNoAF) Base at Bardufoss, which now offers tri-service provision for Arctic survival, military training and flying. Understandably, given the emphasis on littoral strike, rotary wing dominates: Merlins from 845 and 846 Naval Air Squadron (NAS), Wildcats from 847 NAS, and, more recently, RAF Chinooks from 27 Squadron and Apaches from 656 Squadron AAA.⁶⁵ Fixed-wing contributions are chiefly drawn from the RAF's Air Mobility Force (AMF) which transports airframes with insufficient range and personnel for the North Sea journey,⁶⁶ leaving the relative absence of RAF combat, ISTAR and refuelling assets to exercises in the High North a risk to operational effectiveness.

This is changing, however. The contribution of RAF F-35s and Poseidon aircraft to COLD RESPONSE 2022, building on the deployment of Typhoons and Voyagers to ARCTIC CHALLENGE EXERCISE 2019 and a multinational freedom of navigation exercise in 2020,⁶⁷ is encouraging and must become routine if the RAF is to achieve a sustained Arctic capability. Further grounds for optimism derive from the platform commonalities between the RAF and the Norwegian and American inventories (P-8 Poseidon, F-35, and, for the moment, C-130J⁶⁸) and the greater promise for trilateral collaboration on tactics, training and concepts of operation in the High North. Denmark's embryonic F-35 fleet and the 2021 announcement⁶⁹ that the Finnish Air Force will procure 64 of the type raises the prospect of further synergy in the air domain. Joining Finland as an incoming NATO ally is Sweden, whose collaboration on the UK-led Future Combat Air System offers opportunities to use High North training to inform sixth-generation development.

Oslo has so far taken the lead in coordinating Allied training. This year's edition of COLD RESPONSE was the largest exercise inside the Norwegian Arctic Circle since the 1980s. Based on an Article V collective defence scenario, the RAF's contribution reinforced institutional relearning in cold-weather warfare. Exercises like COLD RESPONSE further the UK's 'posture of continuous campaigning' in which training has an 'operational end.'⁷⁰ Nevertheless, the territorial defence of Norway is but one High North contingency. Norway's self-imposed policy⁷¹ of restricting Allied aircraft movements over the Barents Sea confines the extent of training. Similarly, Norwegian exercises do not capture the climatic extremes conceivable in an Arctic air contest. Conditions at US airbases like Thule, a further 10° north in latitude, are significantly more intimidating.

Equipment

Presently, the RAF boasts few cold-weather capabilities but unless the UK aspires to be a first-rate Arctic power, capital expenditure on specialist platforms need not be a priority. Firstly, much can be achieved with a greater understanding of, and experience in, the maintenance necessary to achieve high serviceability of conventional platforms in the Arctic. Second, many of the capabilities needed in the High North (such as enablers and MPA) are globally deployable assets. Given this flexibility, defence planners should not feel that preparing for Arctic contingencies divests disproportionately from standing operations. In fact, in keeping with the UK's role as a 'framework nation', the RAF's force structure should complement the anticipated coalition of Arctic players, sparing the need for full-spectrum capabilities. Rather, the main issue is that, precisely because of their flexibility, the service's assets are already in demand elsewhere around the globe. In the absence of combat mass, it is a question of political priorities; priorities which, at least prior to the invasion of Ukraine, centred East rather than North.

In this geopolitical flux, one constant is the extreme Arctic environment. Icing conditions make certain altitudes inaccessible to anything but the most sophisticated de-icing treatments. Exposure to low temperatures stiffens tyres, cracks Perspex, and reduces tensile strength. The behaviour of electronic components, including antennae and actuators, also becomes unpredictable. Temperatures aside, increased ultra-violet radiation at the poles can deteriorate protective coatings.⁷² Admittedly, hail impact and lightning strikes in the Arctic remain low, but since 2010, incidents of summer lightning in the region have tripled⁷³ with the risk of discrete damage to the polymer composites so common a feature of contemporary aerospace. Operating in these extremes, not to mention the stresses of rapid deployment between hot- and cold-weather theatres, may reveal shortcomings not identified during an aircraft's developmental trials. As one example, batteries aboard the F-35 fleet 'critically restrict[ed] the combat readiness'⁷⁴ of the US Air Force in 2018 when exposed to the Alaskan cold. Unforeseen challenges of this kind may manifest as 'friction' in war, demanding compromises on the performance envelope once operations commence.

Retrofitting existing platforms offers one way to rapidly field Arctic capabilities, short of procuring specialist systems like the Russian Aerospace Forces (VKS). RAF Chinooks are already equipped with removable snow skids⁷⁵ for landing on soft terrain and, when operating from unpaved areas, gravel kits are simple modifications to aircraft which reduce foreign object debris ingestion. Depending on the political commitment to the High North, more specialised treatments are available. Safer landing in icy, high-wind conditions has been achieved on the RNoAF F-35 fleet through drag chutes.⁷⁶ Meanwhile, the US experience of operating ski-wheeled LC-130Hs in the High North might inform experimentation on the RAF's soon-to-be-retired C-130J airframes.⁷⁷

These opportunities are nice add-ons but they seem inconsequential to the more urgent need for MPA. From 40 Nimrod in the 1970s to nine Poseidon P-8As today,⁷⁸ the UK's ability to prosecute ASW in the waters around the GIUK Gap has undoubtedly diminished, in concert with the wider NATO alliance. Today's 2:1 submarine-to-MPA ratio – the inverse of the Cold War⁷⁹ – imperils the British continuous-at-sea deterrent and its two carriers, more still the transatlantic SLOCs necessary to reinforce the European theatre. The defence has been that the collective NATO force is sufficient,⁸⁰ and that the MQ-9B Protector fleet, with Seaspray radar, will augment Poseidon's capabilities from 2024. Yet this remains a centre-of-gravity for a seafaring nation, not least because a High North operation would bring British forces in contact with the submarine-infested 'Bastion' of Russia's Northern Fleet.

Another complication for future operations in the region, versus the RAF's Cold War experience, is Chinese ascendance. The spectre of two revisionist powers raises the prospect that the US will split, or worse, redirect, the strategic enablers on which NATO air forces overwhelmingly rely. As the US force model shifts towards a Pacific-led strategy, the UK and its European allies will need to reconfigure force structures to backfill the enablers and C2 systems necessary to support operations across the distances and highly contested airspace of the High North. These key capabilities have been eroded in recent years with the RAF, though by no means the worst offender, prioritising combat air.⁸¹

Uncrewed is often invoked as the solution given its greater loiter time, cost-effectiveness, and reduced risk to personnel, but this could be a false economy. To be sure, removing aircrew may minimise casualties and prisoners of war but it does not negate the need for ground-based pilots, sensor operators, image analysts, aircraft maintainers, or launch and recovery elements – amounting to a logistical footprint similar to, if not greater than, crewed platforms.⁸² The only question, in hitherto undertested conditions, is: in the High North, what is the minimum number of forward-deployed personnel that an assured capability requires? Class III Remotely Piloted Aircraft Systems (RPAS), for instance, remain especially vulnerable to the restricted satellite coverage and bandwidth capacity available at high latitudes, not to mention their increased susceptibility to extreme weather vis-à-vis their crewed equivalents.⁸³ Their greater reliance on a 'system of systems' architecture introduces additional safety-critical features, in part because the redundancy chain will always be one link shorter than aircraft with pilots aboard.⁸⁴

Given these complexities in airworthiness, operation of RPAS can involve frequent use of contractor support for specialist tasks. In this regard, there are two implications. First, there is the practical one of deploying civilians at short notice to a remote part of the world. Second, there are legal implications concerning the RAF's responsibility to provide force protection and medical support to these contractors, and their status in-theatre as non-combatants who are nevertheless participating in hostilities.⁸⁵ Both technical and human issues will need to be resolved to leverage the advantages uncrewed assets can make to defence in the High North.

Personnel

From a physical standpoint, personnel at airfields in the High North are exposed to several hazards. First there are the risks of frostbite, induced in the cold by accidents as *quotidian* as spilt fuel on skin, and worsened only by the wind chill of operations under a helicopter rotor disc or on a flight deck. The cold and wind more generally diminish the efficiency of maintenance crews through fatigue and reduced dexterity but also as an unavoidable consequence of cumbersome warm clothing and gloves.⁸⁶ Less well-studied is the impact of higher radiation doses received both by ground- and aircrew operating at high latitude.⁸⁷

There is also the psychological element. George Swinnow observed that the ‘most dangerous phenomenon [in cold-weather warfare]...is the increase in the number of people who ingenuously find reasons to participate in indoor activity at various headquarters...leaving a decreasing number of unlucky ones to bear the onslaught of the adversary.’⁸⁸ This propensity is acute in an air force, Bernard Ash claimed, as a service in which only a small elite ever fight, the rest being ‘tradesmen.’⁸⁹ The dissolution of front-line constructs in the contemporary battlespace means all personnel should be ‘trained and psychologically prepared to be able to defend themselves and continue to operate,’⁹⁰ more so in the bleak High North. The Winter War,⁹¹ and the invasion of Ukraine more recently, also underscore the home advantage, not only logistically, but in imbuing fighters with a stronger devotion to the cause. Notwithstanding the professionalism of the RAF, Britain’s claim to being the ‘Arctic’s nearest neighbour’ lacks the patriotic significance generations of Russian airmen have attached to the region.

The final personnel element worth noting is that of expertise. Hitler’s ill-informed interventions in the Norwegian campaign⁹² mirror that of General Galtieri’s in the Falklands four decades later. But whereas one ultimately acted on the advice of his Luftwaffe commanders, the other stubbornly saturated airlift capacity with troop transport at the cost of runway improvements at Port Stanley.⁹³ This self-sabotage not only excluded the ability to forward-base at least four fighters for defensive counter-air, but substandard repairs to the runway following Operation Black Buck in any case crippled the ability of fully-laden troop transporters to land.⁹⁴ Competent commanders with theatre knowledge are fundamental to any campaign; the Arctic is however especially unforgiving of military ignorance. Mindful of the expertise lacking in-house, the Luftwaffe enlisted a senior Lufthansa manager as the lead logistician for Germany’s invasion of Norway.⁹⁵

Drawing on industry expertise today is most vivid in the work of the British Army’s Staff Corps but the RAF has made in-roads too with 601 Squadron. Moreover, although it has given commendable service capacity-building in partner nations, the RAF should not hesitate to seek train, advise and assist programmes by Nordic air forces to form the nucleus of a cold-weather capability within its ranks. This would have the benefit of strengthened relationships with potential coalition partners, reinforced through the air attaché network. The RAF should also leverage the expertise in sister services (particularly the Royal Marines) and its own Mountain Rescue Service.

Infrastructure

Efforts to rationalise the defence estate initially centred on yielding a ‘peace dividend’ in the post-Cold War era with the 2008 financial crisis, and the austerity policy which followed it, explaining more recent attempts. Fiscally-prudent thought it may be, this programme has seen RAF assets concentrated among fewer, albeit larger and more complex, airbases⁹⁶ in contrast to Russia’s mushrooming Arctic facilities and the potential military threat they embody.

As will be analysed below, mobile basing in support of distributed operations can restore some flexibility despite the budgetary imperatives to consolidate. While that remains conceptual, however, the UK’s disposal of strategically-sited airfields in favour of these enlarged hubs has immediate implications for the RAF’s ability to operate in the High North. RAF Macrihanish (1996), Stornoway (1998), Kinloss (2012) and Leuchars (2015) are amongst the Scottish facilities abandoned by the RAF in recent years, facilities which historically provided interceptor, MPA, and convoy escort duties at high latitudes. These installations, although presently retained as Relief Landing Grounds and commercial airports, would require significant investments to sustain prolonged combat as a Forward Operating Base (FOB). That is not to say reactivation of latent facilities is unachievable, however. Remote Radar Head Saxa Vord was recently restored for operations to improve coverage of High North airspace.

Norway’s restrictions on Allied training in the Barents Sea have already been discussed but this is just one example of another infrastructural challenge: the RAF’s vulnerability to the internal politics of host nations. In its most recent Arctic Policy Framework, the UK government acknowledged that ‘perhaps the biggest change to the UK’s Arctic position since 2013 was the decision by the people of the UK to leave the European Union.’⁹⁷ An independent Scotland – sought by the devolved administration in a prospective 2023 referendum⁹⁸ – would have even greater ramifications for British air power at high latitudes, ramifications despite which have gone ‘largely unacknowledged’ in the ‘Scexit’ debate.⁹⁹

Specifically, the proximity of Scotland to the waters and airspace of the High North is what makes RAF Lossiemouth crucial to prosecuting air warfare, quick reaction alerts, and SAR in this region. It is possible the UK military may be invited to defend an independent Scotland¹⁰⁰ but one should note Holyrood’s increasingly sovereign approach to the Arctic in addition to articulating its own defence credentials:¹⁰¹ ‘By focusing on the Arctic as a new centre for trade, innovation and investment, Scotland is no longer geographically peripheral at the northwest corner of Europe. We find ourselves in a key position, linking the region with Europe and the wider world.’¹⁰² In the event of independence, retention of defence infrastructure in the High North during any transitory period or post-Scexit settlement is likely to pivot on delicate negotiations concerning the UK’s nuclear

deterrent. Tensions here may well scupper a broader defence agreement encompassing not only reciprocal basing rights, but extending to interoperability, joint missions, and collaboration on research, development and procurement – fragmentation which adversaries may seek to exploit.¹⁰³

The next-closest airbases to the High North, should Lossiemouth be unavailable, are 200 miles south, at RAF Leeming and JHC Aldergrove. FOBs here would exacerbate the RAF's geographic disadvantage vis-à-vis the Russians, reducing aircraft operational radius, time-on-task, and the availability of diversionary airfields. Allied air forces are not immune to this. The autonomous Danish territory of Greenland has a modest independence movement which, as Danish intelligence warns, Russian and Chinese influence operations could exploit. This would jeopardise the US-run military installation at Thule which has major air and deep-water facilities. Indeed, although ultimately accepted in May 2022, Greenland's initial rejection of a \$230 million deal to improve surveillance of the High North was seen as evidence of the devolved government's commitment to demilitarising the island.¹⁰⁴ When one also considers the closure of Norway's main airbase above the Arctic Circle (Bodø) and continued uncertainty over a second (Andøya),¹⁰⁵ there are plausible futures in which assembling an Allied expeditionary force may prove challenging, even without offensive counter-air.

Questions also remain over the availability of basing infrastructure in soon-to-be allies Finland and Sweden. Host nation support agreements currently provide for assistance to NATO forces located on, operating in, and transiting through Swedish and Finnish territory. But Putin has warned that pre-positioned equipment or third-party personnel in either country would provoke a 'symmetric' response, prompting Swedish and NATO officials to reassure him that no such plans exist.¹⁰⁶ This leaves the Alliance's northern flank with a different posture than the east, where tripwire units have evolved to an 'enhanced forward presence' of eight multinational battlegroups stretching from the Baltic to the Black Sea.¹⁰⁷ Without pre-positioned assets, the surge of Allied forces needed to reinforce the Scandinavian peninsula in a crisis may overwhelm the region's existing infrastructure.¹⁰⁸ Mindful that nearly all Finnish air bases are within Russia's A2/AD bubble,¹⁰⁹ the air mobility and force protection elements key to theatre reinforcement will need to think creatively about their war plans.

Given these impediments to power projection northwards, the RAF's recent experimentation with mobile basing seems prudent.¹¹⁰ In highly contested airspace, having self-sufficient units which can warfight from dispersed locations at short-notice is key. Shifting from a heavy dependence on static, built-in airfields towards a runway-independent air force would equip the RAF with greater strategic advantage in the High North. The new *Queen Elizabeth*-class (QE) carriers offer some options but land-based air power has one crucial advantage: airfields don't sink.

That said, whatever the merits of ACE, Arctic conditions forestall easy exploitation of terrestrial infrastructure. Thawing permafrost can be as perilous to hangar foundations as frozen lakes are to landing aircraft.¹¹¹ There is a need to clear snowdrifts from expeditionary airfields while particularly austere bases lack instrumentation and even electricity.¹¹² And then overlaying this are the challenges of ACE itself: command and control between disparate forces; civil-military coordination; sufficient force protection; and, if the need arose, reversing the skill fade in the rapid construction of airstrips. Overcoming these difficulties to secure air superiority is a precondition for high-intensity warfighting in the High North and, as such, the purported cost-savings of ACE vis-à-vis reactivating former airbases should not be overstated.

Doctrine and concepts

Excessive faith, even pride, in improvisation has been described as a fatal flaw in the British military psyche despite history revealing the dangers of using ad hoc solutions as a substitute for sound doctrine and planning. Stress testing the RAF's nascent concepts of operation should therefore be prioritised to evade the 'hubris' of underestimating Clausewitzian friction.¹¹³ This thinking should be informed by tri-service and Allied expertise with a view to achieving coherence across Defence.

Doctrinal analysis of peer competitors could also reveal key insights concerning the character of future conflict. Russian doctrine emphasises an overwhelming aerial assault once hostilities commence.¹¹⁴ The absence of this in its invasion of Ukraine, so far, should not inspire complacency, for its forces may build back better. Equally, the recognition of the logistical demands of winter warfare has shaped training and acquisition in the VKS in the belief that its adversaries will be handicapped by these conditions. Swinzow noted that 'in temperate and cold climates the more prepared side will deliberately select the winter for the decisive battle ... The power better prepared or adapted to winter warfare has the advantage.'¹¹⁵ With the fait accompli strategies conceivable in the High North,¹¹⁶ timing favours the attacker.

Commanders should also expect passive air defence and strategic *maskirovka* (military deception) to enhance the survivability of Russian air assets in the initial assault.¹¹⁷ Artificial smoke provides excellent camouflage in the snow, while false tracks, campfires and decoy airfields can divert the resources of belligerents.¹¹⁸ Skilful deception featured in the Falklands conflict where the Argentine air force 'baited the British with decoys, forced a response, and stretched their [Combat Air Patrol] coverage to improve the chances of survival and success of [the] attack[ing] force.'¹¹⁹ A future combat environment may see Electronic Warfare (EW) shroud Russian activities.

To be clear, the British air power community should be commended in its efforts to outthink adversaries although much more remains to be done. The demand signal for ACE is clearly present, for example, but while conceptually convincing, the RAF appears some way from the distributed, network-centric approaches needed to robustly employ ACE in war. In the interim, an appropriate question might be: how can the spirit of such ideas be exploited without the technological enablers currently envisaged?

A blueprint may be found in Sweden's Cold War development of its Flygbassystem 90 infrastructure, blending *maskirovka* and proto-ACE ideas.¹²⁰ Similarly, partly from its experience implementing ACE-like architecture inside Russia's A2/AD envelope for decades, the Finnish Air Force has learned to rely on one-third the maintainers that comparable US systems demand, despite operating in a harsher climate. The USAF is actively learning from the Finns, in addition to developing its own concepts. These include 'hot-pit' refuelling which the RAF, to its credit, has experimented with in Norway.¹²¹ As platform commonality between the UK and the Arctic States increases, opportunities for further collaboration on tactics and doctrine only grow.

As it stands, these concepts arise ad hoc; a more formal forum for institutional learning may steer High North air power as best practice increases in complexity. The Northern Group, of which the UK is a founding member, hosts a Centre for Conceptual Thinking but its remit is broad.¹²² Thought may be given to an Arctic Studies Group at Cranwell or DCDC, akin to the Pentagon's new Stevens Center for Arctic Security Studies.¹²³ Additionally, pooling Allied expertise into the Norway-based NATO Centre of Excellence in Cold Weather Operations (whose only air output at present is an optional one-day staff course on air mobile operations) may equip the Alliance or the UK-led JEF with a source of sustained analytical effort on High North air power.

Organisation

The RAF is likely to be part of a broad, international effort incorporating at least some of the Arctic States to legitimise and reinforce any operation in the region.¹²⁴ The emergence in recent years of flexible groupings geared towards the High North have the potential to provide strategic ambiguity, enemy decision friction and opportunities for the RAF's operational manoeuvre, providing unity of purpose exists.

Foremost among the probable groupings is NATO, whose 2030 Report calls for 'enhanced situational awareness across the High North and the Arctic' and a deterrence and defence strategy to cover the High North within the Supreme Allied Commander Europe's Area of Responsibility.¹²⁵ Within this context, the challenge for the RAF will be to ensure that the force remains 'allied by design'. This includes fulfilling the UK's ASW responsibilities to NATO and supporting the Alliance's new Atlantic Command. As an island nation, the UK's vulnerabilities include a dependence on transatlantic sea lanes for surface trade, power projection, and reinforcement of the European theatre. In today's world of economic and cyber warfare, ASW is moreover crucial in protecting subsurface infrastructure like data cables, which the DAS considers its first objective.¹²⁶ Hard-wired communications also provide redundancy in the event of attacks on NATO satellites, systems which, due to their limited bandwidth, can in any event cover a mere fraction of the data carried underwater. Though in limited number, the RAF's acquisition of the P-8A Poseidon should aid interoperability with NATO Allies who likewise have the type in their MPA inventory.

That said, some NATO members are uneasy about greater Alliance involvement at high latitudes. Until last year, Canadian sensitivities had seen the removal of explicit language on the High North in NATO's 2010 Strategic Concept and in official declarations since.¹²⁷ The 2021 Brussels Summit Communiqué included for the first time a description of NATO's regional role: 'In the High North, we will continue to undertake necessary, calibrated, and coordinated activities in support of the Alliance's security interests.'¹²⁸ But by NATO's 2022 Strategic Concept, issued amidst the war in Ukraine, heads of state and government still could only agree on one reference to either the High North or the Arctic: 'In the High North, [the Russian Federation's] capability to disrupt Allied reinforcements and freedom of navigation across the North Atlantic is a strategic challenge to the Alliance.'¹²⁹ Short of a collective defence scenario, continued hesitation in some circles may impact the Alliance's ability to achieve consensus and act at the speed of relevance.¹³⁰

Flexible groupings of like-minded partners outside the NATO framework could prove an antidote to sclerotic tendencies. The UK-led JEF (comprising Denmark, Finland, Estonia, Iceland, Latvia, Lithuania, the Netherlands, Sweden and Norway around the framework nation of the UK) and Northern Group (JEF countries less the Netherlands but including Germany and Poland) reflect the British government's convening power. Aerial exercises offer opportunities to burnish these new architectures with organisational, operational and air C2 experience. Part of the challenge is coalescing the constituent air forces of the JEF and Northern Group around shared strategic priorities lest disparities in risk tolerance stymie force concentration at the theatre's operational level.¹³¹ Putin's latest adventurism, for instance, continues to test Alliance solidarity. Furthermore, as mentioned previously, the absence of the US from these endeavours means any expeditionary force must have sufficient non-USAF enablers. Continued deficits across this family of capabilities (let alone in space) are a persistent risk to effective air power.

Finally, given the 'triphibious' nature of a prospective High North operation, jointery is key. Intra-service coordination in Defence has greatly improved at the strategic level, not least with the establishment of Strategic Command and, in 2018, the standing up of a North Atlantic Joint Area of Operations to integrate Royal Navy and RAF deployments in the region.¹³² But the 'dispersal of policy responsibility for Arctic affairs across Whitehall has the potential to frustrate co-ordination'¹³³ as does the single-Service domination at the tactical level of war. As a positive development in this regard, Attack Reconnaissance Teaming (ART) between Commando Wildcats and AAA Apaches promises force multiplication for rotary wing in the High North.¹³⁴ The demands for joint tactical warfighting will nevertheless increase considerably with the distributed operations of ACE. Deviations from the traditional Air Tasking Order towards a more agile, mission-orientated allocation of air assets to the joint force, providing the cultural appetite and technological preconditions in C2 exist, may provide some answers.¹³⁵

Another avenue could be the standing up of an Expeditionary Air Wing (EAW) centred on High North operations. With the closure of RAF Kinloss, the UK's only EAW focusing on MPA and ISR (No.325) was stood down, just a year prior to Russia's annexation of Crimea. Taking inspiration from the MAGTF¹³⁶ and Expeditionary Strike Group concepts in the US, a High North EAW could incorporate naval and force protection elements with expertise in the Arctic realm, such as LRG(N). This might sustain a pan-Defence 'seed-corn' capability in cold-weather operations which could train as a cohesive unit and rapidly deploy when required. Organising the air force on such a territorial rather than functional basis enabled Luftflotte 5 (responsible for operations over Norway, Finland and the Russian Arctic) to accrue valuable cold-weather experience as WWII progressed.¹³⁷ A territorial-centric model would also complement NATO's revival of pre-assigned forces for the eastern flank, where the UK has specific responsibilities for Estonia.¹³⁸ Familiarity with the terrain, pre-positioned equipment, and host nation training and personnel in advance of any operation are considered by the Alliance to be key advantages of this approach.¹³⁹

Information

The first information challenge to the RAF in the High North is influence operations. The UK, particularly as a non-Arctic State, will have to justify its presence north of the traditional Euro-Atlantic area. Disinformation could seek to delegitimise British activity and further Russian narratives of NATO encirclement, and exploit independence movements to degrade military infrastructure in the region. It has been argued that the Alliance's reluctance hitherto to acknowledge the Arctic as a region of interest has opened a vacuum for others to shape the region in their image. Normalising a presence in the High North through routine engagement will be key to future-proofing RAF activity.¹⁴⁰ It may also shape the behaviour of hostile actors through enhanced deterrence.

If adversaries are not deterred, however, identifying destabilising behaviours early relies on improved situational awareness across the High North which should be the product of data-sharing between Allies and platforms even as communications are subjected to the disruptive efforts of opponent(s) and the natural world. To this end, airborne ISTAR assets will find utility across the RAF's range of High North mission sets but their survivability in the event of high-intensity warfighting is doubtful. For the relatively benign tasks of SAR, air policing, and FON, the sophisticated sensor suite of the Protector MQ-9B could provide persistent overhead surveillance, assuming they withstood the temperatures. Faced with hostilities, however, their high reliance on datalinks and electronics renders them vulnerable to the stand-off strike and EW capabilities wielded by Russia.¹⁴¹ This limitation is shared by the Poseidon (MPA) and E-7 Wedgetail (Air Battle Management & Surveillance (ABM&S)), necessitating their confinement to rear echelons until theatre-wide air superiority can be assured.

Instead, while the burden of penetrating ISTAR will likely fall on the stealthy F-35s, the number procured is insufficient to sustain the high attrition rates of a prolonged, state-on-state contest. The ability to degrade the A2/AD umbrella (the precondition for air superiority) is thus unlikely, bar in the most existential conflicts, to occur within politically acceptable levels of loss.¹⁴² The result will be a tough, strategic prioritisation between tasking the F-35 for the flank or main effort. At the same time, the capacity to utilise the admittedly smaller ISTAR fleets of UK allies is hampered by sub-optimal data interoperability, particularly in maritime air. Variations in sonobuoy uplink encryption and acoustic recording are enduring challenges to combined operations in the High North.¹⁴³ There are also then the questions of integrating fourth- and fifth-generation fighters and avoiding fratricide when communication and air defence architectures are stovepiped within national chains of command: a situation one official described as 'plug and pray' rather than 'plug and play'.¹⁴⁴

So too is the RAF presently ill-positioned for space, given the importance the DAS attaches to improved geospatial data for the High North.¹⁴⁵ Among the Global Navigation Satellite Systems (GNSSs), the bulk of UK PNT capability relies on the NavStar GPS which has a maximum orbital inclination of 55° (the North Pole is at 90°), resulting in potential performance limitations in the Arctic. Even the EU's proposed Galileo network will only have persistent overhead coverage up to 56°N, compared with 64.8° in the Russian GLONASS constellation. These low inclines cause disproportionately higher uncertainty in altimetry, making them particularly treacherous for aircraft.¹⁴⁶ The lack of coverage in the Arctic, let alone redundancy, is further complicated by the challenge of GPS jamming which Russia has repeatedly inflicted on NATO forces.¹⁴⁷ Degraded or denied GPS capability – what the Defence Space Strategy terms 'navigation warfare'¹⁴⁸ – would undermine key pillars of modern air warfare (including precision-guided munitions, AAR and data encryption), and the RAF's contribution to humanitarian aid and disaster relief, and SAR. Whereas munitions can resort to electromagnetic-based targeting (e.g. lasers, radar, and infrared), long-range sorties suffer from the limitations of non-GNSS navigational aids: radionavigation (infrastructure is sparse and vulnerable to sabotage), INS (accumulated error over time unless periodically corrected by a different system), celestial navigation (weather- and season-dependent if relying on eyesight alone) and visual observation (a relatively featureless terrain).

The same deficiencies are true of communications. Above 80°, only narrowband high frequency radio and the commercially-operated Iridium network are available.¹⁴⁹ While Skynet, the UK's sovereign MILSATCOM¹⁵⁰ capability, is situated in geostationary orbit and thus has a larger satellite footprint than lower-altitude PNT constellations, its practical range extends only to 75°N.¹⁵¹ Moreover, the higher altitude is unsuitable for detailed optical reconnaissance and, for Class III RPAS, incurs unacceptable latencies in the OODA loop due to the longer orbital relay.¹⁵²

Satellite-based reconnaissance has grown in importance since Russia's 2021 withdrawal (prompted by Washington's exit a year earlier) from the Open Skies Treaty. This agreement – to which the UK is party – permits reciprocal aerial surveillance at short notice between treaty signatories. Russia's departure further obfuscates its military activities, leading to diminished predictability and elevated risks of misunderstanding. In the absence of Open Skies overflight rights, peacetime surveillance consequently relies on plugging the 'polar satellite gap'.¹⁵³

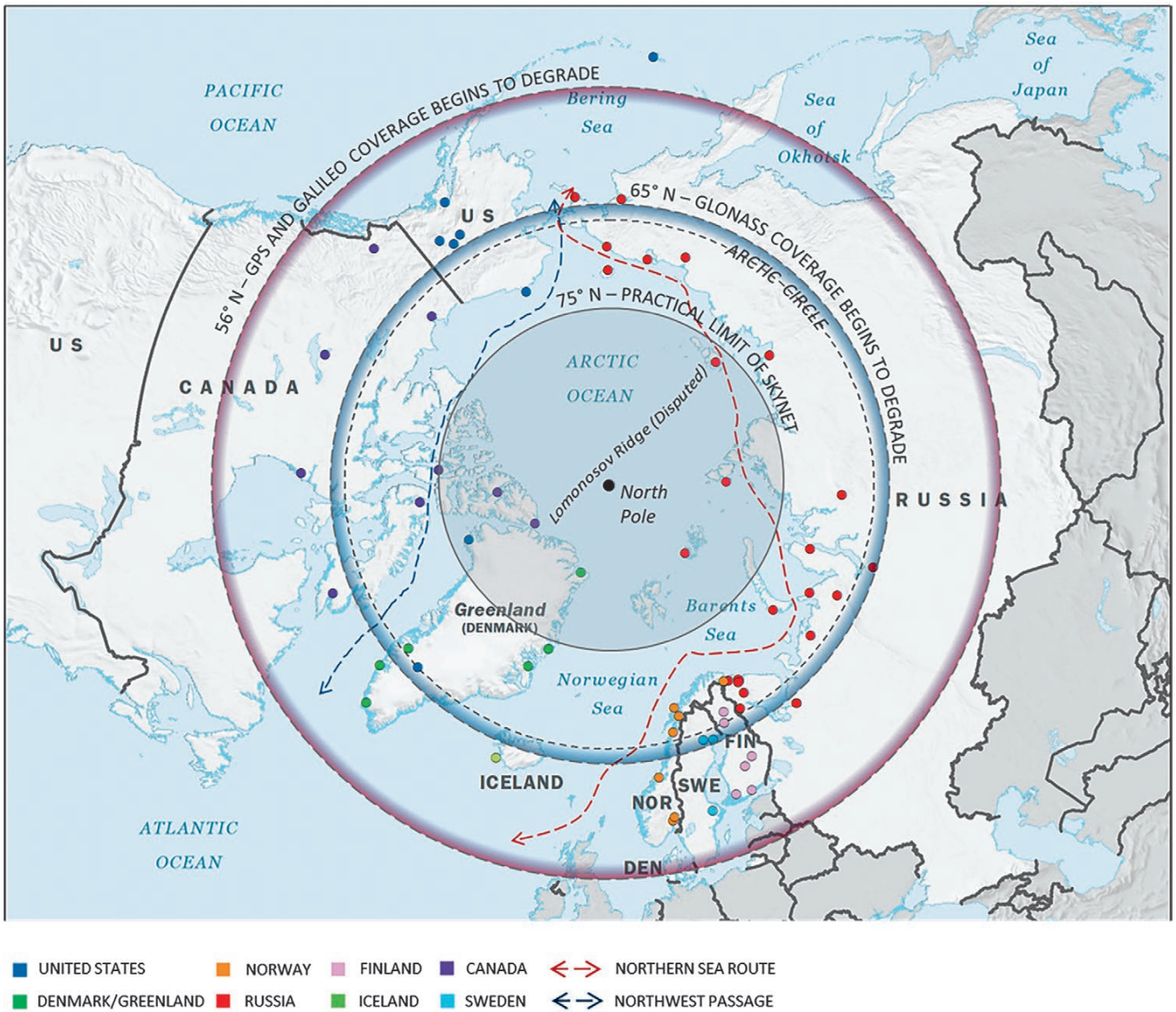


Figure 2: Satellite coverage in the High North.¹⁵⁴

The value of a low-altitude polar orbit to the UK's real-time situational awareness of the High North is shown by the success of Carbonite-2. The satellite, launched in 2018 as a technology demonstrator for Skynet 6, offers 'sovereign, full-motion colour video from space for the RAF for the first time,¹⁵⁵ with ground-tracks up to $\pm 82.6^\circ$ latitude. Carbonite-2 may be part of the solution but not all. Persistent, resilient coverage in the High North, owing to smaller footprints and faster overflight, would require a polar constellation greater than its geostationary equivalent and higher per-satellite launch costs. The susceptibility for low-altitude satellites to decay due to atmospheric drag, in turn eroding their lifespan, further adds to the cost. Some optimism may be found in the government's acquisition of OneWeb whose business model centres on a mega-constellation of relatively inexpensive satellites in polar orbit. Further promising is the admittedly 'longer-term' commitment in the DAS to expand High North coverage through the £1.4bn investment in the Defence Space Portfolio.¹⁵⁶

Finally, it would be remiss to overlook the drawbacks of using space-based C2 and ISTAR in High North operations. Firstly, severe ionospheric disturbances and scintillation arising from auroral phenomena at the poles disrupts transmissions. Then, from a tactical standpoint, satellite coverage can be predicted and therefore evaded, or systems attacked with little chance of repair. Carefully calibrated investments across a diverse range of sensors and domains may spread operational and programmatic risks. Specifically, the Own-Collaborate-Access framework outlined in the Integrated Review should be judiciously employed to obtain desired effects without RAF attempts to do everything everywhere. In this regard, integrating national space assets with Five Eyes partners, as outlined in the Defence Space Strategy, is a welcome step to achieving an 'optimal cost-effective multi-sensor ISR capability' for the UK.¹⁵⁷

Logistics

Destination, distance, demand and duration: these are the 'four Ds' which guide logistics planning.¹⁶⁸ Yet the simplicity of this mnemonic belies the complexity of the logistical challenge in any theatre, least of all the Arctic.

The paucity of High North airfields, and the environmental challenges to supporting infrastructure, have already been described elsewhere in this paper¹⁶⁹ but it is worth underscoring four attributes of the destination specifically relevant to logistics. First, the dependence of modern fighters on long, paved runways and their frequent need to re-arm is likely to saturate slots and parking at the existing NATO network of airfields. But these are the same bases necessary to support airline-derived tankers like the RAF's sole AAR asset, the Voyager.¹⁶⁰ A delicate compromise must therefore be made between combat and tanker sorties near the front line, even in the presence of a *QE* carrier. A related dilemma arising from dispersed operations is the logistical challenge of equally dispersed maintenance staff, RAF Regiment personnel, and spares (or 3D printers for in situ manufacture). The type of equipment cold-weather warfare demands poses a third issue. Winter clothes, for example, tend to occupy considerable cabin volume at the cost of other freight. Finally, the likelihood of increased casualties in an amphibious conflict,¹⁶¹ and the additional number succumbing to weather-induced injuries, places higher demands on aeromedical evacuations (MEDEVAC).

On the distance front, the shift towards a 'short-range' RAF is ill-judged if the UK aspires to be an Arctic player.¹⁶² London to the North Pole, negating any deviation for tactical routing, is over five times the combat radius of the F-35. Absent proximate bases or the *QE* carriers, time-on-task is penalised unless refuelling tankers are available. A shortage of these tankers can have pernicious consequences for the prosecution of an air war at range.¹⁶³ The longer logistics chain Arctic distances entail further exposes the force to vulnerabilities which will need to be protected to the detriment of combat mass on the front line.

These distances in turn affect the demands placed on capabilities. For example, the current fleet of RAF Voyagers is only equipped with a probe-and-drogue system which is incompatible with aircraft solely fitted with flying boom technology. The RC-135W Rivet Joint (intelligence), C-17 Globemaster (air mobility), E-7 Wedgetail (ABM&S) and P-8A Poseidon (MPA) are the RAF fleets affected. Since the MoD has no plans to retrofit Voyagers with this capability, the RAF is beholden to USAF tankers or those from the European Multi-Role Tanker Transport's pooled fleet.¹⁶⁴

The MoD has also faced tough choices balancing threat, ambition and public finances in air transport. The 2021 Defence Command Paper shrank the AMF by between 23 and 30%. These assets are used in troop, freight and special forces transport; MEDEVAC; resupply; and SAR eg by airdropping life rafts – all critical capabilities in the High North. While logical in as much as the decision removes capability overlaps, the premature retirement of the C-130 fleet would stretch airlift capacity in high throughput operations.¹⁶⁵ If, as ministers concede, the Integrated Review has traded mass for responsiveness, this would appear to be ill-thought through.¹⁶⁶

Finally, there is the question of duration. Eventually, air power will deplete the initial stockpile of spares and munitions but replenishments must overcome 'systemic limitations'¹⁶⁷ in the logistics chain. Not only is this true of the RAF's low stocks of stand-off weapons needed to attrit Russian air defences (complicated by their incompatibility with the *QE* carriers' weapons handling system¹⁶⁸), but also transnational manufacturing lines which could mean 'months if not years' to restore combat losses.¹⁶⁹ Added to this are the short-notice obligations to passive defence measures like ACE. If the RAF is 'to project UK hard power quickly across the globe and then to sustain that operation thereafter,'¹⁷⁰ these shortcomings need to be corrected.

Conclusion: cold comfort

This paper reveals that, in the High North at least, there are pressing challenges for British air and space power across all Lines of Development. Although otherwise implied by the rhetoric, the evidence suggests an underestimation of the environment's sheer hostility and the demands that expected tasks impose.

A reasonable worst-case scenario might see a fait accompli in contested waters culminate in a single, dedicated opponent outfighting an improvised coalition of materially sophisticated forces. Confusion induced by PNT- and C2-degradation could undermine dispersal operations, with a critical mass of remaining personnel and assets attrited through extreme environmental conditions (including poor visibility), the SEAD/DEAD effort, and *maskirovka*, all while hostile submarines further afield threaten both the nuclear deterrent and the SLOCs critical to theatre reinforcement. Combat mass and the desired throughput of hardware and personnel to the front line could additionally be impaired by inadequacies in basing, tanker availability, and AMF capacity. Achieving and sustaining even local air superiority is therefore no mean feat; Afghanistan 2.0 this is not.

At any rate, a reasonable best-case might still consist of a further deterioration in international norms leading to recurrent infringement of Allied air space and attempts to constrain FON in contravention of UNCLOS. Limiting the RAF's operational freedom would diminish its capacity to protect CNI from sub-threshold attacks. Moreover, Russian attempts to monopolise SAR operations along the NSR, in a manner resembling the *Kursk* disaster, may conflict with the UK's commitment to British nationals overseas and Arctic inhabitants. Working with allies in the region will demand greater sensitivity to their interests if territorial disputes amongst them intensify. Efforts to legitimise the RAF's presence in the region amidst a targeted information campaign may moreover embolden claims by potentially hostile actors, like China, that it, too, is entitled to be militarily engaged in the High North.

The post-Cold War atrophy in air and space capabilities is partly why these complexities are insufficiently understood by UK Defence. Institutional memory has suffered, quite understandably, from the re-tasking of the RAF to fulfil priorities in the Middle East. In comparison with the other services and their aviation arms especially, RAF training at high latitudes has not been routinised nor have units capable of acting as 'seed corn' capabilities in cold weather warfare been sufficiently embedded in allied air forces (MPA being the slight exception). The immediate result is too few personnel with the requisite expertise to warfight versus merely survive; 'to keep yourself warm with the right clothing, to get a good night's sleep under tough conditions, to eat properly, and to handle the snow, the wet and the waters up there.'¹⁷¹ Simulators cannot recreate this.

Additionally, the dependence of UK Defence on the space domain for C2, PNT and ISTAR has grown considerably since the Cold War, and there is now arguably undue faith in the availability and survivability of these systems in a High North contingency.¹⁷² To its credit, the DAS's commitment to ongoing investments in troposcatter technology and its suggestion of a 'potential... "Responsive Space Launch" capability' to plug gaps at the speed of relevance are welcome.¹⁷³ Yet in the absence of these assets, public evidence of the training regime does not appear to sufficiently account for temporary or permanent outages in space-based services.¹⁷⁴

Put another way, 'flexibility' and 'adaptability' are in danger of becoming bywords for 'muddling through'.¹⁷⁵ It seems assumed that air component commanders will exploit opportunities in real-time,¹⁷⁶ re-tasking dual- and sometimes triple-hatted platforms like the F-35 from role-to-role, location-to-location. Supply, transport and protection elements are anticipated to be similarly agile. Where necessary, the absence of enablers or infrastructure will force improvised tactics, techniques and procedures which will remain interoperable with coalition partners and allies. But whereas the region demands a different mindset, built on leadership, knowledge, and experience rather than unconditional optimism, it seems that delivering decisive air and space power effect in the High North is to defence planners and policymakers a challenge too big, too complex, and, perhaps naively, too unlikely a contingency to warrant rigorous thought. If true, such a lack of air- and space-mindedness would undermine joint warfare and aspirations to be allied by design. Given the stated commitments to the region, one hopes that classified plans are more self-critical, but public knowledge on capability development does not inspire confidence in this author.

This is regrettable as the High North could present an excellent vector for coalition air forces to pose a strategic resource dilemma and stretch VKS deployments, as encouraged by the IOC.¹⁷⁷ While it is true that Russian geography and history imbue its military with distinct advantages, this does not make it omnipotent. The performance of the VKS in Ukraine, without underestimating its capacity for revival, reveals a less than surefooted approach to complex air operations. Similarly, although bristling with interceptors, the High North has seen its air superiority assets deployed in much smaller numbers. The Arctic airfields which could enable their swift redeployment to the region are in many cases unable to support the airlift fleet.

Equally, while Russia maintains a sophisticated defensive counter-air capability in the western Arctic, this is less so in the central sector, to say nothing of its reported deficiencies in ASW.¹⁷⁸ If NATO naval assets can indeed penetrate the bastion, the use of submarine-launched cruise missiles in offensive counter-air operations may tilt the balance in the RAF's favour. Then there are the opportunities of increased platform commonality across allied air forces and, if properly exploited, an extensive live and simulated training infrastructure. Proficiency in High North operations would also improve combat outcomes in less hostile geographies.

In sum, even if RAF kinetic activities might only be expected to contain, not defeat, malign Russian behaviour, deterrence by denial through ‘decisively hard capability with the credibility to warfight’¹⁷⁹ remains the best way of upholding the rules-based international order, retaining operational manoeuvre, and protecting CNI infrastructure, while averting a mutually destructive state-on-state contest in defence of UK interests. The DAS provides a starting point to achieve this. What is needed now are the resources – both material and intellectual – upon which its strategic credibility depends. To this end, this paper identifies the following priorities for policymakers’ consideration:

Enablers

- 1. A review of the enabler fleet**, given the relative shortage of tankers (see below on AAR), MPA, ABM&S and ISTAR assets that will leave UK combat air wanting, more so if US enablers are diverted to the Indo-Pacific.
- 2. Enhanced interoperability** within the RAF’s inventory, particularly in AAR and munitions handling, and between allies, most of all in data, which could otherwise diminish combat effectiveness and efforts to legitimise operations through multilateralism.
- 3. Enhanced space capabilities**, perhaps in cooperation with allies and/or trusted industry partners, for although MoD investments are strengthening polar coverage, the overwhelming reliance of NATO forces on PNT renders current systems in the Arctic highly susceptible to ‘data deluge’ and adversary attacks.

Training

- 4. A re-calibration of aircrew training to emphasise likely tasks**, particularly SEAD/DEAD (a neglected aspect of the syllabus over recent decades), AAR, low-level flying, instrument and night ratings, and the capacity to warfight in a PNT- or C2-suppressed environment.
- 5. Realistic groundcrew training** which emphasises operations in harsh conditions, not only to gain familiarity with aircraft performance, but to acclimatise themselves to the physical and psychological challenge.
- 6. Stress-testing and integration of novel concepts** (e.g. ART, ACE, hot-pit re-fuelling) into exercises derived from contingency plans. A High North EAW to pioneer these efforts should emphasise cohesive training with the FAA, AAA, and allied air forces, and integration with fleets like LRG(N) to deliver a truly ‘triphibious’ capability.

The Political Environment

- 7. A re-examination of mitigation measures** concerning power projection northwards amid the renewed spectre of Scottish independence, not least in the context of airbase closures across Scandinavia. Fiscal constraints post-Covid and political commitments to the Indo-Pacific Tilt further militate against capability development for High North operations.¹⁸⁰ How can the RAF effectively reform its posture within these limits?
- 8. A two-fold influence campaign** to a) reassure allies concerned over an expanded NATO presence in the region, and b) contest narratives by potential adversaries which seek to de-legitimise the RAF’s Arctic presence.

On balance, this paper challenges the DAS claim that the RAF in its present configuration ‘has the capacity to rapidly deploy and operate in the High North’¹⁸¹ for anything other than short-term, low intensity operations. This critically undermines the service chiefs’ warning that ‘[t]he ability to warfight is fundamental to our credibility’ and therefore our deterrence.¹⁸² Developing the RAF demanded by this new reality takes time, and that is a luxury recent experience has shown to be all too quickly expended.¹⁸³

Endnotes

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