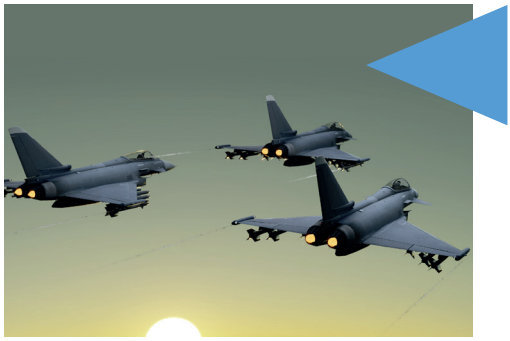
# SMARTER AIRSPACE MANAGEMENT



**Air Vice-Marshal (Ret'd) Justin Reuter, aka 'Reuts', shares his perspective on the training and Net Zero opportunities from smarter airspace management in his role as Chair of ASPA member Airspace Unlimited.**

## LIVE FLYING IN SPECIAL USE AIRSPACE IS ESSENTIAL FOR FORCE GENERATION

We need to think about how we design and manage airspace differently. We talk a good talk about the flexible use of airspace and civil-military cooperation, but the reality is that these concepts are mostly rigid. Special Use Airspace (SUA) used for military training is either 'hot' or 'cold'. It needs to be properly flexible and to anticipate the needs of civil traffic flows. Why? For good reasons, for more effective force generation, lower fuel costs and Net Zero: a win-win-win scenario.

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For western militaries who have reduced their combat air fleets since the mid 1990s, there is an imperative to maximise training for their 4th, 5th and, in future, 6th Generation fighters. Sensor and weapons ranges have increased and, with the reduction in live flying in favour of synthetics, every flight hour is precious.

A war in Europe, increasing instability in the Middle East and a growing threat from China has focussed the need for realistic and collaborative training, and yet, the same basic airspace structures and special use airspace exist that were in use when I started my operational flying just after the Cold War. This construct is quite simply not fit for current, nor next generation air forces that require coordinated, collaborative multi-domain training that utilises Red Air, EW, tankers, crewed & uncrewed vehicles in a Live Virtual Constructive environment that could (and should) extend across FIR boundaries. This is increasingly important as the F-35 user community grows across the European NATO countries and with the USAFE.

## WE NEED SMARTER AIRSPACE MANAGEMENT

Looking at the airspace above us it is sometimes hard to comprehend how complicated it is, organised for different types of traffic, which fly at different altitudes and speeds, and with varying use throughout the day. For example, at higher altitudes, military exercises are carried out in special use airspace. Airlines route around these areas when they are active ('hot'), for obvious safety reasons, and can fly through them when they are inactive ('cold').

What we need is for special use airspace to be as flexible as the civil flights that fly around it. But we have over-used the word 'flexible' and what I mean is an order of magnitude more flexible; no more on and off without regard to civil traffic flows, but a daily optimisation that maximises training effectiveness at the same time as minimising civil flight times. We need to leapfrog the next incremental changes with a bold conceptual and technological step.

This means a new paradigm about how we design and manage airspace.

Counter-intuitively, we should make special use airspace larger and more finely structured, so we can find more optimal solutions for the day's flights – both civil and military. For military exercises we can shape the training to fit with daily predicted civil traffic flows. Avoiding heavy civil traffic flows allows for larger airspace volumes at the same time as giving civil flights shorter paths, saving fuel costs and emissions.

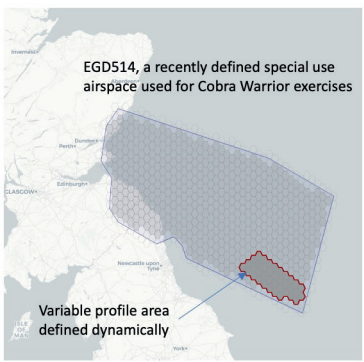
We see the opportunity to bring a similar flexibility to the whole airspace, creating a fluid structure shaped by winds on a daily basis. We call this 'smarter airspace management'.

1

**Traffic flows around special use airspace.** When 'hot', special use airspace causes longer civil flights (red). The D323 design was based on historic traffic flows and military airspace requirements, but is at 70 degrees to the main traffic flows. Airspace Unlimited has been investigating designs to systematically reduce the D323's impact on civil traffic at the same time increasing mission effectiveness.

2

**Rapid prototyping of new concepts of operation.** Here we show a hexagonal tessellation as a basis for daily airspace optimisation with variable profile area concepts. A hexagonal shape has been identified as interesting for efficient packing, but triangular or rectangular tessellations may be more amenable for constructing exercises.



The implication is that special use airspace is:

a. enlarged, potentially by 50-100% - imagine joining areas across the North Sea;
b. activated according to impact on civil traffic flows, not fixed volumes – imagine minimising the impact on civil flights before they flight plan;
c. finely segmented, comprising elemental volumes – imaging shifting an exercise by 10Nm to finesse a carbon reduction;
d. divided into training volumes based on daily mission needs not predefined segments – imagine planning the mission being allocated the airspace volume that is just right;
e. as tightly packed as mission volumes and safety buffers require – imagine accelerating training through more exercises in parallel.

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In an industry that changes gradually, this may seem a big leap, but it is not rational to meet the challenges of this century with incremental solutions. And the solutions are not so much bold as living up to the expectations of what the civil-military concept of the 'Flexible Use of Airspace', introduced just twenty odd years ago, should mean.

## SMARTER AIRSPACE WILL ACCELERATE SUSTAINABLE AVIATION

Around the world, governments are placing increased pressure on all sectors of the economy to decrease carbon emissions in line with the IPPC's 1.5 degree global warming target, also referred to as Net Zero 2050. These demands also include Defence. In the UK, the MoD accounts for approximately half of government carbon emissions and 40% of this is the responsibility of the Royal Air Force; most caused by burning aviation fuel.

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## WE HAVE THE TOOLS

The tools for smarter airspace management are being developed by Airspace Unlimited, supported by the UK's Airspace Modernisation Strategy Fund. From our interactions with the RAF over the last two years we have been encouraged around these bold concepts. With our tools we are able to visualise airspace as a global continuum of traffic, demonstrating rapidly, multiple hypotheses for design and management of the airspace and realistic traffic flows with winds and route charges factored-in. Being able to design airspace changes and concurrently measure the impacts on traffic, we can drastically speed up airspace change and re-envisage how multiple users can use the skies above us in the most effective and efficient ways.

We are delivering these tools as a tiered capability to transform airspace, to support states in: analysing the airspace to understand how it may be improved; designing the airspace to be more flexible, using 'Variable Profile Area' 5-10Nm design rules; and managing the airspace on a rolling 24-7 basis.

Our medium-term goal is to reduce the impact of special use airspace on civil flights and save 1% of civil flight time, which could amount to 2Mt CO2 saved a year across European NATO States. In the shorter term we are focusing on 'Variable Profile Areas'. By disaggregating airspace into elemental volumes, we can pack more exercises into existing airspace design. This means we can achieve more exercises on a daily basis and accelerate training and force generation programmes, all while reducing the interaction with civil traffic flows.

RAF 617 Sqdr F-35Bs arriving into UK airspace for the Ex Atlantic Trident exercise to test rapid dispersal of assets. Conducting missions together with other air forces and preparing for attack and rapid dispersal requires flexibility of our airspace. Photo: Sgt Peter George RAF/Crown

## THE FUTURE IS IN SIGHT

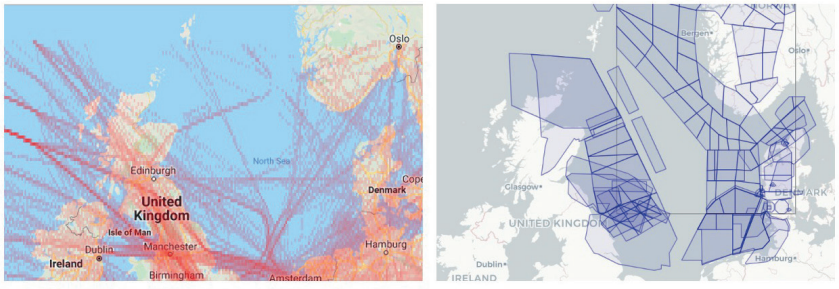
Air Forces, including the Royal Air Force, are seeking to optimise, to get the best out of what they have; however, they are constrained in their training while attempting to increase combat effectiveness. It simply doesn't make sense to conduct live training in airspace that is not fit for purpose – we should strive for the win-win-win scenario that airspace optimisation can bring. It's time to use the tools that we have to re-imagine our airspace and stop accepting the gradual incremental change that suits none of the users.

## NEXT STEPS

The arrival of the F35 throughout Europe and a focus on climate change is stimulating states to revisit and revaluate their airspace designs. Airspace Unlimited's tools have been developed to help them do this rapidly and effectively, to deliver transformation over incremental change. Air Forces, regulators, airlines and Air Navigation Service providers can all drive and benefit from this transformation.

3

**Larger but highly flexible special use airspace**. On the left, a heatmap view of a day's flights showing the impact of special use airspace through the low-density areas and the subsequent civil flight routings. On the right, current special use airspace around the North Sea. Joining these airspaces up is a smarter airspace management concept under study, the 'North Sea Area Initiative', to include variable profile areas and sensitivity to civil traffic flows.




Views expressed in this article are those of AVM Reuter and of Airspace Unlimited and not attributable to the ASPA.