



Directorate of Airspace Policy

31 January 2009

HURN AIRSPACE CHANGE REVIEW

Introduction

The Hurn Airspace Change was introduced on the 15th March 2007. This report details the outcome of a review of the effectiveness of the implementation, and is based on data provided 12 months after its introduction.

Background

Under the terms of its operating licence for En-route operations, NATS is required by the Civil Aviation Authority (CAA) to provide a safe and expeditious air traffic service under strict economic regulation. The titled proposal was put forward by NATS, and involved close coordination and cooperation with the Ministry of Defence (MoD). The proposal represented an extension to the pre-existing route structure and was designed predominantly to address the bottleneck restricting air traffic leaving the UK to destinations to the South by delivering greater airspace efficiency.

Key Objectives

The Hurn development was undertaken by NATS, to meet the needs of civil GAT (generally commercial) aviation, and was designed to complement a planned re-sectorisation at the French Brest Area Control Centre (ACC). As such, in order to ensure a co-ordinated approach and maximise the benefits of these developments, the Eurocontrol South West Regional Focus Group acted as co-ordinator for the international aspects of development and designated it the Brest London Interface Project (BLIP).

The airspace design proposed was developed using forecasts of air traffic growth up to 2015 (10 years ahead at the time of the analyses). NATS does not attempt to forecast traffic more than ten years in the future. Beyond 10 years the reduced confidence in the accuracy of forecast traffic levels makes such predictions of little value, and at worst can be misleading¹. It was anticipated that in conjunction with other ATM developments, the proposed changes should accommodate the forecast growth in the Hurn region of airspace until at least circa 2012.

At the time the Hurn change was proposed, the current financial downturn could not have been predicted and, consequently, this had not been factored into the forecasts.

¹ Some stakeholders have commented that they are more accustomed to working with 30 year forecast timescales for transport infrastructure plans. However it is relatively easy to change the position of airways (compared with changing the location of roads and railways), and the nature of air traffic demand is more volatile than other forms of transport, hence it has been found that 10 years is the maximum period practical for forecasting growth.

The redesign and revised arrangements to the airspace (see Fig 1), both above and below FL245 (24,500ft)², were based on a need to reduce delays to commercial aircraft and deliver a substantial increase in Air Traffic Services (ATS) route capacity of 20%. From a MoD perspective, in particular the Royal Navy, suitable airspace sharing arrangements were established to ensure existing and future operational capability.

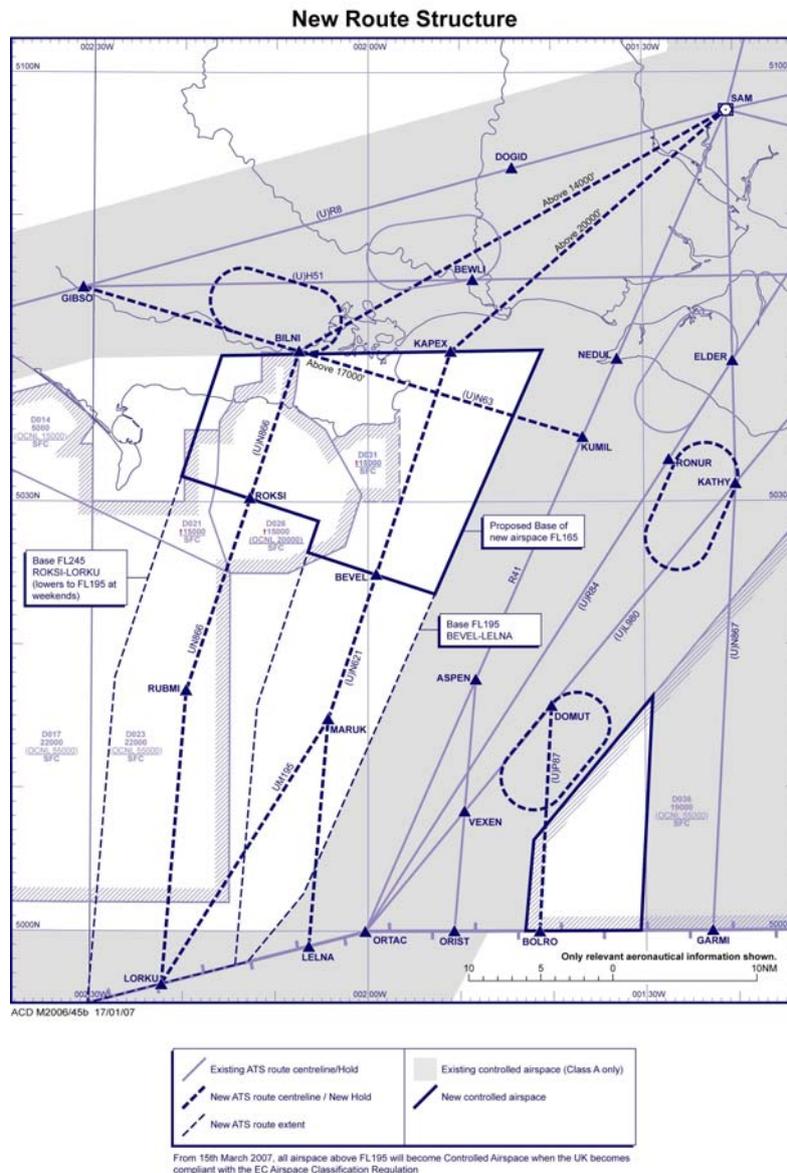


Figure 1. Airspace structure after implementation

Civil Air Traffic Management Requirements

The Hurn Sectors (comprising Sectors 19, 20 and 21³) form part of the London Area Control Centre (LACC) Local Area Group (LAG) South and incorporates airspace over central southern England and the English Channel; these Sectors handle the following major traffic flows:

² For the purposes of this document, all reference to Flight Level (FL) should be interpreted as referring to an equivalent value in thousands of feet; eg FL245 equates to approximately 24,500 feet

³ The Hurn airspace resectorisation created the additional new sector S22.

North Atlantic Track (NAT):

- When the NAT track structure is anchored on Oceanic Exit and Entry Points (OEPs) at and south of Ireland, the LAG South is heavily affected by the easterly and westerly NAT flows. Such traffic is predominantly London Terminal Manoeuvring Area (LTMA) arrivals or occasional departures, or over-flights from/to continental Europe.

European/Domestic traffic. The Hurn Sectors handle:

- Traffic operating on a northeast-southwest axis from/to LTMA, Manchester TMA, Scottish TMA, Midlands (Birmingham, Coventry, Nottingham East Midlands) airfields and other northern UK airfields to /from South West Europe via the Brest Flight Information Region/Upper Information Region (FIR/UIR);
- Traffic operating on a northeast-southwest axis from/to Scandinavian and other north European airfields to/from southwest Europe via the Brest FIR/UIR;
- Traffic on an east-west axis operating between Ireland, LTMA and Europe;
- Scottish TMA inbounds/outbounds from/to Southern Europe;
- Traffic operating from/to Solent (Bournemouth and Southampton) airfields;
- Traffic operating from/to Exeter Airport to/from the east; and,
- Traffic operating from/to Channel Island airfields from/to LTMA, Midlands, Manchester TMA and other northern UK airfields.

The Hurn Sectors also handle flights entering/leaving UK airspace across the international FIR/UIR boundary to the south.

The Sectors are bounded to the south by the Brest FIR/UIR (Brest ACC).

The following Sectors geographically abut the Hurn Group:

- LAC S6 (Berryhead);
- LAC S1 (London Upper Sector (LUS) West);
- LAC S18 (Seaford);
- LAC S25 (London Middle Sector (LMS) West); and,
- London Terminal Control (LTC) Southwest (TC Ockham, TC Willo & TC SW Deps).

The new Hurn Sector arrangement was designed to complement a planned re-sectorisation at Brest ACC.

Military Air Traffic Management (ATM) Requirements

In the area of airspace affected by the Hurn airspace changes, the main military Air Traffic Service Providers (ATSP) are Swanwick Military and Plymouth Military. A variety of other ATSPs (mainly terminal units at airfields) provide ATS within their respective area of responsibility. These include RNAS Yeovilton and RAF Boscombe Down. Additionally, RAF Boulmer, 1 ACC, the RN 'D' School at RNAS Yeovilton, and Airborne Early Warning (AEW) assets, including RN and RAF aircraft, provide Air Defence services in accordance with MoD requirements.

A variety of military sorties are conducted over the region where the proposed airspace changes were implemented, which include:

- Aircraft transiting to and from all the military airfields to carry out segregated autonomous operational sorties within Danger Areas (DA);
- Aircraft descending into the Low Level areas and climbing out from Low Level sorties;
- Aircraft from RAF Boscombe Down conducting Test and Evaluation tasks and Empire Test Pilot School (ETPS) sorties;

- Air-to-air Refuelling tasks;
- AEW aircraft carrying out sorties in AEW orbit areas;
- Royal Navy (RN) 'D' (air defence) school training sorties;
- RN AEW sorties; flying training at respective RAF and RNAS units;
- Operational Air Traffic (OAT)⁴ transit flights throughout the region which may also join the ATS route structure and fly as General Air Traffic (GAT) – and vice-versa;
- Short notice military tasks.

It is not possible to list the precise detail of all military flying; however, military flying is carried out in areas of Class G uncontrolled airspace and when en-route to/from military bases. Appropriate airways crossing services are provided by Swanwick Military and other approved units within the Hurn Sectors area.

Key Elements

From a civil aviation perspective, the key element to this proposal was to reduce delays by increasing capacity. Prior to the airspace change being implemented, this region regularly attracted significant Air Traffic Control (ATC) attributable delays, which caused it to be included in the Operational Partnership Agreement (OPA) top 10 issues for several years.

The level and characteristics of civil ATC delay for 2004⁵ is shown in Figure 2, below. The proportion of UK Flight Information Region (FIR) delay attributable to the Hurn group of Sectors, at 13% (135,558 minutes), was a significant proportion of the total UK delay figure.

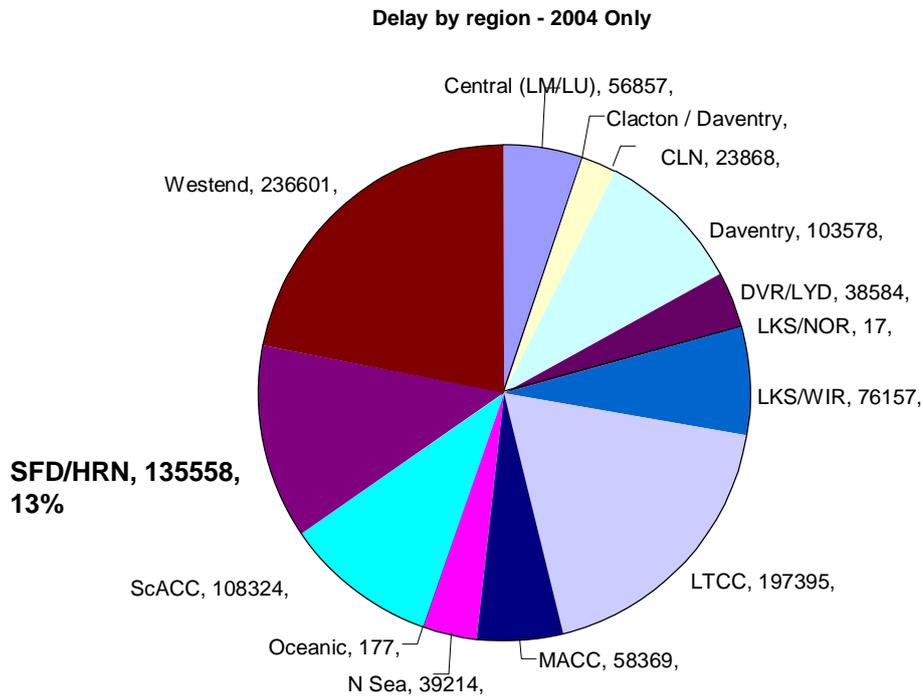


Figure 2. UK FIR delay by ATC Regions – 2004

⁴ In general, OAT are flights controlled by military ATC; GAT are flights controlled by Civil ATC.

⁵ When proposal was developed, 2005 traffic figures had not been calculated

When demand for air traffic access to a known volume of airspace is likely to exceed the available ATC capacity, an ATC Unit applies an Air Traffic Flow Management (ATFM) regulation through the Central Flow Management Unit (CFMU). In this way ATC can maintain a safe, orderly and expeditious flow of air traffic through its area of responsibility by regulating the flow of aircraft accessing it. It is normally the imposition of these regulations that causes delays.

ATFM regulations may also be applied when there are known or forecast conditions which may reduce the number of aircraft a Sector can handle safely; such as staff shortages, bad weather, ATC system outages, prolonged emergency situations, and runway blockage.

At peak times, the en-route airspace configuration and ATC Sector organisation in place before the airspace change was unable to meet demand for access to the airspace in this portion of the south of England. This resulted in the frequent application of a CFMU regulation for the LACC Hurn Sectors (S19, S20 and S21) to limit the flow of aircraft. During recent years air traffic movements into and out of UK airfields, in particular the airfields within the south east of England, have increased considerably. This factor, together with a general increase in North Atlantic Oceanic crossing traffic and UK over-flying traffic between the Canaries, the Iberian peninsula and continental Europe, has put a further burden on the ATS system.

The increase in generic air traffic volume has been accentuated by the introduction of "low fare" airlines and by the many different aircraft types operating in the region, consisting of both heavy and fast jets, regional jets and light turboprop aircraft. The increase in traffic and the resultant traffic mix increased complexity appreciably and led to delays when ATFM regulations were introduced to ensure that aircraft operating in this area were handled safely.

The design options looked at the use of alternative routes avoiding the Hurn sectors. However, this was not considered a practical option, especially for Heathrow and Gatwick inbounds, since any alternative routes were determined to be inefficient in terms of route mileage and would have served to create further workload for the surrounding Sectors.

In order to gain the most benefit from the available airspace the proposal went beyond simple redesign of the airspace structures and sought to change the ATM system as a whole in this area. In particular, the development looked to improve the efficiency of the available airspace through enhanced principles of operation such as:

- Increased use of systemisation⁶ for civil traffic
- New airspace sharing arrangements and enhanced Flexible Use of Airspace (FUA) arrangements
- Reorganisation of NATS ATC Sectors
- Increased use of autonomous operations on ATS routes for civil traffic

Specific design objectives for the proposal tailored the airspace to more effectively encompass main traffic flows, and simultaneously looked to reduce the reliance upon radar vectoring by controllers to maintain lateral separation between traffic. In addition, more efficient integrated minor flow axes into the main flows were introduced that minimised additional workload.

As part of the Hurn development, NATS looked to subdivide the airspace and established a new Sector, S22, which helped distribute the workload and enabled the ATC system to handle more traffic safely and without introducing additional delay.

⁶ Process of organising air traffic into manageable streams, such that the frequency of conflicts between streams is limited.

The establishment of triple parallel routes allowed autonomous operation (i.e. sufficiently spaced to allow lateral separation to take place under radar monitoring rather than positive vectoring). Such routes enabled systemisation of major traffic flows through separate unidirectional inbound routes. This reduced the workload by reducing the need for radar vectoring.

Only where identified as being beneficial, was additional controlled airspace sought to facilitate vectoring and to accommodate more separated tracks.

The additional routes included Conditional Routes⁷ (CDRs) and were established to provide alternative options for operators to flight plan when certain routes were closed as a consequence of Military Danger Area (DA) activity.

Although this development was not a jointly sponsored civil/military project, NATS were cognisant of the extensive military activities in the area and thereby ensured that military agencies, in particular the Royal Navy, were actively involved in the planning of the development. This has ensured that the military requirement for airspace in the region has not been compromised by the new airspace arrangements.

Areas of Contention

Environmental

Environmental Guidance from the Secretary of State for Transport and the Cabinet Office Code of Practice determines a requirement for widespread environmental consultation in two circumstances:

- Changes to airspace below 7,000 feet above ground level
- Where visual intrusion by aircraft above 7,000 feet may be a consideration in exceptional cases such as National Parks and Areas of Outstanding Natural Beauty (AONB)

Prior to the change, the airspace utilised above the AONBs and National Park in the region indicated that they were already over-flown by a significant number of aircraft on a daily basis. Notwithstanding this occurrence and that the lowest altitude of any new controlled airspace was 16,500 feet, consultation was undertaken with local authorities and other bodies representing the New Forest National Park and all AONBs in the areas above which controlled airspace was to be introduced.

Certain concerns were raised over the impact of the changes on issues of tranquillity, noise levels and the sustainability of air traffic growth. In accordance with Government requirements, the NATS license dictates that it must accommodate forecast traffic growth when considering any airspace development. Considering the other issues raised, it was determined by the Environmental Research and Consultancy Department that, in general, as aircraft would over-fly the AONBs and National Park at greater heights than before, associated noise levels will fall well below the Government agreed tolerances. Although some areas not over-flown before would now experience visual sightings of aircraft, those areas already over-flown would likely experience either unchanged or reduced levels of noise and visual intrusion.

Analysis

⁷ A Conditional Route is a flexible airspace structure that can be opened and/or closed subject to civil/military requirements

The impact of the Hurn airspace change with regard to the air traffic distribution over the National Park and AONBs in the area is shown at Figure 3. Of these, the only area over which new controlled airspace was established was the Dorset AONB, which is highlighted in purple. The areas of either National Park or AONB that were already covered by existing airspace are coloured blue.

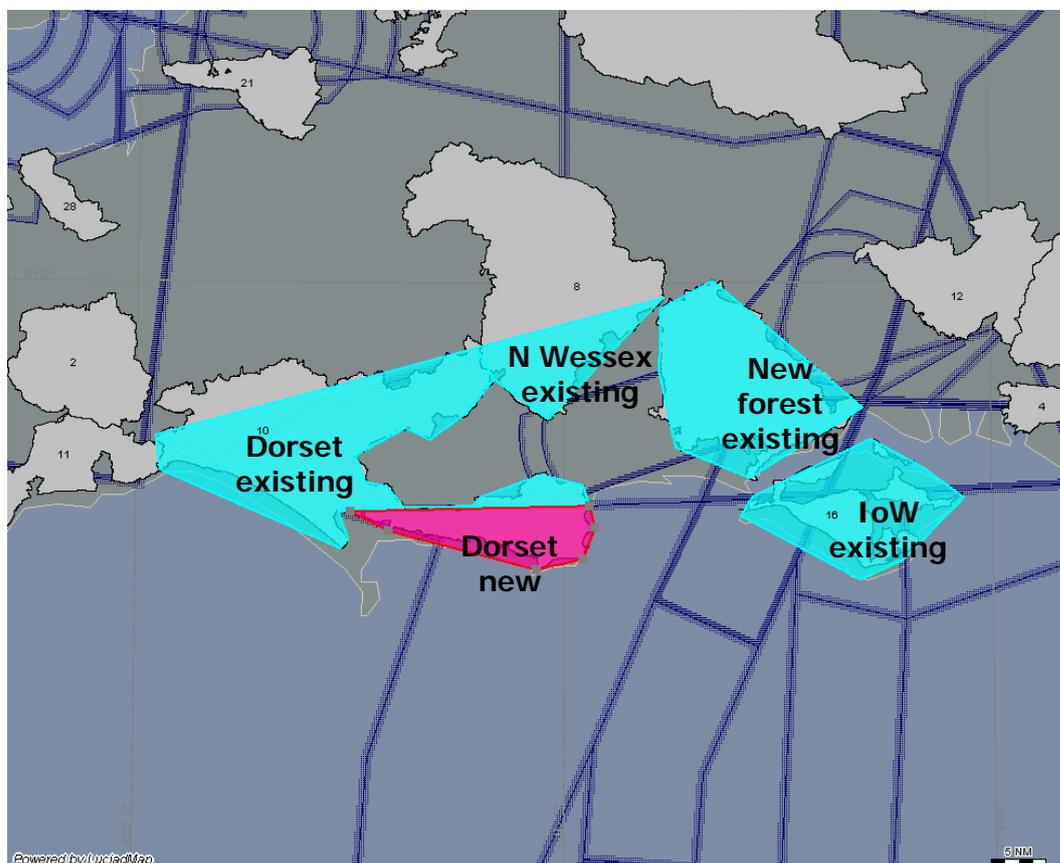


Figure 3. Air Traffic distribution over National Parks and AONBs

With the new airspace design in operation, a larger area of the Dorset AONB is overflowed. Table 1 (colours refer to areas shaded in Figure 3), demonstrates how this changed the distribution of flights over the Dorset AONB based on figures taken on an average busy summers day. 'Before' it is averaged from the 24th-30th July 2006, and 'after' data is averaged from the 23th-29th July 2007.

Traffic sample/area	Total over-flights	Below FL195	Above FL195
Before/existing	162	20	142
Before/new	10	3	7
After/existing	210	24	186
After/new	55	2	53
Total change	+53%	+13%	+60%

Table 1. 2006/7 Average number of aircraft per day over-flying the Dorset AONB

The area of the AONB that is over-flown after the change is larger, with 2 new routes now established which cross the eastern portion of the AONB. As a result of the new route structure, the number of aircraft flying over this new portion of the Dorset AONB has increased from 10 to 55 per day, with most of these, 96%, being above FL195.

The increase over the whole AONB below FL195 is 13%, with the majority of these flights attributed to an incremental increase in numbers of aircraft operating to/from Southampton and Bournemouth airports.

Taking these factors into consideration, the figures at Table 1 show the total number of flights over the Dorset AONB has an overall increase of 53%.

Table 2, below, looks at the overall impact of the Hurn airspace change across all affected AONBs and the New Forest National Park. The data, again averaged from 24th-30th July 2006 and 23rd-29th July 2007, shows that the Dorset AONB, New Forest National Park and North Wessex Downs AONB have experienced a change in over-flights above the national average traffic growth (3.1%), whilst the Isle of Wight AONB experienced a reduction in over-flights. These changes are assumed to be due to the change in the flight paths as a result of the Hurn airspace change.

The change in over-flight of all AONBs and the National Park in the area showed an overall 13.4% increase, compared to the national traffic growth average of 3.1% for the FY 2007/8.

		Total	% change	Below FL195	% change	Above FL195	% change
Dorset AONB	Before	172		23		149	
	After	264	53%	32	39%	232	56%
New Forest National Park	Before	504		147		357	
	After	552	10%	157	7%	395	11%
North Wessex Downs AONB	Before	85		9		76	
	After	106	25%	8	-11%	98	29%
Isle of Wight AONB	Before	355		61		294	
	After	344	-3%	83	36%	261	-11%
Total before implementation		1116		240		876	
Total after implementation		1266	13.4%	280	16.7%	986	12.6%

Table 2. 2006/7 Summary of flights over AONBs and National Park.

Emissions Methodology

Pre-implementation, NATS assessed that based on typical aircraft types flying the new route structure, the airspace change was likely to result in a reduction in CO₂ production per flight, which was then reflected in the Hurn Airspace Change Decision letter.

In analysing the overall emissions comparison, two days were selected from before the change and two from after implementation. The 27 and 29 Jul 2006 were chosen so that a weekday and a weekend day were being considered in the study and to be consistent with other aspects of the Post Implementation Review (PIR). The corresponding days, 26 and 28 Jul 2007, were then selected to represent emissions after the change.

Radar Data Extraction

In order to analyse radar trajectories for emissions assessment, the flight profiles have to be simplified into phases of flight. NATS have extracted this radar data using a bespoke tool that reduces each track's data from an average of 116 points to approximately 5 points. This is achieved through extracting points of interest from the data where an aircraft:

- Enters or exits the designated area
- Changes its rate of climb within the sector, e.g.:
- Climbing to Levelling out
- Level to Climbing or Descending
- Descending to Levelling out

The tool then matches tracks to the UK Flight Data Base entries to assign aircraft types and categories.

KERMIT (Kerosene Emissions Research Modelling In the TMA) is a European recognised emission model developed by NATS. The model is designed to estimate pollutants that are directly proportional to fuel burn, namely CO₂, H₂O and SO₂ and estimates the fuel burn of an aircraft using the following parameters:

- Height of aircraft;
- Speed of aircraft;
- Aircraft type; and/or,
- Aircraft attitude (phase of flight)

Results

Emissions values were analysed for the sample days before and after the airspace change and then compared. The main factor for comparison is the CO₂ emissions figure on the given days in the study. The traffic mixes before and after the change are also summarised.

Total CO₂ Emissions

The emissions results are taken from the output of KERMIT. The total CO₂ for the Hurn airspace before and after the change, along with average emissions per aircraft, are summarised at Table 3.

	Total CO₂ (tonnes)	No. of Aircraft	Average CO₂ per movement (tonnes)
Before change	2905	2614	1.11
After change	3378	2794	1.21

Table 3. Total CO₂ emissions for the Hurn airspace along with aircraft counts

Table 4 summarises the emissions for each of the days considered. Results show that the total amount of CO₂ has increased by approximately 16% since the change to the airspace. The corresponding increase in traffic is 7% leading to an average CO₂ increase per movement of approximately 9%.

Date	Total CO ₂ (tonnes)	No. of Aircraft	Average CO ₂ per movement (tonnes)
27 Jul 2006	1462	1225	1.19
29 Jul 2006	1442	1389	1.04
26 Jul 2007	1677	1303	1.29
28 Jul 2007	1701	1491	1.14

Table 4. CO₂ emissions broken down by day in the study

The results from Table 4 show that the trends identified from Table 1 hold true when considering individual days within the sample.

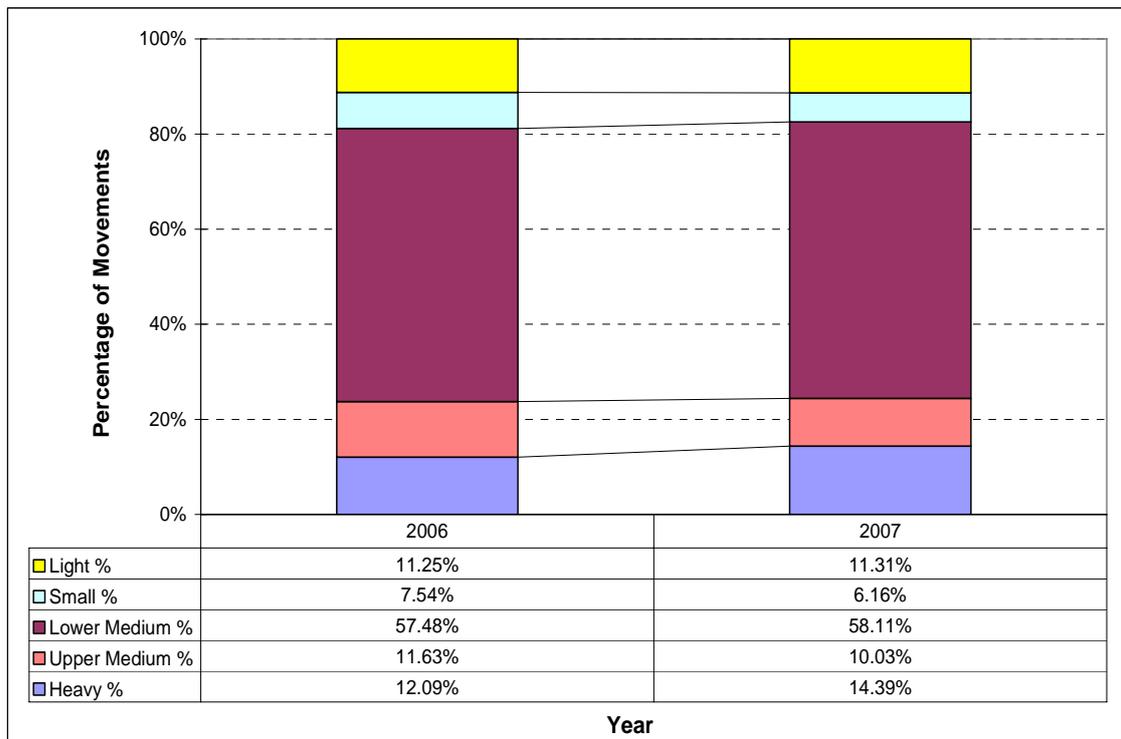


Figure 4. Breakdown of aircraft type before and after the airspace change including percentage of total traffic mix

The results in Figure 4, show that there was a noticeable difference in the percentage of heavy aircraft after the change; the figure has increased by 2.3%. Other aircraft types show some variation in distribution before and after the airspace change. The increases from 2006 to 2007 for Light, Small, Lower Medium and Upper Medium are 0.06%, -1.38%, 0.63% and -1.6% respectively.

A statistical test showed evidence of a statistically significant change in the distribution of aircraft types between the 2006 and 2007 samples. This change may have had some effect on the increase in emissions.

Date	Weight Category – Average CO ₂ per movement (tonnes)				
	Light	Small	Lower Medium	Upper Medium	Heavy
2006	0.29	0.30	1.00	1.51	2.52
2007	0.31	0.30	1.04	1.46	2.81

Table 5. Average CO₂ per movement per weight category

The results in Table 5, show that the average CO₂ per movement within each aircraft category has increased except for the Small category, which shows no change and the Upper Medium category where the average emissions have reduced.

Since the changes have been implemented the Aviation Related Environmental Complaints department within the Directorate of Airspace Policy have not received any complaints or issues raised as a consequence of the new airspace arrangements.

Aviation Stakeholders

Other than RN operations, the Hurn airspace change had little impact on other airspace users.

FOST⁸ have had few issues with the Hurn changes and the new airspace arrangements have had no negative impact on military operations in the area. From their perspective, the Hurn airspace change capitalised on the then recent FUA programme and since it's inception, has enabled civilian operators and air traffic control agencies to make optimum use of available airspace.

The co-ordination procedures in place between Plymouth Military Radar and the Hurn Sector work extremely well and epitomise the ethos of FUA. Indeed, the way in which this particular piece of airspace is now managed has drawn favourable comment from the Directorate of Aviation Regulation and Safety (DARS).

The Route Network Development Sub-Group⁹ has commended the new FUA arrangements as an example of the benefits FUA can bring to the European ATM network and is in accord with the European Future Airspace Strategy.

⁸ Flag Officer Sea training – the Royal Navy agency which controls the Portsmouth and Portland Danger Areas.

⁹ RNDSG – sub division of the Eurocontrol Airspace and Navigation Team

All controllers at Plymouth Military Radar are perfectly satisfied that the new airspace arrangements, which provide them with the flexibility to achieve their operational remit.

Effectiveness of Change

Safety

The new airspace design is demonstrably as safe as, if not safer than, the airspace it replaced. The current SSE¹⁰ rate of 0.8 per 100,000 movements is below the SSE rate of 1.3 that existed immediately prior to the airspace being introduced. Additionally, the conflict points that were close to the LTMA have now been mostly removed and opposite direction tracks are much reduced. Systemisation of traffic has removed many of the conflicts, reducing controller workload.

An analysis of all incidents – Observation Reports¹¹ and MORs (Mandatory Occurrence Reports) involving the Hurn sectors was conducted using NATS' STAR database¹²; the before and after datasets used were 15th March 2006 – 14th March 2007 and 16th March 2007 – 14th March 2008 (note that this is the same number of days due to the leap year), respectively. This data was compared with another LAC Sector that is considered to have a similar structure/traffic flow as the Hurn Sectors and was not subject to design change during the periods concerned. The comparison sector chosen was S18, which is located over the southern coast and also abuts the Brest FIR/UIR (France).

Comparing the overall number of reported incidents on the changed sectors (S19-22) and the control sector (S18) both before and after the airspace change. Incidents in the changed sectors decreased by 20% (from 137 to 109), compared to incidents in the control sector, which decreased by 21% (from 42 to 33). When observation records are removed and MORs only are analysed, the decreases are more evident. The sectors affected by the airspace change have 30% fewer MORs (126 to 88) after the resectorisation, whilst the control sector has 37% (from 38 to 24) fewer MORs following the airspace change.

By comparing the number of MORs recorded against the traffic handled throughout the data sets, the rate of MORs per 100,000 movements can be determined. The changed sectors saw a 38% reduction; similarly, S18 saw a 41% decrease. Thus, the numbers of incidents at London Area Control Swanwick have not increased as a result of the changes applied, but have reduced proportionally in line with the control sector.

Additionally, NATS performed an analysis of the 'structural risk' of the airspace design by analysing radar data to assess the likelihood of aircraft being on converging trajectories whilst in the airspace. Comparing the new airspace structure with the old using this methodology, it was shown that aircraft are now 7% less likely to be on converging tracks and, as such, the new design gives controllers more time for controller intervention.

¹⁰ Safety Significant Event – NATS' internal safety reporting system

¹¹ Observation reports are those that are optionally completed by ATC in order to highlight a potential safety related issue. Numbers of Observations reported can be influenced by changes in reporting culture, hence are separated out in the analysis in order to give a more balanced picture.

¹² STAR – Safety Tracking And Reporting is NATS' internal system for reporting all incidents/observations.

Capacity/Delay

NATS use two methods to determine the capacity increase that the airspace change realised; these were:

- Investigating capacity change based on Monitor Values and throughput
- Investigating capacity change based on relative throughput and delay

Monitor Values

By comparing Monitor Values (MV)¹³ before and after the changes for the Hurn Sectors, a basic assessment of the capacity change can be made. The figures in Table 6, below, show that if all sectors were open, the overall MV for Hurn post-implementation is 108 compared with the previous value of 83 – an increase of 25. Therefore, across the new Sector arrangement, this is an increase of over 30%.

Sector	Monitor Values		Difference
	2006	2007	
19	35	29	-17.1%
20	30	36	+20%
21	18	21	+16.7%
22*	-	22	>100%
Total	83	108	
Increase		+30.1%	

* New Sector

Table 6. Monitor Values for Hurn Sectors before and after development

Throughput

The combined total number of aircraft handled by the Hurn Sectors for the year before the change was 245,947. For the corresponding period after the change the number had increased to 263,149. Overall there was thus an increase of 7.0% traffic throughput through this group of Sectors.

Delay

Table 7, below, shows the total delay per year generated as a result of capacity restrictions being imposed on the Hurn Sectors. The overall level of delay for the Hurn Sectors post-implementation is 7597 minutes compared with the previous value of 99840 minutes – a reduction in delay of over 90%.

¹³ Monitor Values (MV) are used by Air Traffic Flow Managers, as a guideline, to regulate the numbers of aircraft a controller can expect to work in a given time period, above which regulations are often imposed

Sector	Delay (mins)		Difference
	2006	2007	
19	79314	4685	-94%
20	20526	1970	-90%
21	0	0	0%
22	-	942	-
Total	99840	7547	
Reduction		92%	

Table 7. Delay generated by Hurn Sectors pre and post Resectorisation

Capacity versus Delay Summary

Tables 6 and 7 illustrate that as a result of the airspace development, the post-implementation capacity of the Hurn group of sectors based on MV assessment, has increased by over 30%. This has enabled controllers on the new Hurn sector arrangement to handle an increased throughput of traffic 7%, while at the same time delays have reduced by 92%.

Other Benefits

Flexible Use of Airspace

Flexible Use of Airspace working relationships between NATS and MoD have developed and been improved following the introduction of the changes to Hurn airspace. Additionally, the Airspace Management Cell reports that working arrangements with Brest ACC have also benefited and arrangements have been agreed with the CFMU between NATS and DSNA (Direction des services de la Navigation Aerienne, the French aviation regulator). This will enable more efficient working practises and is likely to have a positive impact on further reducing delays.

ATC Operational Impact

NATS Swanwick London Area Control

The current MV for both the combined and elementary sector configurations are approximately 5% greater than before; simulations have shown that increases of 12% and greater may be possible in the future.

The overall greater volume of airspace has allowed Hurn Sector controllers to present traffic to adjacent Sectors in a more effective and considerate manner, either in trail or route separated. This can only have positive safety and capacity benefits for those surrounding Sectors and ACCs.

NATS Swanwick London Terminal Control (LTC)

The Hurn changes have provided benefit for TC South West Sectors by providing increased airspace within airway R8 for LTMA outbounds via SAM (Southampton VOR). This provides increased flexibility for controllers, especially with the positioning of slower outbound aircraft. Additionally, the inbound positioning requirements have introduced increased predictability of traffic presentation from LAC Hurn controllers to comply with the standing agreements to LTC.

Therefore, the capacity increases provided to LAC have not had a detrimental effect on the LTC operation.

NATS Network Management

The new sectorisation has increased capacity by giving Network Managers and Operational Managers the opportunity to operate the Hurn sectors in different configurations, dependent upon the traffic demand on a particular day or portion thereof. This results in the improved ability to balance traffic levels within certain combinations of Sectors combined; some watches operate with one portion of Hurn East combined with S18 (SFD) where there are insufficient staff to operate all the sectors individually. There is no doubt whatsoever that S19/22, either operating combined or individually, has far greater capacity than the old Hurn East Sector (S19). Looking at demand across the whole of Hurn's airspace, Network Management now have far more options available when working with the Watch Supervisor to minimise delay.

Ministry of Defence (MoD)

MoD and FOST were involved with the development of the proposal and associated procedures from an early stage; subsequently, few issues have arisen as a result of the Hurn ACP and, from the FOST perspective, there is no impact on military operations. From the perspective of HQ DTE¹⁴, the Hurn ACP development and implementation went well.

International Impact

Brest ACC

The Hurn airspace change was implemented in conjunction with the new Brest airspace sector design. This resulted in the creation of two new sectors, VS and VU, within Brest airspace at the interface and the redesign of Brest's J Sector.

The main change in the procedures between Brest ACC and LAC is the new management of the Portsmouth DAs military activity. From Brest's perspective, it is seen as a major improvement. There were some teething problems initially, but amendments to some procedures have been successful in resolving these issues. Brest controllers are no longer required to tactically vector traffic to avoid military activity; this is considered a vast improvement in procedures and is also beneficial for the users. Brest controllers are of the opinion that these procedures could be improved still further when they are notified of a late cancellation of military activity.

¹⁴ Headquarters Air Command and Defence Training Estate

Additionally, the creation of two new entry points (LORKU and LELNA) from Hurn to Brest enables LAC to provide the V sectors with traffic correctly positioned for onward routing downstream; this reduces the workload for controllers within Brest ACC and allows more aircraft to achieve their optimum cruising levels quicker.

In terms of capacity it is difficult to assess the actual impact of the Hurn airspace itself because the Brest resectorisation project took place at the same time. However, it is recognised that the new route network, combined with the improved management of the military zones has significantly reduced the complexity and therefore increased the capacity.

During the first few weeks post implementation, Brest saw an increase in the number of reports filed¹⁵. An analysis of these reports showed that most of the reports were linked to minor operational problems relating to the new management of the sectors. These issues were resolved with close cooperation between LAC and Brest ACC. 12 months after implementation, Brest considers that the changes have been a success.

Jersey Air Traffic Support Unit

Improvements in Capacity

Manager ATC Operations, Jersey stated that *'Jersey currently has no official mechanisms to measure improvements in capacity. The only flag from Jersey is that unofficially, as I have nothing to measure it against, capacity was marginally reduced due to the fact that prior to 15-March-2007 over-flight traffic previously attempting to out climb the Jersey Zone and requiring coordination did not feature in our stats or movements. Now that they are part of the system, and if this was measured against a sector capacity then on paper we would have seen a marginal reduction in sector capacity'*.

Safety

The main driver behind the Jersey reasons for the airspace change was safety, particularly relating to aircraft departing the south coast of England and slow climbing through the NE section of the Jersey Zone. Before the Hurn airspace change was implemented, a stream of reports were filed on last minute telephone coordination, no flight data in the Jersey system and on occasions, no coordination at all.

Following the changes, Jersey ATC is now part of the data exchange and part of the coordination process that is laid out in the relevant Letter of Agreement between Units. Initial feedback from Jersey controlling staff is that the process was somewhat complex but safer, as Jersey has become part of the information chain. The process is being reviewed by Jersey and NATS Swanwick to see what further improvements can be made.

Conclusion

NATS' initial assessment that there should be a reduction in emissions per flight has not occurred and analysis of post-implementation data has shown that CO₂ emissions have increased over and above the traffic increases. The total emissions

¹⁵ Brest ACC had requested controllers submit reports for any problem encountered.

have increased by over 16% and the average emission per-flight has increased by approximately 9%. However, it is considered by NATS that the overall increase in CO₂ emissions per-flight is partly due to a higher proportion of larger aircraft types using the airspace. The origin and destination of aircraft utilising the Hurn Sectors has changed markedly between the 2006 and 2007. Traffic samples have shown that more transatlantic flights route through the airspace than before the airspace change was implemented, with more heavy, long-haul traffic, now using the routes within the Hurn Sectors. It has therefore been impossible to render a direct comparison of the operating efficiency from before and after the change. Consequently, NATS have been unable to produce a valid comparison of the relative environmental efficiency of the sector group.

The very effective FUA arrangements put in place as a result of the change have served to enhance the already efficient management of the airspace by the Airspace Management Cell at Swanwick. The military's tactical ability to conduct both surface and aerial evolutions has clearly benefited from the new arrangements.

From a safety perspective, the resectorisation and new airspace arrangements have combined to reduce the number of reported incidents and aircraft are now less likely to fly on converging headings.

The Hurn resectorisation and introduction of new routes has resulted in a significant reduction in delay, and a comparison of MVs before and after the change, shows that capacity has increased beyond the initial estimate, to 30% and the throughput of traffic has increased by 7%.

Although the Brest ACC experienced an increase in the number of reports filed after the airspace change had been implemented, they were assessed as only minor and were quickly resolved. It is now considered by Brest ACC that the change has been a success.

Overall, although the reasons for the development and implementation of the change appear justified, the environmental assessment was modelled on what were then typical types of aircraft using the route structure at the time. Although NATS could not perhaps foresee the operational changes that have taken place and did not therefore look at the worst case scenario in their initial assessment, it is something they must be cognisant of in future proposals, where a greater number of heavy and longer range operations could be used on new routes structures.

Nevertheless, the Hurn airspace change is considered to have overall delivered significant benefits in capacity, safety performance and reduction of delay.

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