Note: Please be aware that the names of the final procedures submitted as part of Bristol Airport's Stage 2 work have been updated and simplified.

Bristol ACP Stage 2 Design Workshop 1

[redacted]

8th January 2020

Attendees:

[redacted] – NATS ATC design lead
[redacted] – NATS LAMP design lead (deployment 1)
[redacted] – NATS Airport Safety
[redacted] – Cardiff ATC Deputy Watch Manager
[redacted] – NATS Engineering (SEM) LAMP
[redacted] – NATS Engineering (SEM) LAMP
[redacted] – Bristol Airport Ops
[redacted] – NATS Procedure Design
[redacted] – ACOG
[redacted] – NATS ACP lead
[redacted] – Cardiff ATC Watch Manager
[redacted] – NATS Analytics
[redacted] – NATS Manager Airport Concepts
[redacted] – Bristol ATC Watch Manager
[redacted] – NATS GM Bristol Airport

Introductory Slide pack presented by [redacted] (support from [redacted]) covered the following:

- Introductions
- Context of this Design Options work
- Inputs to the process so far
- Outputs and how we get there
- Initial design option development
- Wrap up and next steps

Slide pack was distributed to attendees (14/01/20) which can be found separately and uploaded to the portal.

General design guidance

Guidance received from ACOG that we either commence design work collaboratively (as this exercise) or Bristol Airport could start their design work based solely on their own objectives; prior to including the requirements of adjacent airports and NERL. However, all elements need to be incorporated as part of the design input at some point – which way round is not important (as long as all decisions are evidenced).

All ideas should be considered as design options – even if they get rejected during the design work (prior to Design Principle evaluation) they should still be documented. The design work documentation and evidence should stand up to future scrutiny including if and why a concept was not considered further.

<u>Design elements</u>

The main elements of design work were presented, these are intended to capture practical 'building blocks' of the overall design and are all based on preceding work. Apart from the requirements of the Airspace Modernisation Strategy (CAP1711), two local studies initiated the development of this ACP from a Bristol airport and ATC viewpoint. Namely the 'Boxkite' study, which investigated capacity requirements from a perspective of current and future demand, and the ATC Safety Survey which identified several airspace and procedural issues which required addressing now we are in a period of forecast growth.

There was a suggestion received during the workshop that there currently isn't anything under the "design elements" which captures the need for an appropriately sized area of CAS e.g. for manoeuvring/ vectoring aircraft. There is a Design Principle which covers this.

There was a discussion on the possibility of using 1 min departure splits; however, it was noted that the current manoeuvring constraints when lining-up for a 09 departure (topography and glideslope protection area) may mean that such procedures would be more difficult to take advantage of when in that runway configuration. It was noted that 1 min splits would be of particular advantage in reducing pre-departure delay during the first-rotation early morning period.

The proposed design potentially does not have to adhere to the "*CAP493 – MATS I*" regulation for 1-minute departure separation (45° route separation) by using the NATS developed RADSIM method of collision risk investigation and mitigation. This is now an accepted methodology and has been used in other locations. This allows for development of bespoke designs utilising potentially less than 45° route separation after take-off.

<u>Presentation on Bristol ACP capacity considerations – [redacted]</u>

The following recommendations were presented to Bristol following the 'Boxkite' analysis completed by NATS Analytics:
- More Controlled airspace is required for a future increase in traffic movements;
- Revised SIDs and STARs to reduce tactical intervention and workload;
- Relocation of the Hold away from current location (in the overhead);
- 7NM Arrival/Departure/Arrival (ADA) separations;
- Traffic allocated to 'north' and 'south' 1 min split SIDs (to increase from the 30/hr departure limit which currently exists).

(Note: other recommendations have already been implemented and are thus excluded from this report).

The peak departure hours in the morning are driven by aircraft which stay at the airport overnight and want to depart first thing next morning.
Peak hour movements at forecast 20 mppa: 42 deps, 41 mixed, 25 arrivals
Peak day movements: 525 ATMs per day.

The spread of departure direction during the early morning peak hours should help to determine the proposed design. There is a known high demand of traffic departing to the South and South-East (continental Europe) - based on their destination. This demand profile is not expected to materially change.

It is predominantly medium-sized aircraft flying to and from Bristol Airport (e.g. A319/320/321), which tend to have good climb performance. The number of B788 aircraft is also likely to increase slightly in the future but the fleet mix will most likely stay similar to today.

There are a reasonable number of GA users that occasionally fly VFR circuits and a based helicopter operator that conducts power-line surveys.

Runway usage split:
Runway 09 – approx. 1/3
Runway 27 – approx. 2/3

<u>Further findings illustrated in the presentation:</u>

- There is limited CAS to the South of Bristol Airport. There is slightly more available in the North, which could be used for vectoring/ shortening flight paths.
- The Hold over the airport is not in an optimal location; it adds complexity and workload for approach controllers, including label garbling.
- From radar evidence a large proportion of traffic (~90%) does not follow the defined eastbound SID(s). There was also a suggestion that taking aircraft off SIDs to the South may actually decrease workload later on due to resolving the issue of opposite direction a/c which is a feature of the current route design. There could be benefit in a high-performance SID(s) to allow more direct route design and reduce intervening (same with STARs).
- All departures currently climb straight ahead to circa 4.5NM which prevents the application

Design work

General discussion

It is worth Bristol Airport considering the introduction of published gradients higher than the minimum standard for obstacle clearance (3.3%) in order to capitalise on modern a/c performance and achieve faster and more continuous climbs to higher levels. Gradients of 5-8% should be no problem – however airlines are less likely to agree to significantly steeper (e.g. above 8%) due to managing adherence in all conditions. Bristol ATC already has some evidence from easyJet to support this.

The LAMP letterbox matrix will be available soon. The LAMP design team has asked Bristol - alongside other FASI-S airports - to send any potential designs to the design team to indicate where letterboxes may be positioned. There is theoretically no restriction on the number of letterboxes – this should be led by Bristol and their specific requirements. Departure letterboxes have previously been supplied by Bristol, although this was prior to any design work commencing so will be updated as we progress.

LAMP design team confirmed that the UK exit points are expected to remain broadly unchanged from today.

Different SIDs from the same runway but servicing the same direction were discussed. There could for example be advantage in both low and high performance SIDs in the same direction if they could be separated, thus not constraining a 'fast following slow' scenario. Such design would need to be fully coordinated with the network structure to comply with any delivery time intervals that may be required, but could be used perhaps to deliver to different downstream sectors. If such routes shared the same letterboxes this could increase complexity for the network. The goal is, using RNAV design standards, to separate letterboxes (from the same or different airports) enabling completely independent departures.

The workshop was then structured to examine

(a) Departure routes, having established those options to look at
(b) Potential inbound holds and routes.
(c) Alternative delay absorption methods such as arrival metering or Point-merge would also be considered.

A projected map showing ground features and basic current airspace structure (for context) was used to free-form route design discussion and capture any/all potential options.

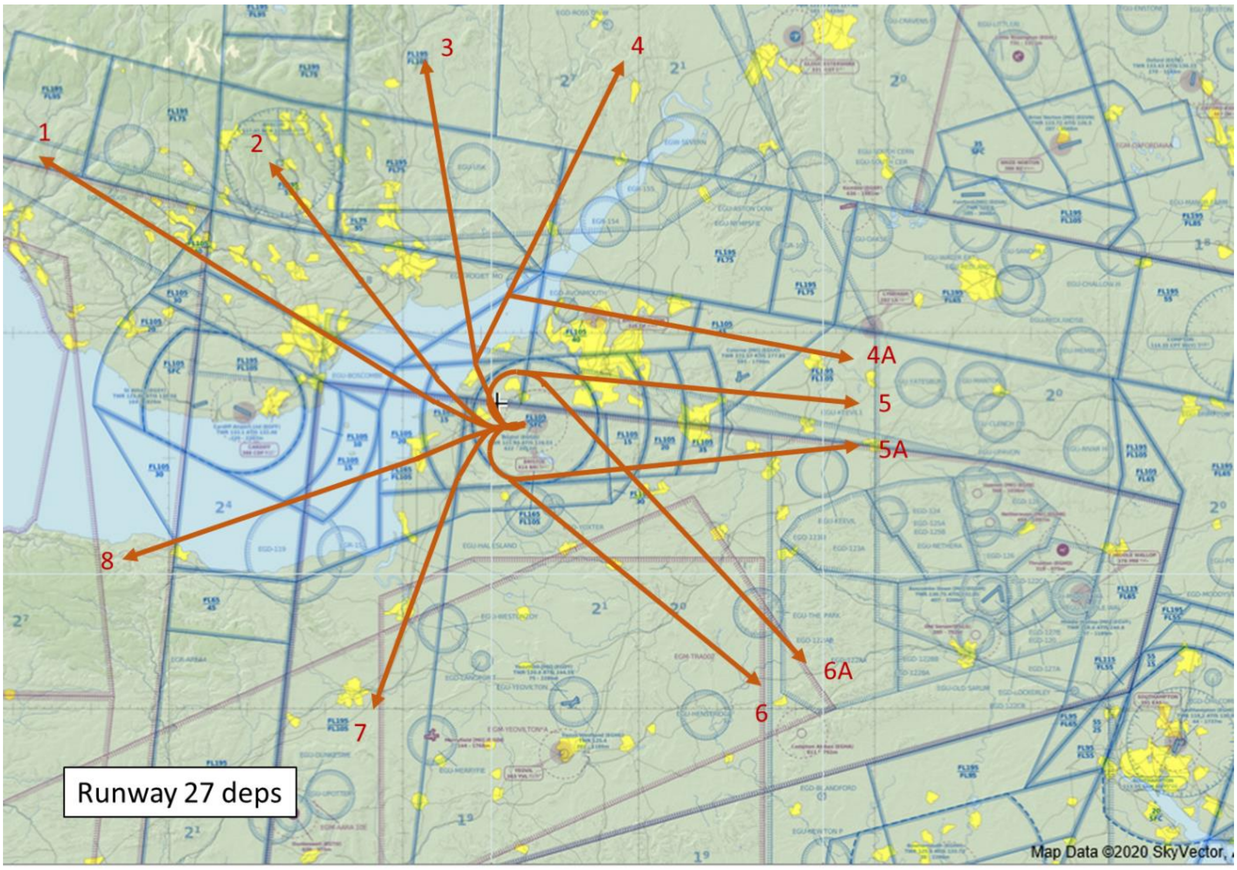
Positive points and any potential issues were recorded as 'Pros' and 'Cons', below.

General note regarding all departure route options: At this level of fidelity no consequences can be drawn regarding overflight of populations close to the airport. A further level of detailed planning will be necessary to examine this.

No consequential changes to CAS boundaries have been made or are implied at this stage of detail. All route options shown are indicative only and do not necessarily correlate with any particular ground features.

Runway 27 Departures

General features included SIDs allowing compass departures, including wrap-around SIDs to the east and south-east. 1 minute SID splits enabled plus potential for alternative 'respite' routes (noted in the Design Principles). There could be potential for cross-overs of some routes, but this could be mitigated by being operated at different times or procedurally separated.



Route 1 (North-West towards Strumble)

Pros:
Direct route to current key fix (environmental benefit);
A lot of the climb would be over water (noise benefit) – likely to reach 7,000ft over the Bristol Channel;
There is a potential for Bristol to share a letterbox with Cardiff departures (although it was also suggested that this could be very complex).

Cons:
Extra CAS may be required in the fillet to the north-west of Cardiff Airport (vs Cardiff city centre);
Potential conflict with Cardiff Runway 12 departures (to East/ North-East) and other Cardiff inbound routes;
Could overfly Cardiff city (noise vs slow climbers);

Potential impact on other airspace users (alongside proximity to Cardiff traffic already mentioned).

Route 2 (North-West towards BCN)

Pros:
Direct route to current key fix (environmental benefit);
Similar to the current departure profile (towards BCN) therefore minimal change;
Avoids Cardiff city more than route 1;
Some of the climb would be over water (noise benefit);

Cons:
Similar to route 1 disbenefits but to a lesser extent (as closely replicates current routing);
Likely to conflict with Bristol and Cardiff arrival routes (albeit less than route 3)

Route 3 (to the North)

Pros:
A more direct route to some Northern destinations (environmental benefit);
Flies over less populated areas than some of the other routes (noise benefit);
Some of the climb would be over water (noise benefit);
No new CAS required.

Cons:
Conflict with Bristol inbounds (current inbounds from the North, plus potential holding traffic depending upon location);
Overflies Usk gliding site (South Wales, North-East of Newport) although it is likely departures would be very high at this point.

Route 4 (to the North-East)

Pros:
Direct route to certain destinations (environmental benefit);
Possibility for some of the climb to be over water (noise benefit);
Flies over less populated areas than some of the other routes (noise benefit);
Dependency on CAS to the North of N14 (although ATS Routes N91/N92 were recently established).

Cons:
Conflict with Bristol inbounds (current inbounds from the North, plus potential holding traffic depending upon location);
Potential conflict with Birmingham traffic;
Potential conflict with Runway 27 arrival vectoring area;
This might not always be available (potential limited hours?);

There may not be the required demand to necessitate the need for this route; much less potential usage foreseen than some of the other routes.

Route 4A (alternate route East towards Compton)

Pros:
Supports respite (potential alternative to route 5);
Provides alternative for higher demand destinations to the East;
Potential for low-performance traffic;
Avoids overflying Bristol City;
Main climb could be over water.

Cons:
Longer flight path than Route 5 (not direct);
Could be difficult to achieve 1 min split from route 5;
Potential conflict with Bristol inbounds to Runway 27/ Holding positions and LTMA traffic (outbounds);

Route 5 (to the East)

Pros:
Shorter route than current (environmental benefit);
Enables 1 minute splits from LTO or straight ahead routes (reduce pre-departure delays):
Should be deconflicted from arrivals from the east (arrivals likely to be further to the north);
Utilises current CAS;
Follows current practice and what is tactically flown today, therefore should minimise overall change and the impact on LAMP;
Could support respite as one alternative route to the east:
Allows potential for some path stretching to improve climb profile.

Cons:
Balance between the climb performance of departures vs inbounds to Runway 27 (goal is for CCO);
Potential conflict with LTMA inbound traffic (to be explored with LAMP);
Route likely positioned over Bristol;
Might require speed limits to achieve required turn performance.

Route 5A (alternate route to the East)

Pros:
Direct track (environmental benefit);
Enables 1 minute splits from RTO or straight ahead routes (reduce pre-departure delays);
No conflict with arrivals from the east;

Could support respite as one alternative route to the east:
Avoids flying over the centre of Bristol;

Cons:
Requires new CAS to south and east;
Potential conflict with left-hand downwind inbounds to Runway 27;
Overflies the Mendip AoNB;
ditto Halesland gliding site;
Potential cross-over conflicts if 6A is used;
Dependencies with routes 5 re. presenting in-trail traffic to the network;
Probably doesn't provide 1 min splits against other southbound departures;
Might require speed limits to achieve required turn performance.

Route 6 (to the South-East)

Pros:
Direct route which could specifically be used early morning (environmental benefit);
Route which helps to meet a known high demand period;
Supports 1 minute splits from RTO east and northbound traffic for peak early morning departure flows (reduce pre-departure delays);
Airline preference for this route;
Avoids conflict with TMA inbounds and outbounds;
Does not overfly any large populations (albeit over an AoNB);
Good chance of enabling CCOs;

Cons:
Overflies the Mendips AoNB;
ditto Halesland gliding site;
May require minimum performance requirements due to topography (high ground);
Potential conflict with military users and operations;
Revised and new CAS (but can be matched to demand periods);
Will require revised network structure to support;
Interactions with arrivals for left-hand downwind arrivals for 27 (DWL);

Route 6A (alternate route to the South-East)

Pros:
Supports respite (alternative to route 6);
Route which helps to meet a known high demand period;
Airline preference for this route;
Could enable 1 min splits from southbound departures (e.g. routes 7 and 8);

Will achieve higher level than route 6 (potentially reducing the amount of new CAS needed);
All similar positives to route 6 above, asides from not being as direct.

Cons:
Longer route (environmental disbenefit);
Conflict with inbounds for Runway 27 from north and east;
Further potential conflict with route 5A;
Might require speed limits to achieve required turn performance.

Route 7 (to the South)

Pros:
Shorter route than current (environmental benefit);
Airlines currently request this routing (shorter route and lower fuel burn);
Matches where traffic currently flies when the conditional route is available (N90, weekends only);
Supports 1 min splits from RTO or straight ahead departures;
Improved fit around Exeter inbounds and outbounds;
Deconflicts with inbounds from the south (current Exmoor conflict requires tactical intervention).

Cons:
Would require new permanent CAS (negotiation with other airspace users);
Revised procedures to be developed to deconflict from 27 DWL arrivals;

Route 8 (South-West, towards Lands' End)

Pros:
Direct track (environmental benefit);
A lot of the climb would be over water (noise benefit) – likely to reach 7,000ft over the Channel;

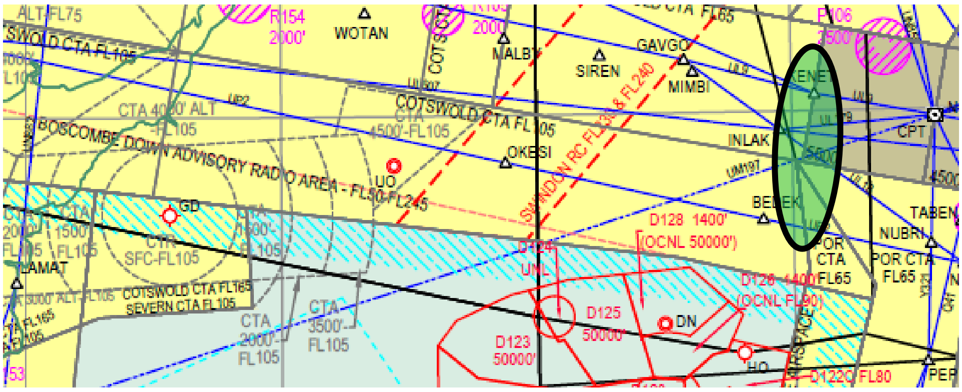
Cons:
Conflict with Cardiff traffic e.g. departures from both runways, arrivals to 30;
No current network connectivity;
Not a widely utilised route (low demand vs development cost);
Potential conflict with military training areas to the west;
Potential conflicts with opposite direction inbounds from the south.

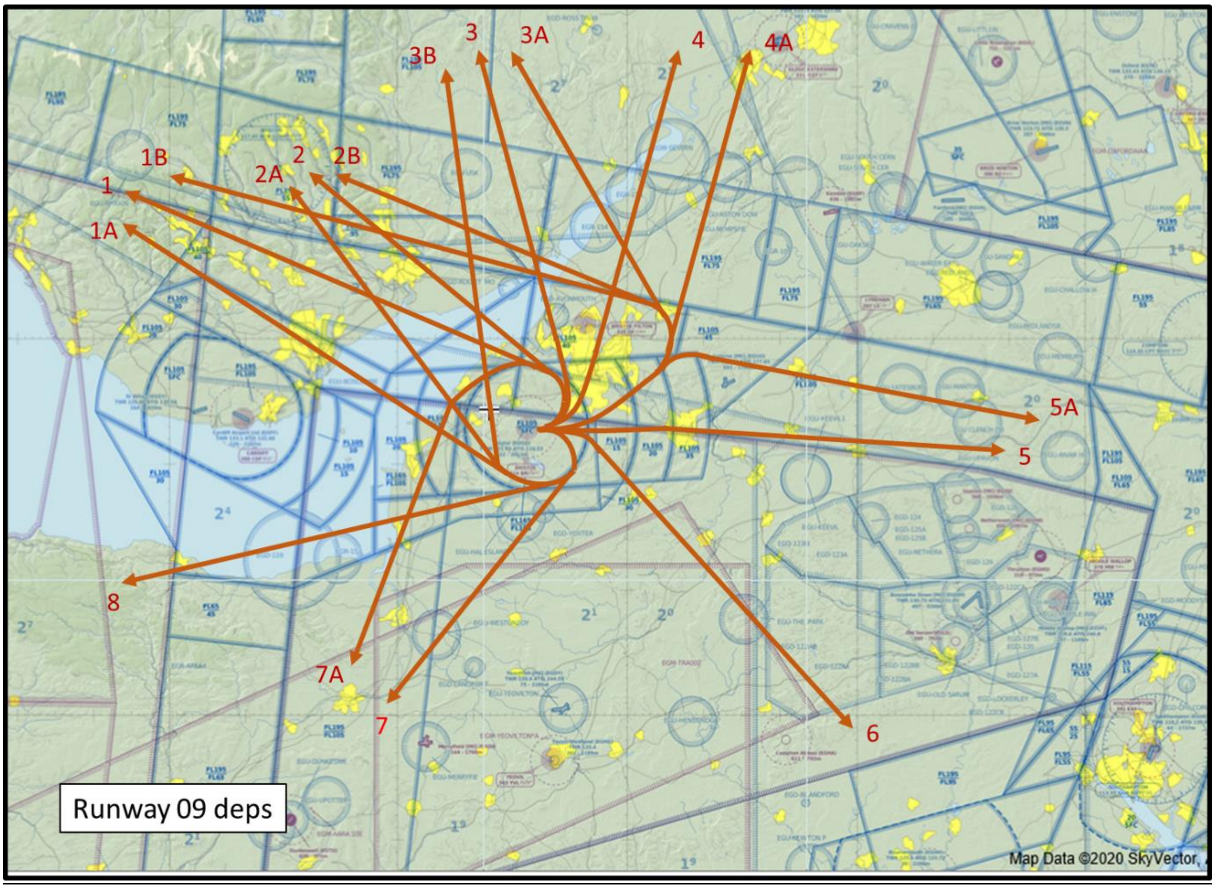
Runway 09 Departures

A similar process was followed for Runway 09. As will be noted there was more potential for alternative 'long way round' turn departures which could provide some advantage with reduced population overflown or departure separation

The group was advised that LAMP are proposing all eastbound departures at or above FL230 by abeam KENET – shown below. This would be an issue with slow climbers, particularly off Runway 09. Options would appear to look at designing additional track miles in order to assure all departures make this level, or implement an alternative low-performance route/climb profile that would require a lower delivery level to London sectors. A key issue is to ensure low performance departures (e.g. turboprops) do not block routes for jet traffic.

Route 5 (see below) could thus be a high-performance SID and 5A used for lower performance, to support this. See text below.





Route 1 (North-West towards Strumble)

Pros:
Early left turn could avoid overflying central Bristol;
Shorter route than current (environmental benefit);
Some climb is over water (noise benefit);
Supports 1 min splits from east and southbound departures;
Likely routing avoids overflying the centre of Cardiff and Newport.

Cons:
Tight turn may be required after departure requiring speed limitations;
Potential conflicts with Cardiff inbounds/ outbounds and Bristol arrivals;
Might require new low-level (4,000ft base) and high-level CAS.

Route 1A (RTO North-West towards Strumble)

Pros:
Right turn avoids overflying central Bristol;
Direct routing to STU (environmental benefit);
Some climb is over water (noise benefit);

Supports 1 min splits from east and northbound departures.

Cons:
Slightly longer route (environmental disbenefit);
Potential interaction with Cardiff inbounds and outbounds.
Conflict/overlap with inbound traffic for 09.
May overfly Cardiff;
Overflies the Mendips AoNB;
ditto Halesland gliding site;
May require minimum performance requirements due to topography (high ground).

Route 1B (LTO North-West towards Strumble, north of Bristol city)

Pros:
Avoids overflying central Bristol;
Less requirement for speed restrictions (compared with Route 1).
Direct routing to STU (when on track);
Should support 1 min splits from east and southbound departures.

Cons:
Conflicts with inbound patterns for 09 arrivals from the east;
Potential interaction with Cardiff inbounds and outbounds;
Extended track distance.

Route 2 (LTO North-West towards BCN)

Pros:
Early left turn could avoid central Bristol;
Shorter route than current (environmental benefit);
Some climb is over water (noise benefit);
Avoids the centre of Cardiff and Newport (dependent on route alignment);
Supports 1 min splits from east and southbound departures.

Cons:
Tight turn may be required after departure requiring speed limitations;
Potential conflicts with Cardiff inbounds/ outbounds and Bristol arrivals (around 5,000 – 6,000ft);
Might require new low-level (4,000ft base) and high-level CAS

Route 2A (RTO North-West towards BCN)

Pros:
Right turn avoids overflying central Bristol;
More climb is over water (noise benefit);
Supports 1 min splits from east and northbound departures.

Cons:
Longer route (environmental disbenefit);
Potential interaction with Cardiff inbounds and outbounds.
Conflict/overlap with inbound traffic for 09.
Overflies the Mendips AoNB;
ditto Halesland gliding site;
May require minimum performance requirements due to topography (high ground).

Route 2B (LTO North-West towards BCN, north of Bristol city)

Pros:
Avoids overflying central Bristol;
Less requirement for speed restrictions (compared with Route 2).
Should support 1 min splits from east and southbound departures;

Cons:
Conflicts with inbound patterns for 09 arrivals from the east;
Extended track distance.

Route 3 (to the North)

Pros:
A more direct route to some Northern destinations (environmental benefit);
Early left turn could avoid central Bristol;
Shorter route than current (environmental benefit);
Supports 1 min splits from east and southbound departures.

Cons:
Tight turn may be required after departure requiring speed limitations;
Potential conflicts with Cardiff inbounds/ outbounds and Bristol arrivals.

Route 3A (LTO to the North, east of Bristol city)

Pros:
Avoids overflying central Bristol;
Less requirement for speed restrictions (compared with Route 3).
Should support 1 min splits from east and southbound departures;
Could support respite.

Cons:
Conflicts with inbound patterns for 09 arrivals from the east;
Extended track distance;

Route 3B (RTO then direct north)

Pros:
Right turn avoids overflying central Bristol;
More climb is over water (noise benefit);
Supports 1 min splits from east and northbound departures;

Cons:
Longer route (environmental disbenefit);
Potential interaction with Cardiff inbounds and outbounds.
Conflict/overlap with inbound traffic for 09.
Overflies the Mendips AoNB;
ditto Halesland gliding site;
May require minimum performance requirements due to topography (high ground).

Route 4 (direct to the North-East)

Pros:
Direct route to certain destinations (environmental benefit);
Dependency on CAS to the North of N14 (although ATS Routes N91/N92 were recently established);
Possibility for some of the climb to be over water (noise benefit);

Cons:
Flies directly over the centre of Bristol and over nature reserves;
Potential conflict with Birmingham traffic;
Conflict with 09 inbound traffic from the east, and potential hold positions;
No current network connectivity although there might be justification for making higher levels permanent;
Limited demand.

Route 4A (to the North-East, avoiding Bristol city)

Pros:
Avoids overflying central Bristol;
Less requirement for speed restrictions (compared with Route 3).
Should support 1 min splits from east and southbound departures;
Could support respite.

Cons:
Conflicts with inbound patterns for 09 arrivals from the east;
Extended track distance;

Route 5 (to the East)

Pros:
Direct route (environmental benefit);
Similar initial climb profile to today's NPR;
Supports 1 min splits from other departure routes;
Should be deconflicted from arrivals from the east (arrivals likely to be further to the north);
Generally follows current practice and what is tactically flown today;
Therefore minimises the overall change and the impact on LAMP.

Cons:
Requirement for additional low-level CAS;
Route positioned over Bath;
Issue with achieving FL230 requirement, may require speed limits to achieve required climb profile.

Route 5A (to the East)

Pros:
Avoids flying over Bath and Bristol;
Utilises current CAS (advantage over route 5);
Could support 1 min splits from southbound traffic;
Potential to support respite from route 5;
Longer track distance, may assist with FL230 requirement;
Possibility for use as low performance alternative to route 5.

Cons:
Less direct and longer track distance than route 5;
Presenting traffic to the network in 2 different places to the east may increase complexity;
Potentially a lot of traffic on the initial leg (concentrated area)

Route 6 (to the South-East)

Pros:
Direct route which could specifically be used early morning (environmental benefit);
Route which helps to meet a known high demand period;
Supports splits for peak early morning departure flows (could help to reduce pre-departure delays);

Airline preference for this route;
Avoids busy LTMA and TC airspace;
Does not overfly any large populations;
Supports CCOs;

Cons:
Potential conflict with military users and operations (timing);
Revised and new CAS (but can be matched to demand periods);
Will require revised network structure to support;

Route 7 (direct to the South)

Pros:
Shorter route than current (environmental benefit);
Similar to current routing when N90 CDR is available (note: route as drawn cuts the corner, to be subject of further design work);
Supports 1 min splits from LTO, easterly or (potentially) south-easterly departures;
Improved fit around Exeter inbounds and outbounds;
Deconflicts with inbounds from the south (current Exmoor conflict requires tactical intervention).

Cons:
Would require new permanent CAS (negotiation with other airspace users);
Overflies the Mendips AoNB;
ditto Halesland gliding site;
May require minimum performance requirements due to topography (high ground);

Route 7A (LTO then routing south)

Pros:
Supports 1 min splits from east and south-easterly departures;
Route could potentially be positioned over the Channel (if extended).

Cons:
Longer track distance than route 7 (environmental disbenefit);
Tight turn may be required after departure requiring speed limitations;
Conflict/overlap with inbound traffic for 09;
Potential conflicts with Cardiff inbounds from south;
Left-hand turn would be over Bristol;

Route 8 (direct to South-West, towards Lands' End)

Pros:
Direct route (environmental benefit);
Avoids built up areas (less noise impact).

Cons:
Overflies the Mendips AoNB;
ditto Halesland gliding site;
May require minimum performance requirements due to topography (high ground);
Conflict with inbounds from the South and Cardiff departures;
High-level CAS may be required;
Not a widely utilised route (low demand vs development cost);
Potential conflict with military training areas to the west;
No current network connectivity;

Arrivals

Having identified all initial candidates for departure routes, the group performed an initial assessment of arrivals and possibilities for delay absorption (holding etc). The discussion is recorded here but will require further development.

The current arrival routes (STARs) are predicated on the location of the current BRI Hold, which as identified is operationally not sustainable. Design goal is to separate arrival routes from departures as far as possible, and concentrating on procedures to support CCOs and CDOs, particularly on the major traffic flows. Accepting that some routes will inevitably cross, minimal tactical intervention should be the aim.

RNAV STARs will define routes to each runway that can be flown with minimum ATC intervention. However, the designs must also support the ability for ATC to tactically intervene to deliver the required spacing to maximise runway utilisation.

Holding

Bristol Airport requires some form of arrival delay absorption method – options include traditional holds, point-merge or relying on the network to stream all traffic. A key feature of the airport is its variable weather, due to geographical location and airfield height. Low Visibility Procedures (LVPs) are a dominant factor which, alongside unpredictable met conditions, regularly require the need for short notice airborne delaying procedures.

There are typically 3-4 arrival peaks per day at Bristol which results in two alternative holding/ delay absorption requirements:

- A metering system for times of peak demand; and
- A delay absorption method for low visibility periods.

In good weather, peak arrival flows may sometimes need delay absorption due to demand exceeding capacity (this may grow in future with increased demand), but a sudden requirement for airborne delay due to deteriorating weather occurs with very little notice. This creates a great challenge for the network to have the capability to present traffic to match highly fluctuating demand.

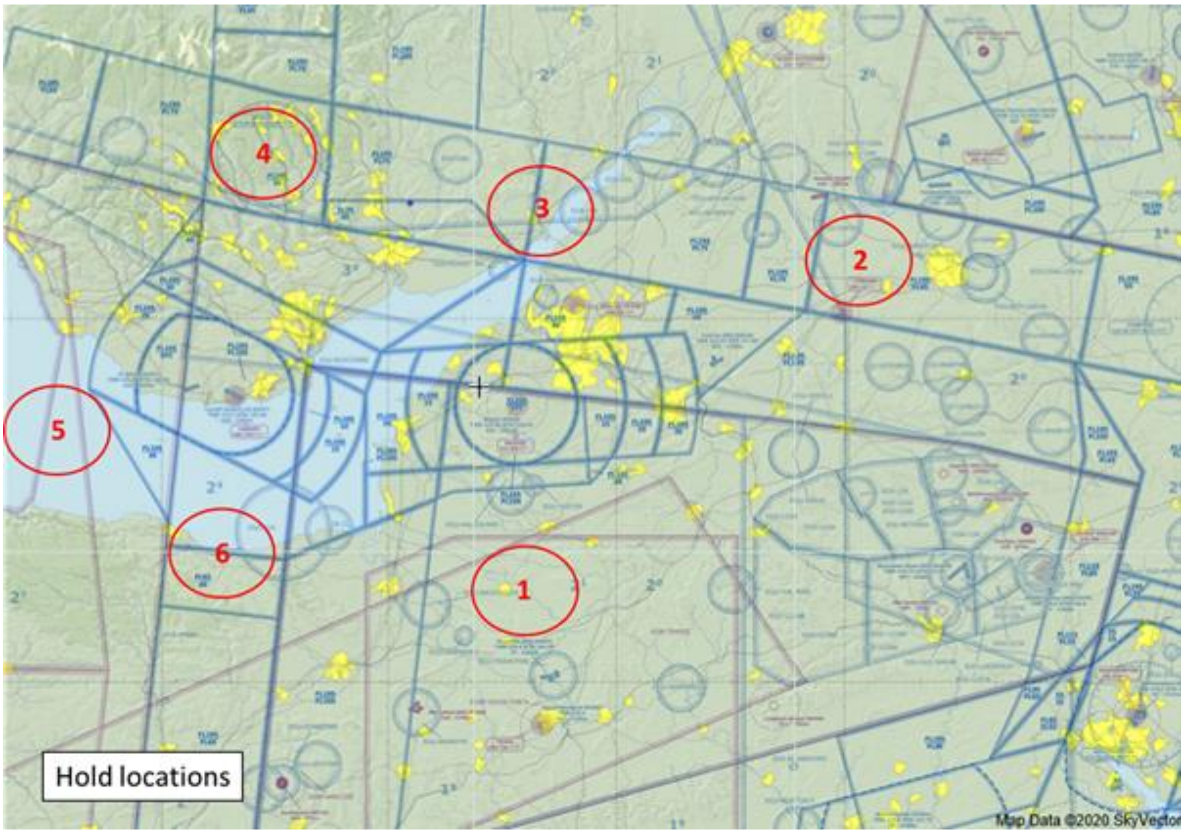
As an additional complication, in LVP conditions individual aircraft may or may not be able to make an approach due to their own minima and constantly varying weather conditions. ATC must be able to react to this. Therefore, the delay absorption required is unlike a (for instance) London TMA airport which can be regular and reasonably predicable due to a more constant demand profile and less volatile met conditions.

Bristol Airport will therefore require delay absorption capability in a relatively close location to the airport in order to be able to react to variable weather conditions. It must be able to be utilised flexibly and at short notice, and thus minimise disruption and any unnecessary airborne delays - with associated environmental consequences.

The LAMP design team has assumed a point-merge for its modelling scenarios however, a point-merge procedure in this region is likely to be challenging in terms of airspace design and usage. Further design study will be undertaken, although a concern is that a point-merge system(s) would probably require much more CAS than currently exists. This could impact on other airspace users/ traffic flows including even Bristol's own departure routes and undermine one of the Design Principles (only use the minimal required amount of CAS). It was noted that the LAMP design team plans to explore the idea of having smaller point-merge arcs nearer to airports with traditional holds further out (to be used during times of low visibility etc.). Whether this would result in the most efficient airspace for Bristol will need to be further examined.

The fluctuation in the number of a/c required to hold as a result of weather variations described above currently overloads the capacity of the current singe hold. The Boxkite study also modelled future demand in which such overloads happened more frequently. An increase in holding capacity is thus also a requirement.

In the time available the potential locations of new Holding facilities for Bristol Airport was briefly and only approximately discussed – this has been summarised below:



Hold to the South (1)

Pros:
Separation from majority of departures;
Flexibility of placement, to allow equal distance to touchdown for both runways (approx. 25 nms);
Fully under Bristol ATC's control, enabling maximum efficiency of arrival spacing.

Cons:
Additional permanent CAS required;
Difficult for the network to deliver arrivals to this location?

There could also potentially be a hold to the South-East of Bristol Airport, however it might be even more difficult for the network to deliver arrival traffic there.

Hold to the Northeast (2)

Pros:
An acceptable location for Bristol Airport traffic from the east, although long track distance to Runway 09.

Cons:
Potential interaction with Fairford and Brize Norton traffic (both airfields are expected to get busier).
Maximum level available potentially constrained by LTMA outbound traffic.

Hold to the North (3)

Pros:
Good position for both Runway directions (equidistant intermediate approach, approx. 25nms);
Low impact on majority of departure routes;
Fully under Bristol ATC's control, enabling maximum efficiency of arrival spacing.

Cons:
Conflict with some possible departure routes if avoiding Bristol city;
Conflict with existing Cardiff departure route (but subject to design work under this programme).

Hold to the Northwest, BCN area (4)

Pros:
Could service arrivals from north and west.

Cons:
Conflicts with some proposed north and west departure routes;

Long track distance for inbounds from the east, and for approaches to Runway 27 (increases workload associated with accurate metering);
Not under Bristol ATC control (under current delegated ATS arrangements);
Conflict with existing Cardiff departure route (but subject to design work under this programme).

Hold to the West, over the Channel (5)

Pros:
Reduced noise impact at lower levels (although holding is anticipated to remain at 7000ft and above);

Cons:
Conflict between intermediate approach and Cardiff traffic;
Long track distance for inbounds from the east, and for approaches to Runway 27 (increases workload associated with accurate metering);
Requires new permanent CAS;
Conflict with other airspace users (military?);
Not under Bristol ATC control (under current delegated ATS arrangements).

Hold to the Southwest (6)

Pros:
Location is over low density population;
On current arrival route;
Could be de-conflicted from southbound departures, depending on choice of departure route;

Cons:
Conflict between intermediate approach and Cardiff traffic;
Long track distance for approaches to Runway 27 (increases workload associated with accurate metering);
Not under Bristol ATC control (under current delegated ATS arrangements).

Note:

CAS requirements associated with any Hold will be subject to assessment of protected airspace compliant with PANS-Ops criteria. Any additional CAS required cannot therefore be accurately stated at this time.

Point-merge

There was a final short discussion on the potential location of a point-merge arc(s).

The East of Bristol Airport would not appear to be a good location due to the density of traffic and needs of other airports and airspace users, such as the London TMA inbounds and outbounds, military traffic etc.

A point-merge to the West of Bristol Airport could potentially be positioned over the sea. This could help to reduce the noise impact to stakeholders on the ground such as when arrivals are peeled off and descend below 7,000ft.

However, as a high proportion of arrivals are from the East a point-merge to the West of the airport could add complexity – particularly taking account of the fluctuation of delay requirements as described above and the need for proximity to the airport for tactical control in varying weather. A point-merge in this location would also increase the likelihood of conflicts with Cardiff traffic.

A Point-merge facility to the south of the airport was also discussed, although this suffers the same constraints as a traditional hold in this location, plus the likelihood of an even larger volume of new CAS.

Further examination of a Point-merge option will be conducted by the design team.