

Future Airspace Strategy Implementation South (FASI-S)  
Cardiff Airport

Gateway documentation:

Stage 2 Develop & Assess

2B (ii) Initial Options Appraisal



## Sign-Off

Action	Role	Date
Produced	Airspace Change Specialist	28/01/2022
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## Introduction

This document forms part of the document set in accordance with the requirements of CAP1616 airspace change process. It aims to provide adequate evidence to satisfy *Stage 2 Develop and Assess Gateway, Step 2B Options Appraisal (Phase I Initial)*, including a Safety Assessment.

This document has been submitted to the CAA to satisfy the requirements for Stage 2 alongside the *Design Options* and *Design Principle Evaluation* documentation which can also be found on the portal ([link](#)).

This Initial Options Appraisal is the first of three options appraisals as part of CAP1616. The design options presented herein all passed the required criteria of the Stage 2A Design Principle Evaluation.

This Initial Options Appraisal builds on the Design Principle evaluation and identifies the key impacted audiences of the design options and a qualitative assessment of each. This assessment takes into consideration feedback received from stakeholders during the Stage 2 engagement activities alongside operational knowledge of the ACP design team.

The changes proposed in Cardiff Airport's ACP will impact flights below 7,000ft. Hence in accordance with the Levels as defined in CAP1616, it has been categorised as a Level 1 change. In line with the requirements for a Level 1 change, this Initial Options Appraisal contains a qualitative environmental impact assessment which has been conducted on the basis of CO<sub>2</sub> emissions and noise impact.

The baseline (do nothing) option would not deliver any improvement or modernisation from today's operations and is used as the benchmark against which the benefits of the proposed change can be measured. The Design Principles are either not met or met by default for this option, i.e., 'no change'. As such, this option is not being progressed.

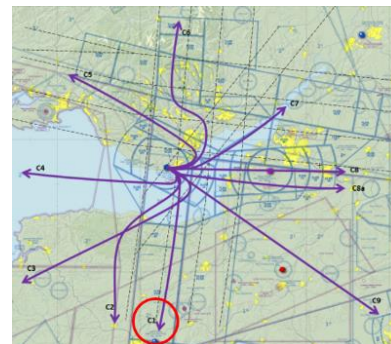
The detailed makeup of the baseline option and the Hold/ SID options, including evaluation is detailed in Stage 2 Develop and Assess: *Stage 2A(i) Design Options* and *Stage 2A(ii) Design Principle Evaluation*.

Following on from the Design Principle Evaluation, Cardiff Airport is progressing the following different design options which form the focus of this Initial Options Appraisal:

- 8 options for Runway 12 SIDs
- 8 options for Runway 30 SIDs
- 5 options for a Hold

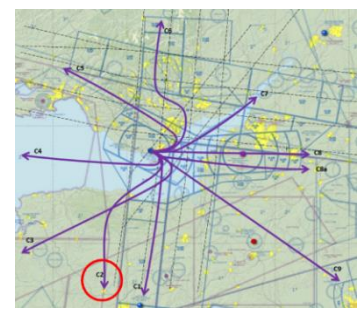
# Runway 12 SIDs

## Runway 12 SID C1



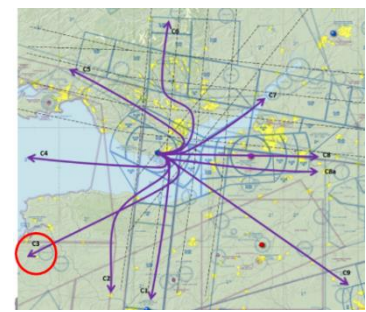
Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
All of the initial climb up to 7,000ft is over water therefore no impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current Noise Preferential Route (NPR) subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Direct route however, CCOs (Continuous Climb Operation) may not be achievable above 7,000ft, due to a potential location of Cardiff's Hold/ transitions. This could therefore increase the greenhouse gas impact and contribution.	
<b>Wider society</b>	Capacity/ resilience
No capacity constraints – anticipated to be frequently used as a large percentage of traffic flies to/ from southern locations. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
Minimal impact – positioned over the water at lower levels and within existing CAS (Controlled Airspace).	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Direct route however, CCOs may not be possible which would increase fuel burn for airlines. Fuel planning would have to take this into account.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

## Runway 12 SID C2



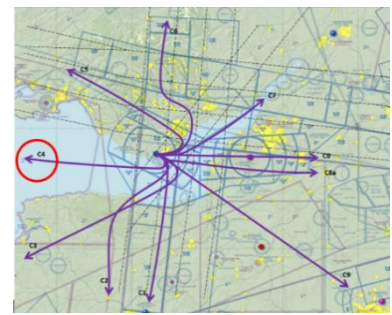
Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
All of the initial climb up to 7,000ft is over water therefore no impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Longer track than currently flown and slightly longer than option C1 (covered above). Also, CCOs above 7,000ft may not be achievable, due to a potential location of Cardiff's Hold/ transitions. This could therefore increase the greenhouse gas impact and contribution of this design option.	
<b>Wider society</b>	Capacity/ resilience
No capacity constraints – anticipated to be frequently used as a large percentage of traffic flies to/ from southern locations. Good alignment with the network route structure. Also, should be suitable for lower performance aircraft types. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
Minimal impact – positioned over the water at lower levels and primarily contained within existing CAS (Controlled Airspace). It may require a small amount of additional CAS to the west of the current Berry Head CTA but this should be above 7,000ft.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Longer than currently flown and CCOs may not be possible which would increase fuel burn for airlines. Fuel planning would therefore have to take into account additional track miles.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

## Runway 12 SID C3



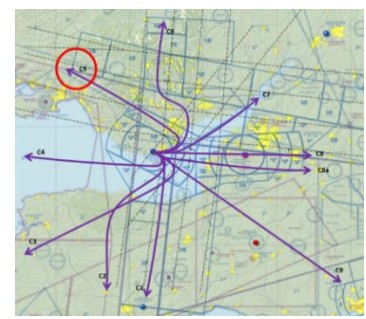
Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
<p>New route intended only for some early morning departures (low demand). All of the initial climb up to 7,000ft is also over water therefore no impact for ground-based stakeholders.</p> <p>Any re-alignment from the current NPR could overfly new communities.</p>	
<b>Communities</b>	Air quality
<p>Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality.</p> <p>Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.</p>	
<b>Wider society</b>	Greenhouse gas impact
<p>Slightly shorter track than today (cuts the corner) however, CCOs above 7,000ft may not be possible due to a potential location of Cardiff's Hold/ transitions. This could therefore lessen a reduction in greenhouse gas impact and contribution.</p>	
<b>Wider society</b>	Capacity/ resilience
<p>This route would be used as an early morning offload route for departures joining southerly Atlantic tracks or southern Europe destinations. Supports growth for these destinations however, low demand initially anticipated.</p> <p>Does not currently align with the network route structure, further work would be required.</p> <p>All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.</p>	
<b>General Aviation</b>	Access
<p>Minimal impact – may climb outside of CAS for a short amount of time but this would only be early in the morning.</p>	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
<p>No effect on capacity.</p>	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
<p>Small reduction in fuel burn for airlines as this option would cut the corner slightly when compared to today's route. However, CCOs above 7,000ft may not be achievable, due to a potential location of Cardiff's Hold/ transitions. This could therefore impact the fuel burn saving.</p>	
<b>Commercial airlines</b>	Training costs
<p>Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.</p>	
<b>Commercial airlines</b>	Other costs
<p>No other airline costs are foreseen.</p>	
<b>Airport/ ANSP</b>	Infrastructure costs
<p>This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).</p>	
<b>Airport/ ANSP</b>	Operational costs
<p>This proposal is not expected to change airport or ANSP operational costs.</p>	
<b>Airport/ ANSP</b>	Deployment costs
<p>This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations.</p> <p>Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery.</p> <p>Internal documentation will also require updating.</p>	

Runway 12 SID C4



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
<p>New route intended only for some early morning departures (low demand). All of the initial climb up to 7,000ft is also over water therefore no impact for ground-based stakeholders.</p> <p>Any re-alignment from the current NPR could overfly new communities.</p>	
<b>Communities</b>	Air quality
<p>Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality.</p> <p>Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.</p>	
<b>Wider society</b>	Greenhouse gas impact
<p>CCOs above 7,000ft may not be possible due to a potential location of Cardiff's Hold/ transitions. This could therefore increase the greenhouse gas impact and contribution.</p>	
<b>Wider society</b>	Capacity/ resilience
<p>This route would be used as an early morning offload route for departures joining southerly Atlantic tracks or southern Europe destinations. Supports growth for these destinations however, low demand initially anticipated.</p> <p>Does not currently align with the network route structure, further work would be required.</p> <p>All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.</p>	
<b>General Aviation</b>	Access
<p>A significant amount of additional CAS would be required. However, as this would be over water there would be minimal impact on other airspace users.</p>	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
<p>No effect on capacity.</p>	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
<p>CCOs may not be possible which would fuel planning would therefore have to take into account.</p>	
<b>Commercial airlines</b>	Training costs
<p>Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.</p>	
<b>Commercial airlines</b>	Other costs
<p>No other airline costs are foreseen.</p>	
<b>Airport/ ANSP</b>	Infrastructure costs
<p>This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).</p>	
<b>Airport/ ANSP</b>	Operational costs
<p>This proposal is not expected to change airport or ANSP operational costs.</p>	
<b>Airport/ ANSP</b>	Deployment costs
<p>This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations.</p> <p>Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery.</p> <p>Internal documentation will also require updating.</p>	

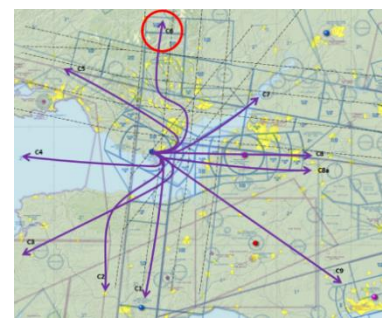
## Runway 12 SID C5



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
Potential to impact new communities around Cardiff City. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
More direct route than currently flown therefore, reduced impact for greenhouse gas contribution.	
<b>Wider society</b>	Capacity/ resilience
No capacity constraints – this would formalise a tactical procedure which is currently used in the operation. Good alignment with the network route structure. However, there may be an increase in operational complexity as this route would depart towards adjacent CAS. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
This route option would require a small amount of additional CAS to the north-west of Cardiff Airport. This could impact GA access by reducing the area they can operate within.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
More direct route than currently flown therefore, a reduction in fuel burn for airlines.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	



Runway 12 SID C6



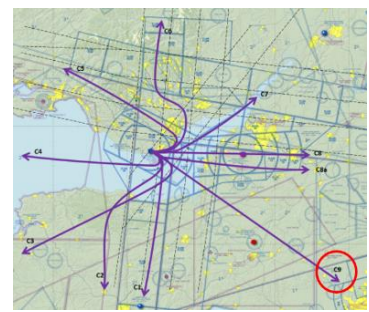
Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
Minimal impact - the initial climb is over water then the route is specifically positioned to avoid communities (resulting in a slightly longer track distance than what is currently flown). Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Slightly longer track distance than currently flown which could increase the greenhouse gas impact and contribution.	
<b>Wider society</b>	Capacity/ resilience
No capacity constraints – similar to current route and good alignment with the network route structure. However, there may be an increase in operational complexity as this route would depart towards adjacent CAS. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
Minimal impact – a small chance that the CAS base would require lowering but otherwise, contained within existing CAS.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Slightly longer track distance than what is currently flown therefore, slight increase in fuel burn for airlines. Fuel planning would have to take additional track miles into account.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

## Runway 12 SID C7



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
Positioned to purposefully overfly water therefore no impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Shorter track distance than today therefore this would reduce the greenhouse gas impact and contribution.	
<b>Wider society</b>	Capacity/ resilience
No capacity constraints – should support an expected increase in future traffic to eastern destinations alongside being suitable for lower performance aircraft types. It would also have good alignment with the network structure. However, this design option would require increased collaboration with Bristol Airport due to the potential impact on Bristol arrivals. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
No impact – designed to be contained within existing CAS.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Shorter track distance than currently flown therefore a reduction in fuel burn for airlines.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

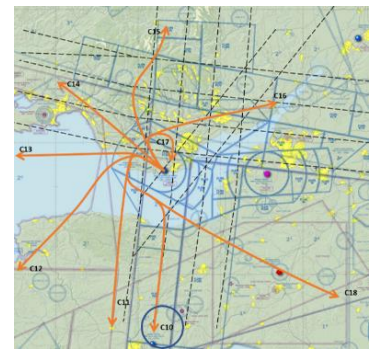
## Runway 12 SID C9



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
All of the initial climb up to 7,000ft is over water therefore no impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Direct route with a significant reduction in its greenhouse gas contribution when compared to today's route. However, this could be reduced as CCOs may not be possible above 7,000ft due to a potential location of Cardiff's Hold/ transitions. This could be further lessened as this route would only be used during early morning hours.	
<b>Wider society</b>	Capacity/ resilience
This design option would be used to reduce pre-departure delay during first rotation (a known high demand period). However, it would not comply with network connectivity and further work would be required. It is also anticipated that it would increase workload for sector controllers when compared to today. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
A significant amount of additional CAS would be required however this would have a minimal impact on GA access (particularly as this route will only be used during early morning hours).	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Direct route with a significant reduction in fuel burn for airlines, when compared to today's route. However, this could be reduced as CCOs may not be possible above 7,000ft due to a potential location of Cardiff's Hold/ transitions. Any potential saving could be further lessened as this route would only be used during early morning hours.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
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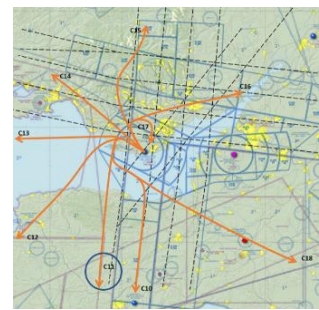
# Runway 30 SIDs

## Runway 30 SID C10



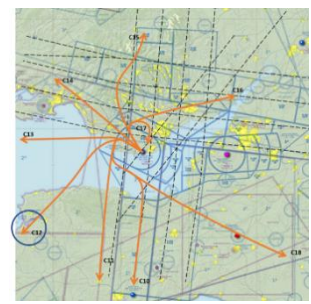
Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
All of the initial climb is over water then avoids overflying any large populations therefore, no impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Slight track extension introduced to best avoid St Athan operations and CCOs may not be possible due to a potential location of Cardiff's Hold/ transitions. Therefore, greenhouse gas emissions could slightly increase.	
<b>Wider society</b>	Capacity/ resilience
No capacity constraints – anticipated to be frequently used as a large percentage of traffic flies to/ from southern locations. Also, good alignment with network connectivity and similar to what is flown today. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
No impact – designed to be contained within existing CAS.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Slight track extension introduced to best avoid St Athan operations and CCOs may not be possible due to a potential location of Cardiff's Hold/ transitions. Therefore, airline fuel planning would have to take into account additional track miles.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

## Runway 30 SID C11



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
All of the initial climb is over water then avoids overflying any large populations therefore, no impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
CCOs may not be possible due to a potential location of Cardiff's Hold/ transitions. Therefore, greenhouse gas emissions could slightly increase.	
<b>Wider society</b>	Capacity/ resilience
No capacity constraints – anticipated to be frequently used as a large percentage of traffic flies to/ from southern locations. However, further design work required as it would currently align with an opposite aligned network route. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
Likely to require additional CAS however minimal impact on GA operations.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
CCOs may not be possible due to a potential location of Cardiff's Hold/ transitions therefore, airline fuel burn could slightly increase and fuel planning would have to take this into account.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

## Runway 30 SID C12



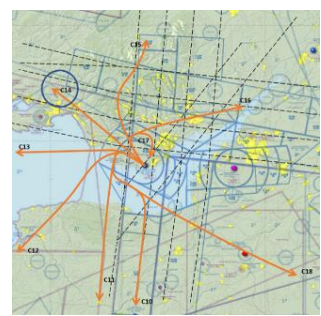
Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
New route intended only for some early morning departures (low demand). Most of the initial climb is also over water therefore minimal impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Small reduction in greenhouse gas contribution as this option would cut the corner slightly when compared to today's route. However, CCOs above 7,000ft may not be achievable, due to a potential location of Cardiff's Hold/ transitions. This could therefore lessen the reduction of greenhouse gas impact for this design option.	
<b>Wider society</b>	Capacity/ resilience
This route would be used as an early morning offload route for departures joining southerly Atlantic tracks or southern Europe destinations. Supports growth for these destinations however, low demand initially anticipated. Does not currently align with the network route structure, further work would be required.	
<b>General Aviation</b>	Access
Minimal impact – may climb outside of CAS for a short amount of time but this would only be early in the morning.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Small reduction in fuel burn for airlines as this option would cut the corner slightly when compared to today's route. However, CCOs above 7,000ft may not be achievable, due to a potential location of Cardiff's Hold/ transitions. This could therefore impact the fuel burn saving which airline fuel planning would have to take into account.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

## Runway 30 SID C13



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
Overflies minimal land and no populated areas therefore minimal impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Direct track to the west introducing minimal greenhouse gas impact and contribution.	
<b>Wider society</b>	Capacity/ resilience
This route would be used for departures joining southerly Atlantic tracks or southern Europe destinations. Supports growth for these destinations however, low demand initially anticipated. Does not currently align with the network route structure, further work would be required. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
A significant amount of additional CAS would be required for protection purposes and would likely impact upon GA access.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Direct track to the west introducing minimal fuel burn for airlines.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

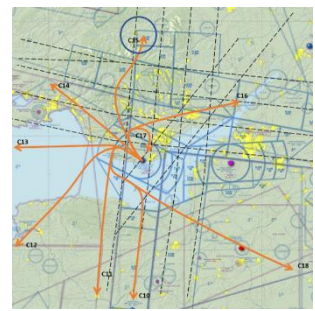
## Runway 30 SID C14



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
	Small increase in noise impact for new communities around Cowbridge. Any re-alignment from the current NPR could overfly new communities.
<b>Communities</b>	Air quality
	Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.
<b>Wider society</b>	Greenhouse gas impact
	More direct route than currently flown therefore, reduced impact for greenhouse gas contribution.
<b>Wider society</b>	Capacity/ resilience
	No capacity constraints – this support growth for more western and transatlantic flights in the future. Good alignment with the network route structure. However, potential to conflict with en route traffic in a known busy region of airspace. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.
<b>General Aviation</b>	Access
	This route option would likely require additional CAS for protection purposes. The positioning of the route would have a significant impact specifically on gliding operations around Brecon and potentially other GA users too.
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
	No effect on capacity.
<b>General Aviation/ commercial airlines</b>	Fuel Burn
	More direct route than currently flown therefore, reduced fuel burn for airlines. Fuel planning would take into account a reduction in track miles.
<b>Commercial airlines</b>	Training costs
	Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.
<b>Commercial airlines</b>	Other costs
	No other airline costs are foreseen.
<b>Airport/ ANSP</b>	Infrastructure costs
	This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).
<b>Airport/ ANSP</b>	Operational costs
	This proposal is not expected to change airport or ANSP operational costs.
<b>Airport/ ANSP</b>	Deployment costs
	This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.

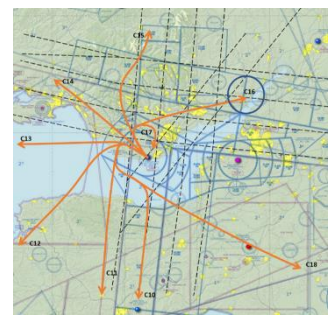


## Runway 30 SID C15



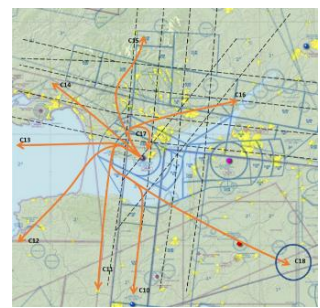
Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
Minimal impact - the initial climb is over water then the route is specifically positioned to avoid communities (resulting in a slightly longer track distance than what is currently flown). Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Slightly longer track distance than currently flown which could increase the greenhouse gas impact and contribution.	
<b>Wider society</b>	Capacity/ resilience
Good alignment with the network route structure however may interact with LTMA arrivals within this known busy region of airspace. Also, possible further capacity constraints from conflict with other Cardiff traffic such as slow departures. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
Minimal impact – a small chance that the CAS base would require lowering but otherwise, contained within existing CAS.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Slightly longer track distance than what is currently flown therefore, slight increase in fuel burn for airlines. Fuel planning would therefore have to take into account additional track miles.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

## Runway 30 SID C16



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
All of the climb is over land with the potential to impact new stakeholders north of Cardiff City. Any re-alignment from the current NPR could overfly new communities.	
<b>Communities</b>	Air quality
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.	
<b>Wider society</b>	Greenhouse gas impact
Shorter track distance than today therefore this would reduce the greenhouse gas impact and contribution. However, London Airport arrivals could impact the potential for a continuous climb.	
<b>Wider society</b>	Capacity/ resilience
No capacity constraints – should support an expected increase in future traffic to eastern destinations alongside being more direct and simpler than the current departure route. It would also have good alignment with the network structure. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.	
<b>General Aviation</b>	Access
No impact – designed to be contained within existing CAS.	
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	Fuel Burn
Shorter track distance than today therefore a reduction in fuel burn for airlines. However, London Airport arrivals could impact the potential for a continuous climb which fuel planning would have to take into account.	
<b>Commercial airlines</b>	Training costs
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	Other costs
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	Infrastructure costs
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	Operational costs
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	Deployment costs
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

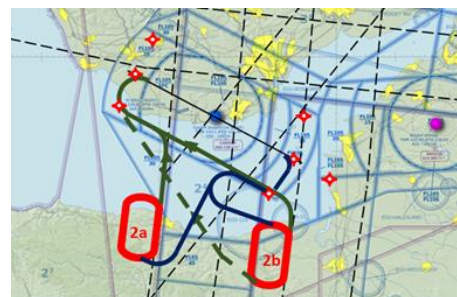
## Runway 30 SID C18



Group	Impact
<b>Communities</b>	Noise impact on health and quality of life
	All of the initial climb is over water and avoids overflying any large populations therefore minimal impact for ground-based stakeholders. Any re-alignment from the current NPR could overfly new communities.
<b>Communities</b>	Air quality
	Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Departing aircraft will still climb through 1,000ft on initial departure, between 2 and 4 nautical miles (about 4-7km) from either end of the runway. This is unlikely to change much from today however, there may be a slight re-alignment of the current NPR subject to further design work.
<b>Wider society</b>	Greenhouse gas impact
	Direct route with a significant reduction in its greenhouse gas contribution when compared to today's route. However, this could be lessened as this route would only be used during early morning hours.
<b>Wider society</b>	Capacity/ resilience
	This design option would be used to reduce pre-departure delay during first rotation (a known high demand period). However, it would not comply with network connectivity and further work would be required. It is also anticipated that it would increase workload for sector controllers when compared to today. All SID options will be explored for suitability of applying reduced departure separations, thus reducing pre-departure delay.
<b>General Aviation</b>	Access
	Some additional CAS may be required however this would have a minimal impact on GA access (particularly as this route will only be used during early morning hours). The initial climb would occur within existing CAS.
<b>General Aviation/ commercial airlines</b>	Economic impact from increased effective capacity
	No effect on capacity.
<b>General Aviation/ commercial airlines</b>	Fuel Burn
	Direct route with a significant reduction in fuel burn for airlines, when compared to today's route. Fuel planning would take into account this reduction in track miles. However, this could be lessened as this route would only be used during early morning hours.
<b>Commercial airlines</b>	Training costs
	Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.
<b>Commercial airlines</b>	Other costs
	No other airline costs are foreseen.
<b>Airport/ ANSP</b>	Infrastructure costs
	This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).
<b>Airport/ ANSP</b>	Operational costs
	This proposal is not expected to change airport or ANSP operational costs.
<b>Airport/ ANSP</b>	Deployment costs
	This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.

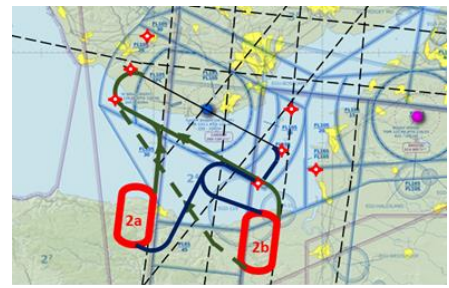
# Cardiff Airport Hold Options

## Hold 2A



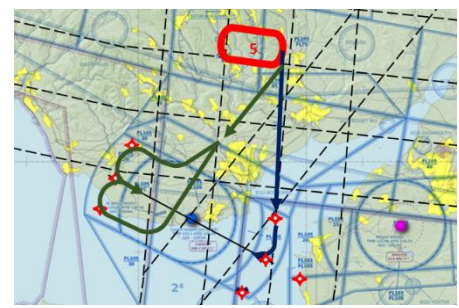
Group	Impact
<b>Communities</b>	<b>Noise impact on health and quality of life</b>
Transitions would primarily be positioned over water and not overfly any large populations. PBN routing will be used to minimise overflying population centres.	
<b>Communities</b>	<b>Air quality</b>
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Arriving aircraft will still descend through 1,000ft on final approach, between 2 and 4 nautical miles (about 4-7km) from touchdown at either end of the runway. This is close to landing, in the very final stages of the approach, and is no change from today.	
<b>Wider society</b>	<b>Greenhouse gas impact</b>
Appropriate location as this Hold is close to the airport and the majority of arrivals are from the south and east. Fuel planning does not have to take into account additional track miles due to the location therefore no superfluous environmental impact. Net increase in CO <sub>2</sub> emissions would be small as holding will not be employed for most arrivals (only when required for reasons such as delay absorption, or technical troubleshooting).	
<b>Wider society</b>	<b>Capacity/ resilience</b>
Good alignment with the network route structure and appropriate location for the majority of arrivals from the south and east. Removes Hold from the overhead thus enabling more use of continuous climb operations (CCO) for departures. However, there may be some climb restriction on departures to the south due to the location of the transitions from the hold to the runway.	
<b>General Aviation</b>	<b>Access</b>
Minimal impact – GA flights generally avoid this region due to high terrain. The Hold and transitions would be contained within existing CAS.	
<b>General Aviation/ commercial airlines</b>	<b>Economic impact from increased effective capacity</b>
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	<b>Fuel Burn</b>
Appropriate location as this Hold is close to the airport and the majority of arrivals are from the south and east. Fuel planning therefore does not have to take into account additional track miles due to Hold location.	
<b>Commercial airlines</b>	<b>Training costs</b>
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	<b>Other costs</b>
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	<b>Infrastructure costs</b>
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	<b>Operational costs</b>
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	<b>Deployment costs</b>
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

Hold 2B



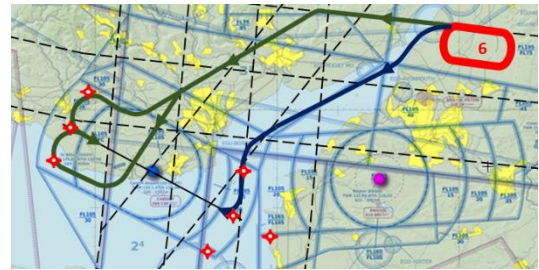
Group	Impact
<b>Communities</b>	<b>Noise impact on health and quality of life</b>
Transitions would primarily be positioned over water and not overfly any large populations. PBN routing will be used to minimise overflying population centres.	
<b>Communities</b>	<b>Air quality</b>
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Arriving aircraft will still descend through 1,000ft on final approach, between 2 and 4 nautical miles (about 4-7km) from touchdown at either end of the runway. This is close to landing, in the very final stages of the approach, and is no change from today.	
<b>Wider society</b>	<b>Greenhouse gas impact</b>
Appropriate location as this Hold is close to the airport and the majority of arrivals are from the south and east. Fuel planning does not have to take into account additional track miles due to the location therefore no superfluous environmental impact. Net increase in CO <sub>2</sub> emissions would be small as holding will not be employed for most arrivals (only when required for reasons such as delay absorption, or technical troubleshooting).	
<b>Wider society</b>	<b>Capacity/ resilience</b>
Good alignment with the network route structure and appropriate location for the majority of arrivals from the south and east. Removes Hold from the overhead thus enabling more use of continuous climb operations (CCO) for departures. However, potential constraint on capacity if departures have to be held beneath the Hold.	
<b>General Aviation</b>	<b>Access</b>
Minimal impact – GA flights generally avoid this region due to high terrain. The Hold and transitions would be contained within existing CAS.	
<b>General Aviation/ commercial airlines</b>	<b>Economic impact from increased effective capacity</b>
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	<b>Fuel Burn</b>
Appropriate location as this Hold is close to the airport and the majority of arrivals are from the south and east. Fuel planning therefore does not have to take into account additional track miles due to Hold location.	
<b>Commercial airlines</b>	<b>Training costs</b>
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	<b>Other costs</b>
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	<b>Infrastructure costs</b>
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	<b>Operational costs</b>
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	<b>Deployment costs</b>
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	

## Hold 5



Group	Impact
<b>Communities</b>	<b>Noise impact on health and quality of life</b>
<p>The transition to Runway 12 would descend over and significantly impact upon new populations (not impacted today). Further design work will investigate whether this could be mitigated by extending the transition further to the south. However it is likely that this would have a detrimental environmental impact from increased track miles.</p> <p>PBN routing will be used to minimise overflying population centres where possible.</p>	
<b>Communities</b>	<b>Air quality</b>
<p>Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality.</p> <p>Arriving aircraft will still descend through 1,000ft on final approach, between 2 and 4 nautical miles (about 4-7km) from touchdown at either end of the runway. This is close to landing, in the very final stages of the approach, and is no change from today.</p>	
<b>Wider society</b>	<b>Greenhouse gas impact</b>
<p>Not an optimal location for arrivals from the south. This would have a negative impact on greenhouse gas emissions when compared to other Hold design options. Net increase in CO<sub>2</sub> emissions would be small as holding will not be employed for most arrivals (only when required for reasons such as delay absorption, or technical troubleshooting). Flights will however have to plan fuel loading to take into account routing to the holding facility; for flights from the south, this would require higher fuel load planning compared with a hold to the south and corresponding higher fuel burn.</p>	
<b>Wider society</b>	<b>Capacity/ resilience</b>
<p>Not an optimal location from a large percentage of arrivals, particularly from the south.</p> <p>Transitions may have an impact on Bristol operations requiring tactical intervention to deconflict, or a restriction on movements in order to deconflict.</p>	
<b>General Aviation</b>	<b>Access</b>
<p>Transitions likely to conflict with gliders which operate in this Class D region of airspace. Minimal impact otherwise – Hold and transitions would be contained within existing CAS.</p>	
<b>General Aviation/ commercial airlines</b>	<b>Economic impact from increased effective capacity</b>
<p>No effect on capacity.</p>	
<b>General Aviation/ commercial airlines</b>	<b>Fuel Burn</b>
<p>Not an optimal location for a significant percentage of arrivals, particularly those from the south. Airlines would have to carry excessive fuel to account for the location of the Hold.</p>	
<b>Commercial airlines</b>	<b>Training costs</b>
<p>Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.</p>	
<b>Commercial airlines</b>	<b>Other costs</b>
<p>No other airline costs are foreseen.</p>	
<b>Airport/ ANSP</b>	<b>Infrastructure costs</b>
<p>This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).</p>	
<b>Airport/ ANSP</b>	<b>Operational costs</b>
<p>This proposal is not expected to change airport or ANSP operational costs.</p>	
<b>Airport/ ANSP</b>	<b>Deployment costs</b>
<p>This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations.</p> <p>Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery.</p> <p>Internal documentation will also require updating.</p>	

Hold 6



Group	Impact
<b>Communities</b>	<b>Noise impact on health and quality of life</b>
<p>The transition to Runway 12 would descend over and significantly impact upon new populations (not impacted today). Further design work will investigate whether this could be mitigated by extending the transition further to the south. However it is likely that this would have a detrimental environmental impact from increased track miles.</p> <p>PBN routing will be used to minimise overflying population centres where possible.</p>	
<b>Communities</b>	<b>Air quality</b>
<p>Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality.</p> <p>Arriving aircraft will still descend through 1,000ft on final approach, between 2 and 4 nautical miles (about 4-7km) from touchdown at either end of the runway. This is close to landing, in the very final stages of the approach, and is no change from today.</p>	
<b>Wider society</b>	<b>Greenhouse gas impact</b>
<p>Not an optimal location for a significant percentage of arrivals, particularly those from the south. This would have a negative impact on greenhouse gas emissions when compared to other Hold design options. Net increase in CO<sub>2</sub> emissions would be small as holding will not be employed for most arrivals (only when required for reasons such as delay absorption, or technical troubleshooting). Flights will however have to plan fuel loading to take into account routing to the holding facility; for flights from the south, this would require higher fuel load planning compared with a hold to the south and corresponding higher fuel burn.</p>	
<b>Wider society</b>	<b>Capacity/ resilience</b>
<p>Good alignment with the network route structure.</p> <p>However, not an optimal location from a large percentage of arrivals, particularly from the south. The location could also potentially constrain capacity such as last-minute runway changes being difficult to accommodate.</p>	
<b>General Aviation</b>	<b>Access</b>
<p>The transitions are likely to conflict with GA flights such as frequent cross-country flights which operate around the Cotswolds within Class D airspace. This could be further exasperated if transitions require additional CAS.</p>	
<b>General Aviation/ commercial airlines</b>	<b>Economic impact from increased effective capacity</b>
<p>No effect on capacity.</p>	
<b>General Aviation/ commercial airlines</b>	<b>Fuel Burn</b>
<p>Not an optimal location for a significant percentage of arrivals, particularly those from the south. Transitions are also excessively long. Flights will have to plan fuel loading to take into account routing to the holding facility; for flights from the south, this would require higher fuel load planning compared with a hold to the south and corresponding higher fuel burn.</p>	
<b>Commercial airlines</b>	<b>Training costs</b>
<p>Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.</p>	
<b>Commercial airlines</b>	<b>Other costs</b>
<p>No other airline costs are foreseen.</p>	
<b>Airport/ ANSP</b>	<b>Infrastructure costs</b>
<p>This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).</p>	
<b>Airport/ ANSP</b>	<b>Operational costs</b>
<p>This proposal is not expected to change airport or ANSP operational costs.</p>	
<b>Airport/ ANSP</b>	<b>Deployment costs</b>
<p>This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations.</p> <p>Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery.</p> <p>Internal documentation will also require updating.</p>	

## Hold 7



Group	Impact
<b>Communities</b>	<b>Noise impact on health and quality of life</b>
The transitions would primarily be over water therefore, minimal impact. PBN routing will be used to minimise overflying population centres where possible.	
<b>Communities</b>	<b>Air quality</b>
Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local quality. Arriving aircraft will still descend through 1,000ft on final approach, between 2 and 4 nautical miles (about 4-7km) from touchdown at either end of the runway. This is close to landing, in the very final stages of the approach, and is no change from today.	
<b>Wider society</b>	<b>Greenhouse gas impact</b>
Appropriate location for a significant percentage of arrivals, particularly those from the south. However, slight increase in emissions for arrivals from the east when compared to other Hold locations. Net increase in CO <sub>2</sub> emissions would be small as holding will not be employed for most arrivals (only when required for reasons such as delay absorption, or technical troubleshooting).	
<b>Wider society</b>	<b>Capacity/ resilience</b>
Good alignment with the network route structure. Appropriate location for a large number of arrivals. However, there may be an impact on continuous climb operations for southerly departures from Cardiff runway 30 created by transitions to runway 30.	
<b>General Aviation</b>	<b>Access</b>
The transition to runway 30 is likely to require additional CAS. Otherwise this design option would utilise a relatively quiet region of current CAS. Minimal impact on GA flights.	
<b>General Aviation/ commercial airlines</b>	<b>Economic impact from increased effective capacity</b>
No effect on capacity.	
<b>General Aviation/ commercial airlines</b>	<b>Fuel Burn</b>
Appropriate location for a significant percentage of arrivals, particularly those from the south. However, slight increase in fuel planning for arrivals from the east when compared to other Hold locations.	
<b>Commercial airlines</b>	<b>Training costs</b>
Qualitatively, flight procedures change worldwide with each AIRAC cycle and airlines would update their procedures accordingly, training if required. This proposal is not anticipated to require additional training costs for airlines.	
<b>Commercial airlines</b>	<b>Other costs</b>
No other airline costs are foreseen.	
<b>Airport/ ANSP</b>	<b>Infrastructure costs</b>
This proposal is not expected to change airport or ANSP infrastructure, beyond the initial deployment phase which would require some system engineering amendments (internal ATC system adaptation changes only).	
<b>Airport/ ANSP</b>	<b>Operational costs</b>
This proposal is not expected to change airport or ANSP operational costs.	
<b>Airport/ ANSP</b>	<b>Deployment costs</b>
This proposal is expected to require air traffic controller training for controllers and assistants at Cardiff Airport and NATS Swanwick with use of the NATS simulator facilities at both locations. Support staff are required to run the simulator – planning, training staff, data preparation and testing, pseudo pilots, safety analysts, outputs to be recorded and reported etc. Some staff may only require briefings. There may be occasions where the reduced availability of operational controllers during their conversion training could mean operational rostering becomes a factor when considering continuous service delivery. Internal documentation will also require updating.	



## Safety Assessment

A qualitative safety assessment has been completed for each of the above design options and also includes those which were rejected as part of the *Step 2 - Stage 2A Design Principle Evaluation*.

This safety report documents the initial safety appraisal of the Cardiff Airport design options by providing a summary of potential safety implications and a qualitative statement for each design option.

The safety assessment has been summarised in a separate report and uploaded to the portal ([link](#)) alongside this document.

## Conclusion and Next Steps

This proposal has been developed following the submission of the [linked](#) Statement of Need to the CAA Airspace Regulation. This summarised Cardiff Airport's requirement for an airspace change including and limiting the environmental impact of flights and better management of noise impact for ground-based stakeholders.

This document has described the design options which address the Statement of Need by the proposed introduction of new arrival and departure procedures. These options have been developed through engagement with Cardiff Airport's stakeholders including representatives from airlines and the GA/ MoD communities. Cardiff Airport thanks all of these stakeholders and looks forward to continuing the development of this proposal alongside them.

These design options have been qualitatively appraised and will be taken forward for further development and consultation. Subject to CAA approval at the *Stage 2 Develop and Assess Gateway Assessment*, this proposal will then move on to *Stage 3 Consult*.