Future Airspace Strategy Implementation (FASI)

London Terminal Manoeuvring Area (LTMA)

Airspace Change Proposal (ACP)
ACP-2020-043
ACP-2020-044
ACP-2020-045

Stage 2 Develop and Assess
Bournemouth Airport Arrivals Connectivity Module

To be read in conjunction with Master Document

NATS

1. Introduction

1.1 About this document

1.1.1 This document describes the arrival connectivity options for Bournemouth Airport, which have been developed using the methodology described in Section 2 of the Master document.

1.1.2 Bournemouth is a single runway airport sited on the south coast approximately 100 miles southwest of London. It handles scheduled flights frequently serving Western Europe and the Mediterranean, with charter and seasonal services serving North Africa, North America and the Caribbean.

2. Baseline

2.1.1 This description of the current airspace around Bournemouth should be considered the 'Do Nothing' option if no airspace change was to take place.

2.1.2 Table 1 shows actual[1] airport traffic counts from the 2019 baseline traffic year to 2022. The NERL forecast for network traffic levels is shown in the Master document Section 3.9. Airport forecasts are independent of the network and will be included within airport ACPs.

Year	Arrivals	Departures	Total Movements
2019	6,382	5,919	**12,301**
2020	4,515	4,345	**8,860**
2021	6,458	6,462	**12,920**
2022	6,146	5,940	**12,086**

Table 1 Actual air traffic movements: Bournemouth Airport 2019-2022

2.1.3 Bournemouth currently shares the same arrival procedures as Southampton, shown in Figure 1 and Table 2. One hold, SAM, provides for delay absorption.

Airport	Hold	STARs	Associated ATS Routes
Bournemouth	SAM	BUGUP 1S, THRED 1S, ELDAX 1S, UMBUR 2S, CPT 1S, COWLY 1S	L8, Y322, Q41, Y110, N20, M8, M40, Q63, Q41

Table 2 Current arrival connectivity for Bournemouth

2.1.4 Bournemouth does not have SIDs but has initial departure routes which join with the ATS route network at designated waypoints[2] (Table 3). These routes may be varied at the discretion of ATC.

Departure to	Via	Route
North or Northwest	Q41/Q63	SAM – Q41 – NORRY SAM – Q41 – TABEN - KENET
Northeast, East or Southeast	GWC	SAM – Y8 - GWC
South	Q41	THRED – Q41 – ORTAC THRED – Z171 - LELNA
West	FIR	N/A

Table 3 Current departure connectivity for Bournemouth

[1] This is based on CFMU actual data for 2019; this may vary from airport data.

[2] Departure routes are all below 7,000ft and will be subject to Airport ACP. NERL will ensure network connectivity.

Figure 1 Current arrival procedures for Bournemouth

2.1.5 Figure 2 shows a radar density plot of Bournemouth arrival traffic for a typical busy summer week and indicates traffic distribution. About 50% arrives from the south and southeast.

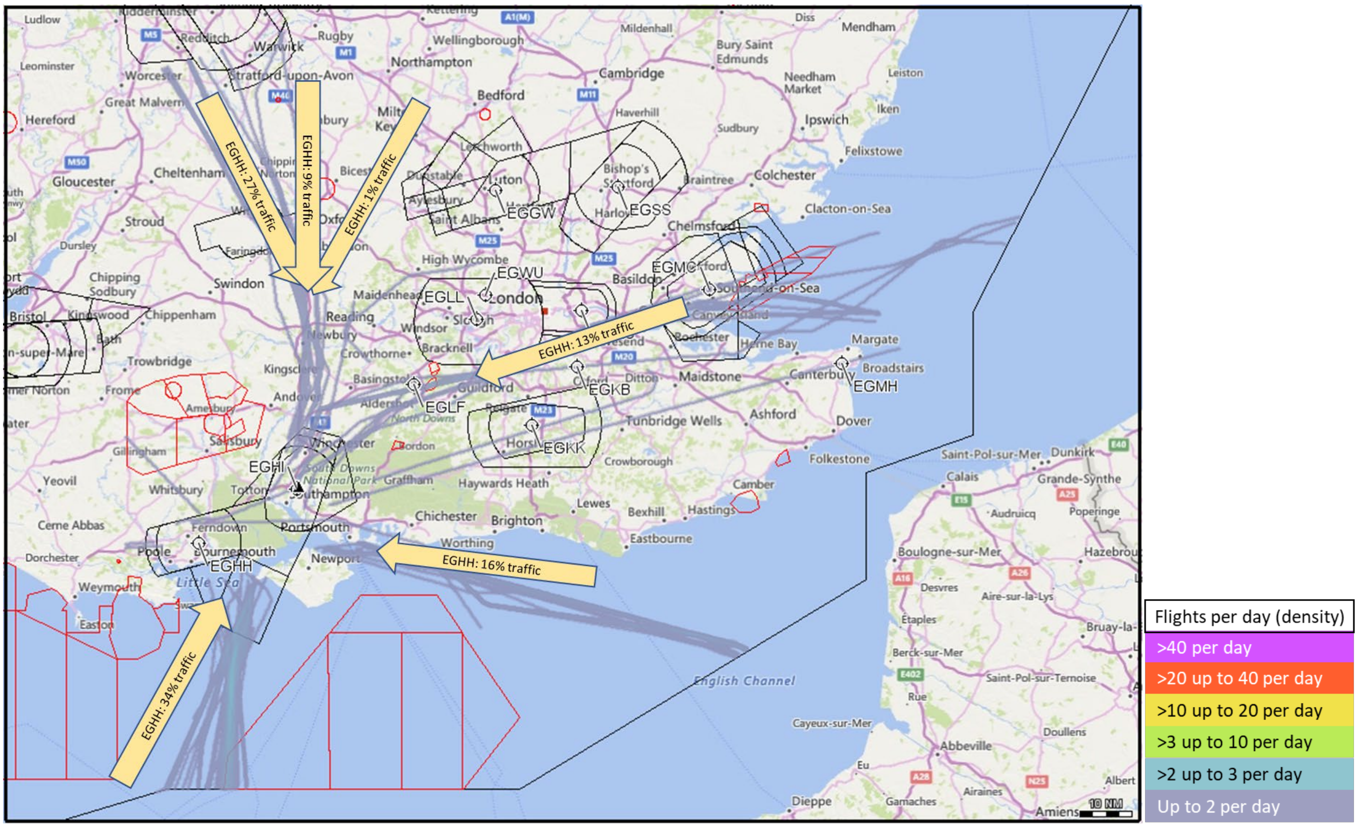


Figure 2 Bournemouth traffic density arrivals FL245-FL70 5-11 August 2019

2.1.6 Medium jets are the most prevalent aircraft type at Bournemouth, as shown in Table 4. Ryanair was the most prevalent operator in 2019, with approximately 28% of the traffic.

Bournemouth – Aircraft Type		
Aircraft Group	Movements	% traffic
Small Jet	2,145	17%
Medium Jet	5,265	43%
Heavy Jet	61	>1%
Turboprop/Piston/Prop	4,823	39%

Bournemouth – Top 4 Aircraft Operator Usage		
Operator	Movements	% traffic
Ryanair	3,416	28%
TUI	1,130	9%
NetJets	254	2%
JetFly	236	2%

Table 4 Aircraft type and top carriers - Bournemouth

3. Design Development

3.1.1 Working with the airport, NERL developed 11 high-level concept options for Bournemouth[3]. NERL has assessed that based on required traffic loading, Bournemouth would require at least one hold, either attached to an RMA or attached to a systemised arrival structure.

3.1.2 Initial viability assessments were produced for location and structure type (Figure 3) and presented to stakeholders in formal engagement (Ref 7). Feedback was requested through the engagement response questionnaire.

Arrival Structure Viability Assessment									
Arrival Structure Type	Location								
	N	NE	E	SE	S	SW	W	NW	OH
Do nothing	✗	✗	✗	✗	✗	✗	✗	✗	✗
Optimised (inner) hold(s)	✗	✓	✓	✓	✓	✗	✗	✓	✓
Hold(s) further out	✗	✗	✗	✗	✗	✗	✗	✗	✗
Point merge	✗	✓	✓	✓	✓	✗	✗	✗	✓
Switch merge	✗	✗	✗	✗	✗	✗	✗	✗	✗
Trombone	✗	✗	✗	✗	✗	✗	✗	✗	✗

✓ Viable Option: taken forward to DPE

✗ Not considered a viable option: eliminated at this point

Figure 3 Engagement Initial Viability Matrix

3.2 Stakeholder engagement

3.2.1 We received 7 responses from 7 different stakeholders related to the Bournemouth design concepts. Table 5 presents a summary of the feedback and how this has influenced the design.

3.2.2 Feedback recognises that Bournemouth is an airport with lower traffic demand compared to others in the LTMA and suggests this should be a consideration in the design development. This feedback has been used to inform the Design Principle Evaluation.

3.2.3 No new options were developed as a result of the stakeholder engagement.

[3] See Master document Section 2.2 for a detailed description of this work.

Stakeholder	Feedback ('You said')	Response ('We did')
Airspace4All	Supports holds at minor airports, with direct routings, to keep track miles minimal.	Feedback was used to inform the evaluation of DP1, DP2, DP3 & DP8 for each airport.
Bournemouth Airport	Agree with the design envelope displayed and look forward to working more closely with NERL and Southampton in the future.	No amendment to design envelope or design options required as a result of this feedback.
British Airways	Considering the number of movements at Bournemouth, this must be deprioritized to facilitate Heathrow and Gatwick efficiencies.	At this stage, no airport will be prioritised over another, as we strive for a balanced network-wide design. Stage 3 work will identify prioritisation needs.
BGA	Traffic demand at Bournemouth is low. Any network supporting structure should be proportionate to this level of traffic.	Feedback was used to inform the evaluation of DP5 & DP6 for each airport.
Gatwick Airport Limited	Most concerned with designs to east and northeast. Provided these minimise interactions with Gatwick's arrival and westerly/south-westerly deps, no issues.	Appropriate deconfliction /colocation of specific routes will be determined at Stage 3.
Ryanair	Acceptance of proposed options. Capacity is the most important consideration.	No amendment to design envelope or design options required as a result of this feedback.
Southampton Airport	Have responded to Bournemouth ACP with specific feedback.	No amendment to design envelope or design options required as a result of this feedback.

Table 5 Engagement feedback and NERL response

3.3 Bournemouth Design Concepts

3.3.1 Table 6 summarises the high-level qualitative considerations for potential locations for Bournemouth arrival structures, and Table 7 summarises the viability assessment for the arrival structures suitable for Bournemouth. These have been developed from SME input and stakeholder engagement.

3.3.2 Not every arrival structure concept may be viable in every location; the Viability Matrix (Figure 5) illustrates the possible combinations.

3.3.3 As described in the Master document paras 2.4.2 & 2.4.3, the concepts Holds Further Out and Trombones were removed as viable concepts at this stage. A detailed description of each structure can be found in Section 5 Appendix 1.

Location		Viability Considerations
North	✗	An arrival structure, and associated connectivity, to the north of the airfield would likely conflict with Salisbury Plain DA Complex.
Northeast	✓	There is sufficient airspace to enable an arrival structure, and associated connectivity, to the northeast of the airfield, subject to deconfliction with Farnborough and Southampton traffic and Salisbury Plain DA Complex.
East	✓	An arrival structure to the east of the airfield is already in place within the current design, albeit shared with another sponsor. A structure in this area remains possible, subject to deconfliction with Farnborough and Southampton traffic.
Southeast	✓	There is sufficient airspace to enable an arrival structure, and associated connectivity, to the southeast of the airfield, subject to deconfliction with Farnborough and Southampton traffic and Portsmouth DA Complex
South	✓	There is sufficient airspace to enable an arrival structure, and associated connectivity, to the south of the airfield, subject to deconfliction with Southampton traffic and Portsmouth and Lulworth & Portland DA Complexes.
Southwest	✗	An arrival structure, and associated connectivity, to the southwest of the airfield would likely conflict with Lulworth & Portland DA Complex.
West	✗	An arrival structure, and associated connectivity, to the west of the airfield would not cause likely conflict with LTMA traffic. However, is inviable due to no Bournemouth traffic flows in this area.
Northwest	✓	There is sufficient airspace to enable an arrival structure, and associated connectivity, to the northwest of the airfield, subject to deconfliction with Salisbury Plain DA Complex.
Overhead	✓	A dedicated arrival structure, and associated connectivity overhead the airfield would likely conflict with Southampton traffic. A shared arrival facility may be possible.

Table 6 Bournemouth Arrivals: Location viability considerations – post engagement

Structure		Viability Considerations
Optimised (inner) holds	✓	Optimisation of current day structures. There is sufficient airspace for optimised hold(s), and this would likely meet the runway throughput demands.
Point Merge	✓	There is sufficient airspace to suitably place a Point Merge. Based on traffic throughput, this may need to be a shared facility.
Switch Merge	✗	There is insufficient airspace to suitably place a Switch Merge.

Table 7 Bournemouth Arrival structures: Viability considerations – post engagement

3.3.4 Figure 4 shows the Bournemouth design envelope, developed by SMEs through collaborative workshops and formal engagement with Bournemouth and other stakeholders. This design envelope is based on the viability considerations presented above in Table 6 & Table 7, developed through two-way engagement as shown in Table 5.

3.3.5 Airspace design constraints, as described in the Master document Section 3.5, are highlighted in orange. Considerations for Bournemouth are the Salisbury Plain, Portsmouth and Lulworth & Portland Danger Areas as shown.

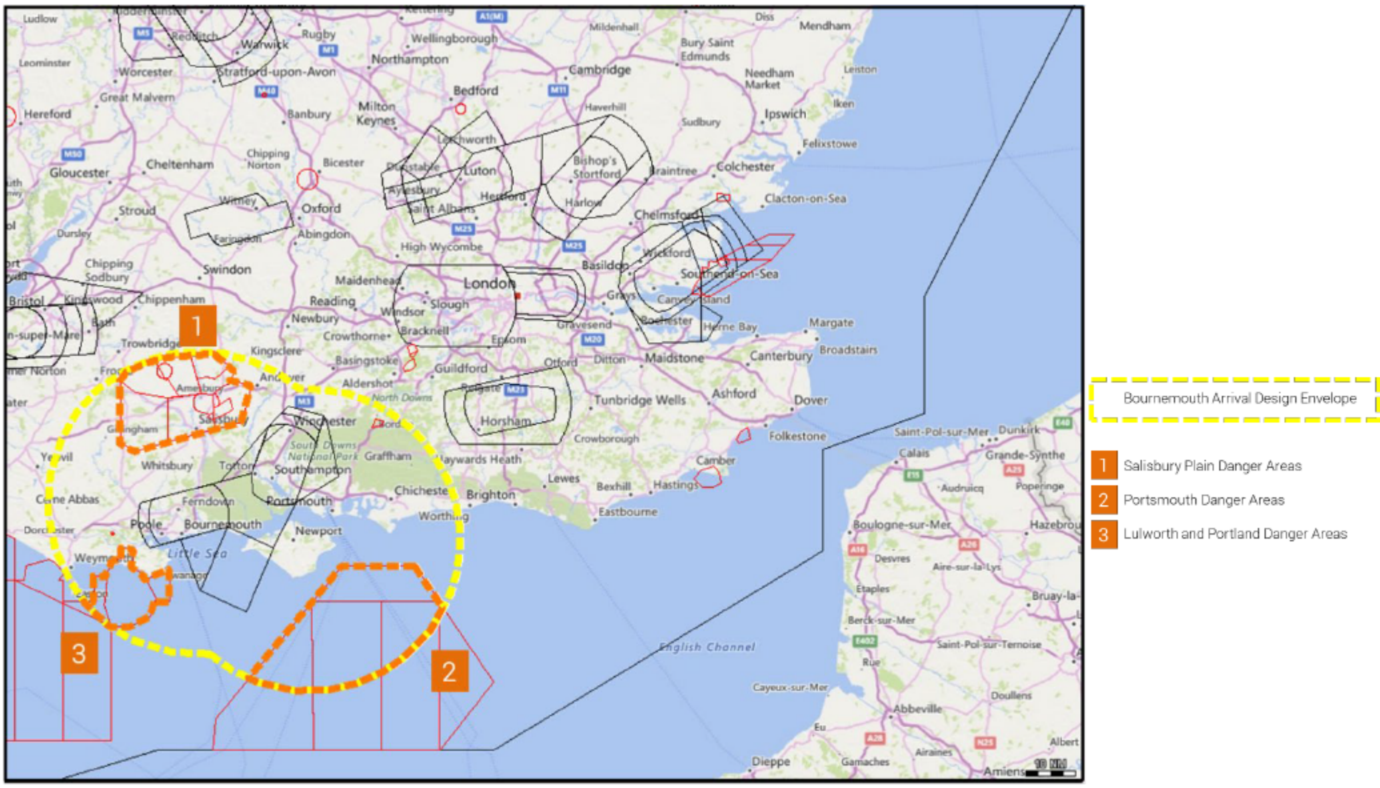


Figure 4 Bournemouth Design Envelope and design constraints – post engagement

3.3.6 The Bournemouth Design Concepts which were considered viable at this stage, within the Design Envelope presented, are shown in the Bournemouth Arrival Structure Viability Assessment (Figure 5).

Arrival Structure Viability Assessment									
Arrival Structure Type	Location								
	N	NE	E	SE	S	SW	W	NW	OH
Do nothing	✗	✗	✗	✗	✗	✗	✗	✗	✗
Optimised (inner) hold(s)	✗	✓	✓	✓	✓	✗	✗	✓	✓
Point merge	✗	✓	✓	✓	✓	✗	✗	✗	✓
Switch merge	✗	✗	✗	✗	✗	✗	✗	✗	✗

✓ Viable Option: taken forward to DPE

✗ Not considered a viable option: eliminated at this point

Figure 5 Bournemouth Design Options Comprehensive Viability Matrix

3.3.7 These 11 viable options were taken forward as the comprehensive list to Design Principle Evaluation, along with 'Do Nothing'.

3.4 Design Principle Evaluation

3.4.1 Table 8 shows the DPE assessment criteria. SMEs, in this case air traffic control experts and airspace change experts, list topics associated with each DP and qualitatively test how each option would react to those topics, describing how a red/amber/green outcome is reached.

DP	Priority	Description	SME subjective assessment topics, include but not limited to	Red	Amber	Green
0	A AMS	**Safety** Safety is always the highest priority (Note: Red could not be solved by mitigation, amber may be able to be solved by mitigation).	Human performance (ATCO control-ability) Human performance (pilot fly-ability) IFP (fly-ability) Surrounding airspace users (inside/outside of CAS) Impact if ATM tools fail	Unacceptable level of safety risk	Diminished - Issue(s) identified could result in an elevated level of safety risk when compared to today's operation	Enhanced - improvement over today's level of safety. Maintained - safety risk could be maintained within acceptable levels of today's operation
1	B AMS	**Operational** The airspace will enable increased operational resilience	<u>Network</u> Weather avoidance Disruption in neighbouring ANSPs	Reduced resilience and capacity during disruption	Similar resilience and capacity during disruption	Increased resilience and capacity during disruption
			<u>Airport</u> Holding levels Delay absorption between hold and 7,000ft	Reduction in delay absorption	Delay absorption similar to today	Improve delay absorption
			<u>Airport</u> Time to restart after runway closure Number of aircraft off the hold	Reduction in disruption recovery	Disruption recovery similar to today	Improve disruption recovery
2	B	**Economic** Optimise network fuel performance	Track mileage Economic performance Aircraft height Method of delay absorption	Fuel performance worsened	Fuel performance similar to today	Fuel performance improved
3	B AMS	**Environmental** Optimise CO_2 emissions per flight	Track mileage GHG performance Aircraft height Method of delay absorption	CO_2 emissions worsened	CO_2 emissions similar to today	CO_2 emissions improved

DP	Priority	Description	SME subjective assessment topics, include but not limited to	Red	Amber	Green
4	C	**Environmental** Minimising of noise impacts due to LAMP influence will take place in accordance with local needs	Overall environmental impact Environmental impact below 7,000ft Impact on tranquillity (or visual intrusion)	LAMP influence not aligned with local ACP sponsors' needs	Extent of alignment not yet known	LAMP influence fully aligned with local ACP sponsors' needs
5	C	**Technical** The volume of controlled airspace required for LAMP should be the minimum necessary to deliver an efficient airspace design, taking into account the needs of the UK airspace users	Lateral footprint of CAS Vertical footprint of CAS Proportional to airport traffic levels	Airspace required not the minimum necessary to deliver an efficient design	Extent of airspace required not yet known	Airspace required the minimum necessary to deliver an efficient design
6	C AMS	**Technical** The impacts on GA and other civilian airspace users due to LAMP will be minimised	Change to boundaries of CAS Changes to CAS classification Safety based impacts	Excessive negative impacts	Negative impacts minimised but requires changes to other airspace users' activities	Negative impacts minimised, no impact, or positive impacts to other airspace users' current activities
7	C AMS	**Technical** The impacts on MoD users due to LAMP will be minimised	Overall amount of danger area available Amount of time for danger area available Flexible use airspace provision Change to access between danger areas Safety based impacts Radar corridor access	Negative impacts not minimised or would require excessive changes to current MoD operations	Negative impacts minimised but requires changes to current MoD operations Or Extent of impact not yet known	Negative impacts minimised or no negative impact on current MoD operations
8	B AMS	**Operational** Systemisation will deliver the optimal capacity and efficiency benefits (Note: This is about airspace capacity, not ground infrastructure capacity which could be the limiting factor to overall airport capacity).	Traffic throughput Sectorisation Effect on overall network capacity Effect on airports' arrival flow	Design option unable to support the forecast traffic loading for the airport and the network	Design option supports the forecast traffic loading for the airport or the network	Design option supports the forecast traffic loading beyond the reference period for both the airport and the network
			Overall ATCO workload Levels of tactical intervention (radio transmissions per flight) No increase to operations requirements Balancing out of hot spots	Design option increases ATCO workload	ATCO workload similar to today	Design option decreases ATCO workload

DP	Priority	Description	SME subjective assessment topics, include but not limited to	Red	Amber	Green
9	B AMS	**Technical** The main route network linking airport procedures with the En Route phase of flight will be spaced to yield maximum safety and efficiency benefits by using an appropriate standard of PBN (Note: The main route network is considered as FL70 - FL245. Approach structures are not considered as 'the main route network').	Airspace requirement vs. RNAV rating Required aircraft equipage standards	PBN standard applied to route spacing would maintain or decrease efficiency and maintain safety	PBN standard applied to route spacing would limit efficiency and safety benefits	PBN standard applied to route spacing is likely to maximise efficiency and safety benefits
10	A	**Policy** Must accord with the CAA's published Airspace Modernisation Strategy (CAP1711) and any current or future plans associated with it.	AMS "Ends" Strategic Objectives Safety (DP0) Integration of diverse users (DP6 and DP7) Simplification (DP1, DP8 and DP9) Environmental sustainability (DP3)	No or limited alignment with the AMS	Partial alignment with the AMS	Aligned with the AMS

Table 8 Design Principle Evaluation Assessment Criteria

3.4.2 Table 9 shows the AMS assessment criteria which are used to determine the overall RAG status for DP10.

DP10 outcome	Criteria for DP0, DP1, DP3, DP6, DP7, DP8 and DP9
Red	DP0 (Safety) is red OR 2 other DPs are red
Amber	All other colour combinations not covered by Red or Green
Green	2 DPs are green and 0 are red OR 3 DPs are green and 1 is red

Table 9 - AMS Assessment Criteria

3.4.3 The criteria in Table 10 describe how each option's overall combination of reds/ambers/greens lead to the option progressing to the next step or to rejection and discounting from further development.

DP Priority	Criteria for Rejection Status
A	1 red OR 1 amber
B	2 reds
C	2 reds

Table 10 - Accept / Reject Criteria

3.4.4 Each design option has been assessed against the Design Principles. The following code is used for each design option. Airport (e.g. HH) - Structure Type (e.g. Inner Hold: IH/Point Merge: PM) - Location (e.g. Northeast: NE). DN = Do Nothing. DM = Do Minimum.

DP	Priority	HH - DN (Shared)	HH - IH – NE (Maybe shared)	HH - IH - E (DM) (Maybe shared)
RESULT		REJECT	ACCEPT	ACCEPT
DP0 Safety	A AMS	Maintained: Similar operation to today	Maintained: Holds are used in current day operations and are known to be safe	Maintained: Holds are used in current day operations and are known to be safe
DP1 Operational (Delay Absorption)	B AMS	Today's operation, no change from baseline	Optimised concept of current day operation, which provides similar delay absorption	Optimised concept of current day operation, which provides similar delay absorption
DP1 Operational (Disruption Recovery)	B AMS	Today's operation, no change from baseline	Optimised concept of current day operation, which provides improved disruption recovery	Optimised concept of current day operation, which provides improved disruption recovery
DP2 Economic (Fuel)	B	Today's operation, no change from baseline	Optimised concept aligned with airport traffic flows, therefore improved fuel performance	Optimised concept, partially aligned with airport traffic flows, therefore fuel performance neutral
DP3 Environmental (CO_2)	B AMS	Today's operation, no change from baseline	Optimised concept of current day operation aligned with airport traffic flows, therefore CO_2 emissions per flight improved	Optimised concept, partially aligned with airport traffic flows, therefore CO_2 emissions neutral
DP4 Environmental (Noise)	C	Today's operation, no change from baseline	Impact on routes (and noise distribution) below 7,000ft not known at this point	Impact on routes (and noise distribution) below 7,000ft not known at this point
DP5 Technical (CAS)	C	Today's operation, no change from baseline	A design to the NE may require additional CAS, depending on location. Therefore, extent not yet known	A design to the east may require additional CAS, depending on location. Therefore, extent not yet known
DP6 Technical (Other Users)	C AMS	Today's operation, no change from baseline	Potential additional CAS may require changes to other airspace users' activities	Potential additional CAS may require changes to other airspace users' activities
DP7 Technical (MoD)	C AMS	Operation is known not to impact MoD currently, therefore no change in impact	Assumes design would not impact Salisbury Plain DA Complex. Therefore, no negative impact on current MoD operations	No military-use areas in the vicinity, therefore, would not require a change to MoD operations
DP8 Operational (Capacity)	B AMS	Aligns with network traffic flows but does not support forecast network loading. Can support the airport required arrival loading	Aligns with network traffic flows and concept can support the airport required arrival loading	Aligns with network traffic flows and concept can support the airport required arrival loading
DP8 Operational (Efficiency)	B AMS	Today's operation, no change in ATCO workload anticipated	Assumes CAS is agreed if required, therefore workload similar as today	Similar concept to today's operation, therefore no change in ATCO workload anticipated
DP9 Technical (Route Spacing)	B AMS	Does not fully utilise the performance capabilities of modern aircraft	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes
DP10 Policy (AMS)	A	Green: DP0, DP7 Amber: DP1, DP1, DP3, DP6, DP8, DP8 Red: DP9	Green: DP0, DP1, DP3, DP7, DP8, DP9 Amber: DP1, DP6, DP8 Red: None	Green: DP0, DP1, DP7, DP8, DP9 Amber: DP1, DP3, DP6, DP8 Red: None

DP	Priority	HH - IH - SE (Maybe shared)	HH - IH – S (Maybe shared)	HH - IH – NW (Maybe shared)
RESULT		ACCEPT	ACCEPT	REJECT
DP0 Safety	A AMS	Maintained: Holds are used in current day operations and are known to be safe	Maintained: Holds are used in current day operations and are known to be safe	Maintained: Holds are used in current day operations and are known to be safe
DP1 Operational (Delay Absorption)	B AMS	Optimised concept of current day operation, which provides similar delay absorption	Optimised concept of current day operation, which provides similar delay absorption	Optimised concept of current day operation, which provides similar delay absorption
DP1 Operational (Disruption Recovery)	B AMS	Optimised concept of current day operation, which provides improved disruption recovery	Optimised concept of current day operation, which provides improved disruption recovery	Optimised concept of current day operation, which provides improved disruption recovery
DP2 Economic (Fuel)	B	Optimised concept, partially aligned with airport traffic flows, therefore fuel performance neutral	Optimised concept, partially aligned with airport traffic flows, therefore fuel performance neutral	Does not align with airport traffic flows. Fuel performance worsened
DP3 Environmental (CO_2)	B AMS	Optimised concept, partially aligned with airport traffic flows, therefore CO_2 emissions neutral	Optimised concept, partially aligned with airport traffic flows, therefore CO_2 emissions neutral	Does not align with airport traffic flows. CO_2 emissions per flight worsened
DP4 Environmental (Noise)	C	Impact on routes (and noise distribution) below 7,000ft not known at this point	Impact on routes (and noise distribution) below 7,000ft not known at this point	Impact on routes (and noise distribution) below 7,000ft not known at this point
DP5 Technical (CAS)	C	A design to the SE may require additional CAS, depending on location. Therefore, extent not yet known	A design to the south may require additional CAS, depending on location. Therefore, extent not yet known	Design would require more CAS than would be needed for alternative orientations
DP6 Technical (Other Users)	C AMS	Potential additional CAS may require changes to other airspace users' activities	Potential additional CAS may require changes to other airspace users' activities	Additional CAS required, anticipated negative impact
DP7 Technical (MoD)	C AMS	Assumes design would not impact Portsmouth and Lulworth & Portland DA Complexes. Therefore, no negative impact on current MoD operations	Assumes design would not impact Portsmouth and Lulworth & Portland DA Complexes. Therefore, no negative impact on current MoD operations	Assumes design would not impact Salisbury Plain DA Complex. Therefore, no negative impact on current MoD operations
DP8 Operational (Capacity)	B AMS	Aligns with network traffic flows and concept can support the airport required arrival loading	Aligns with network traffic flows and concept can support the airport required arrival loading	Aligns with network traffic flows and concept can support the airport required arrival loading
DP8 Operational (Efficiency)	B AMS	Similar concept to today's operation, therefore no change in ATCO workload anticipated	Assumes CAS is agreed if required, therefore workload similar as today	Assumes CAS is agreed if required. Increased workload due to bigger operating range and airspace volume
DP9 Technical (Route Spacing)	B AMS	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes
DP10 Policy (AMS)	A	Green: DP0, DP1, DP7, DP8, DP9 Amber: DP1, DP3, DP6, DP8 Red: None	Green: DP0, DP1, DP7, DP8, DP9 Amber: DP1, DP3, DP6, DP8 Red: None	Green: DP0, DP1, DP7, DP8, DP9 Amber: DP1 Red: DP3, DP6, DP8

DP	Priority	HH - IH - OH (Maybe shared)	HH - PM - NE (Maybe shared)	HH - PM - E (Maybe shared)
RESULT		REJECT	REJECT	REJECT
DP0 Safety	A AMS	Maintained: Holds are used in current day operations and are known to be safe	Diminished: A structure of that size in this location would increase complexity for other traffic which could reduce safety	Diminished: A structure of that size in this location would increase complexity for other traffic which could reduce safety
DP1 Operational (Delay Absorption)	B AMS	Optimised concept of current day operation, which provides similar delay absorption	Similar holding capacity as today, plus delay absorption by flying the PM. Overall delay absorption similar to today	Similar holding capacity as today, plus delay absorption by flying the PM. Overall delay absorption similar to today
DP1 Operational (Disruption Recovery)	B AMS	Optimised concept of current day operation, which provides improved disruption recovery	Assumed contingency hold within the transition, net disruption recovery similar to today	Assumed contingency hold within the transition, net disruption recovery similar to today
DP2 Economic (Fuel)	B	Fuel performance worsened as aircraft route overhead then track away to lose height on descent, increasing track miles	Extended track miles to complete the PM structure. Aligns with airport traffic flows. Net neutral	Worsened due to extended track miles to complete the PM structure. Partially aligns with airport traffic flows. Net worsened
DP3 Environmental (CO_2)	B AMS	CO_2 emissions worsened as aircraft route overhead then track away to lose height on descent, increasing track miles	Extended track miles to complete the PM structure. Aligns with airport traffic flows. Net neutral	Worsened due to extended track miles to complete the PM structure. Partially aligns with airport traffic flows. Net worsened
DP4 Environmental (Noise)	C	Impact on routes (and noise distribution) below 7,000ft not known at this point	Impact on routes (and noise distribution) below 7,000ft not known at this point	Impact on routes (and noise distribution) below 7,000ft not known at this point
DP5 Technical (CAS)	C	A design in the overhead may require additional CAS, depending on location. Therefore, extent not yet known	A design to the NE may require additional CAS, depending on location. Therefore, extent not yet known	A design to the east may require additional CAS, depending on location. Therefore, extent not yet known
DP6 Technical (Other Users)	C AMS	Potential additional CAS may require changes to other airspace users' activities	Potential additional CAS may require changes to other airspace users' activities	Potential additional CAS may require changes to other airspace users' activities
DP7 Technical (MoD)	C AMS	No military-use areas in the vicinity, therefore, would not require a change to MoD operations	Assumes design would not impact Salisbury Plain DA Complex. Therefore, no negative impact on current MoD operations	No military-use areas in the vicinity, therefore, would not require a change to MoD operations
DP8 Operational (Capacity)	B AMS	Aligns with network traffic flows and concept can support the airport required arrival loading	Supports the required airport arrival loading, however, negatively impacts capacity of south and westbound network traffic flows	Supports the required airport arrival loading, however, negatively impacts capacity of south and westbound network traffic flows
DP8 Operational (Efficiency)	B AMS	Assumes CAS is agreed if required, therefore workload similar as today	Assume CAS is agreed, if required. PM structure used minimally (due to traffic volume). ATCO workload similar	Assume CAS is agreed, if required. PM structure used minimally (due to traffic volume). ATCO workload similar
DP9 Technical (Route Spacing)	B AMS	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes
DP10 Policy (AMS)	A	Green: DP0, DP1, DP7, DP8, DP9 Amber: DP1, DP6, DP8 Red: DP3	Green: DP7, DP9 Amber: DP0, DP1, DP1, DP3, DP6, DP8, DP8 Red: None	Green: DP7, DP9 Amber: DP0, DP1, DP1, DP6, DP8, DP8 Red: DP3

DP	Priority	HH - PM - SE (Maybe shared)	HH - PM - S (Maybe shared)	HH - PM - OH (Maybe shared)
RESULT		REJECT	REJECT	REJECT
DP0 Safety	A AMS	Diminished: A structure of that size in this location would increase complexity for other traffic which could reduce safety	Diminished: A structure of that size in this location would increase complexity for other traffic which could reduce safety	Diminished: A structure of that size in this location would increase complexity for other traffic which could reduce safety
DP1 Operational (Delay Absorption)	B AMS	Similar holding capacity as today, plus delay absorption by flying the PM. Overall delay absorption similar to today	Similar holding capacity as today, plus delay absorption by flying the PM. Overall delay absorption similar to today	Similar holding capacity as today, plus delay absorption by flying the PM. Overall delay absorption similar to today
DP1 Operational (Disruption Recovery)	B AMS	Assumed contingency hold within the transition, net disruption recovery similar to today	Assumed contingency hold within the transition, net disruption recovery similar to today	Assumed contingency hold within the transition, net disruption recovery similar to today
DP2 Economic (Fuel)	B	Worsened due to extended track miles to complete the PM structure. Partially aligns with airport traffic flows. Net worsened	Worsened due to extended track miles to complete the PM structure. Partially aligns with airport traffic flows. Net worsened	Worsened due to track miles to complete the PM and route to overhead then away. Net worsened
DP3 Environmental (CO_2)	B AMS	Worsened due to extended track miles to complete the PM structure. Partially aligns with airport traffic flows. Net worsened	Worsened due to extended track miles to complete the PM structure. Partially aligns with airport traffic flows. Net worsened	Worsened due to track miles to complete the PM and route to overhead then away. Net worsened
DP4 Environmental (Noise)	C	Impact on routes (and noise distribution) below 7,000ft not known at this point	Impact on routes (and noise distribution) below 7,000ft not known at this point	Impact on routes (and noise distribution) below 7,000ft not known at this point
DP5 Technical (CAS)	C	A design to the southeast may require additional CAS, depending on location. Therefore, extent not yet known	Design would require more CAS than would be needed for alternative orientations	Design would require more CAS than would be needed for alternative orientations
DP6 Technical (Other Users)	C AMS	Potential additional CAS may require changes to other airspace users' activities	Additional CAS required, anticipated negative impact	Additional CAS required, anticipated negative impact
DP7 Technical (MoD)	C AMS	Assumes design would not impact Portsmouth DA Complex. Therefore, no negative impact on current MoD operations	Assumes design would not impact Lulworth and Portland DA Complex. Therefore, no negative impact on current MoD operations	No military-use areas in the vicinity, therefore, would not require a change to MoD operations
DP8 Operational (Capacity)	B AMS	Supports the required airport arrival loading, however, negatively impacts capacity of southbound network traffic flows	Aligns with network traffic flows and concept can support the airport required arrival loading	Aligns with network traffic flows and concept can support the airport required arrival loading
DP8 Operational (Efficiency)	B AMS	Assume CAS is agreed, if required. PM structure used minimally (due to traffic volume). ATCO workload similar	Assume CAS is agreed, if required. PM structure used minimally (due to traffic volume). ATCO workload similar	Assume CAS is agreed, if required. PM structure used minimally (due to traffic volume). ATCO workload similar
DP9 Technical (Route Spacing)	B AMS	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes	Structure will be designed, in collaboration with the airport, to the highest appropriate PBN standard enabling efficient spacing between routes
DP10 Policy (AMS)	A	Green: DP7, DP9 Amber: DP0, DP1, DP1, DP6, DP8, DP8 Red: DP3	Green: DP7, DP8, DP9 Amber: DP0, DP1, DP1, DP8 Red: DP3, DP6	Green: DP7, DP8, DP9 Amber: DP0, DP1, DP1, DP8 Red: DP3, DP6

Table 11 Design Principle Evaluation

3.4.5 'Do Nothing' and a further 7 design options were assessed as not meeting the DPs and were rejected at this stage. The remaining 4 viable option concepts progress to Step 2B Options Appraisal.

3.5 Initial Options Appraisal

3.5.1 The following viable options have been progressed to IOA:

Bournemouth Design Options progressed to IOA
Inner Holds - Northeast (Maybe shared)
Inner Holds – East (DM) (Maybe shared)
Inner Holds – Southeast (Maybe shared)
Inner Holds – South (Maybe shared)

Table 12 Summary of design options progressed from DPE to IOA

Table 13 shows the assessment criteria used to complete the initial appraisal of each shortlisted option.

Group	Impact
Communities	Noise impact on health and quality of life
A qualitative assessment of changes to noise impacts compared with the 'Do Nothing' baseline. A qualitative assessment of changes to tranquillity impacts compared with the 'Do Nothing' baseline.	
Communities	Air Quality
A qualitative assessment of changes to local air quality compared with the 'Do Nothing' baseline.	
Wider Society	Greenhouse Gas Impacts
A qualitative assessment of changes to greenhouse gas impacts compared with the 'Do Nothing' baseline.	
Wider Society	Capacity / Resilience
A qualitative assessment of changes to airspace capacity and resilience compared with the 'Do Nothing' baseline.	
General Aviation (GA)	Access
A qualitative assessment of changes to GA access compared with the 'Do Nothing' baseline.	
GA/Commercial Airlines	Economic Impact from Increased Effective Capacity
A qualitative assessment of changes to GA and commercial operator economic impacts from increased effective capacity compared with the 'Do Nothing' baseline.	
GA/Commercial Airlines	Fuel Burn
A qualitative assessment of changes to GA and commercial operator fuel burn impacts compared with the 'Do Nothing' baseline.	
Commercial Airlines	Training Costs
A qualitative assessment of changes to commercial operator training costs compared with the 'Do Nothing' baseline.	
Commercial Airlines	Other Costs
A qualitative assessment of changes to other relevant commercial operator costs compared with the 'Do Nothing' baseline.	
Airport / ANSP	Infrastructure Costs
A qualitative assessment of changes to airport and ANSP infrastructure costs compared with the 'Do Nothing' baseline.	
Airport / ANSP	Operational Costs
A qualitative assessment of changes to airport and ANSP operational costs compared with the 'Do Nothing' baseline.	
Airport / ANSP	Deployment Costs
A qualitative assessment of changes to airport and ANSP deployment costs compared with the 'Do Nothing' baseline.	
All	Performance against the vision and parameters/strategic objectives of the AMS
A qualitative assessment of how the design option performs, considering the AMS objectives of improved capacity, reduced CO_2, minimal impact on other users, maintaining or enhancing safety, and facilitation of defence and security objectives, compared with the 'Do Nothing' baseline.	

Table 13 Initial Options Appraisal Assessment Criteria

3.5.2 The baseline 'Do Nothing' is described in Section 2. It did not progress through the DPE however, in line with CAP1616, it must be included in the IOA for comparison purposes. Each option is described in Section 3.3 and Section 5 Appendix 1.

HH – DN Qualitative Initial Impacts Assessment	REJECTED
Group	**Impact**
Communities	Noise impact on health and quality of life
ANG (2017) states "at or above 7,000ft…minimising of noise is no longer a priority". CAP1616 instructs sponsors to consider noise and tranquillity impacts where the proposal has the potential to change overflight of inhabited areas, AONBs and NPs below 7,000ft.. No change in airspace design – no changes to impacts.	
Communities	Air Quality
ANG (2017) states "emissions from aircraft above 1,000ft are unlikely to have a significant impact on local air quality". No change in airspace design – no changes to impacts.	
Wider Society	Greenhouse Gas Impacts
In the short term, there would be no change. In the long term, failure to modernise the airspace would have a negative impact on GHG emissions due to increased likelihood of delays/holding in an unchanged design as traffic is forecast to increase.	
Wider Society	Capacity / Resilience
In the short term, there would be no change. In the long term, failure to modernise the airspace would have a negative impact on capacity and resilience due to increased likelihood of delays/holding in an unchanged design as traffic is forecast to increase.	
General Aviation (GA)	Access
In the short term, there would be no change in impact. In the long term, failure to modernise the airspace would lead to increased likelihood of commercial aircraft delays and holding in an unchanged design as traffic is forecast to increase. This may lead to negative impacts on GA access due to the busier airspace, however as GA access is currently relatively infrequent at network levels, this may not be a major impact.	
GA/Commercial Airlines	Economic Impact from Increased Effective Capacity
In the short term, there would be no change in impact. In the long term, failure to modernise the airspace would have a negative impact on capacity due to increased likelihood of delays/holding in an unchanged design as traffic is forecast to increase. This would lead to a negative economic impact.	
GA/Commercial Airlines	Fuel Burn
In the short term, there would be no change in impact. In the long term, failure to modernise the airspace would have a negative impact on fuel burn due to increased likelihood of delays/holding in an unchanged design as traffic is forecast to increase.	
Commercial Airlines	Training Costs
Flight procedures change worldwide with each AIRAC cycle and operators would update their procedures accordingly, training staff if required. If this baseline system was retained, the same flight procedures would be used, and training cost impacts would not change.	
Commercial Airlines	Other Costs
No change in airspace design – no changes to other commercial operator costs.	
Airport / ANSP	Infrastructure Costs
No change in airspace design – no changes to infrastructure costs. If this baseline system was retained, the same infrastructure would continue to be used in the same way, with no additional costs.	
Airport / ANSP	Operational Costs
No change in airspace design – no changes to infrastructure costs. If this baseline system was retained, the same infrastructure would continue to be used in the same way, with no additional operational costs.	
Airport / ANSP	Deployment Costs
If this baseline system was retained, there would be no deployment, hence no associated costs.	
AMS	Performance against the vision and parameters/strategic objectives of the AMS
• Safety: maintained • Simplification: worsens delay absorption, disruption recovery, airport capacity, network capacity and ATCO workload. Does not utilise aircraft performance capabilities • Integration of diverse users: continues to integrate defence and security and GA • Environmental sustainability: worsens CO_2 emissions	
Qualitative Safety Assessment	
A high-level safety appraisal for this proposed option indicates that if the baseline system was retained, the existing level of safety performance undertaken within the current operation would be at least maintained. However, if there was no change to the current operation the potential increase in traffic as forecast could begin to constrain capacity, which in turn, could increase controller workload and traffic complexity within the LTMA leading to potential safety issues in the future. In order to mitigate any reduction in safety margins it is likely that increased flow management measures would be required, resulting in additional delay.	
Conclusion from IOA	
This option was rejected during the DPE stage. It has been included for comparison purposes only.	

Table 14 HH-DN Initial Options Appraisal

HH - IH – NE (Maybe shared) Qualitative Initial Impacts Assessment	PROGRESSED
Group	**Impact**
Communities	Noise impact on health and quality of life
ANG (2017) states "at or above 7,000ft…minimising of noise is no longer a priority". CAP1616 instructs sponsors to consider noise and tranquillity impacts where the proposal has the potential to change overflight of inhabited areas, AONBs and NPs below 7,000ft. In this network-level proposal, changes would not occur below 7,000ft therefore these impacts are not considered.	
Communities	Air Quality
ANG (2017) states "emissions from aircraft above 1,000 ft are unlikely to have a significant impact on local air quality". Changes would occur at or above 7,000ft, thus in accordance with ANG (2017) there would be no change in local air quality impacts.	
Wider Society	Greenhouse Gas Impacts
As either an independent or shared facility, this design option is an optimised version of today which may reposition the current contingency hold to better align with the traffic flows. This location aligns with airport traffic flows. Overall, could reduce GHG emissions through improved aircraft trajectories compared with the baseline.	
Wider Society	Capacity / Resilience
Capacity: If this is an independent facility, as traffic levels increase, this capacity improvement could reduce the frequency of delays/holding compared with the baseline. This location aligns with network traffic flows. Overall, this option could enable airport capacity and maintain network capacity compared with the baseline. Other non-airspace constraints may hinder overall capacity gains at Bournemouth. If a shared facility, there would be no change to airport capacity compared with the baseline. Resilience: If an independent facility, disruption recovery could be improved, if a shared facility this option could maintain disruption recovery resulting from unplanned runway closure. As either an independent or shared facility, this option would also maintain a similar number of holding levels, therefore it could maintain delay absorption compared with the baseline.	
General Aviation (GA)	Access
As either an independent or shared facility, a holding facility to the northeast may require additional CAS, the extent is not yet known. As a result, the access impact on GA traffic may be worse compared with the baseline.	
GA/Commercial Airlines	Economic Impact from Increased Effective Capacity
As either an independent or shared facility, this option aligns with network traffic flows, which enables capacity gains across the LTMA from an improved network design. This could positively impact all LTMA traffic – commercial and GA. A shared facility would be similar compared with the baseline. An independent facility could enable airport capacity which could result in an economic benefit over the baseline for commercial traffic. However, other non-airspace constraints may hinder capacity and economic gains at Bournemouth. An independent facility could create network inefficiencies over the current baseline (shared facility). This is due to the extended track distance or inefficient profiles required by the network traffic, to deconflict from the additional arrival structure, resulting in increased fuel burn. This could have a negative economic impact on other LTMA traffic – commercial and GA.	
GA/Commercial Airlines	Fuel Burn
As either an independent or shared facility, this design option is an optimised version of today which may reposition the current contingency hold to align with the runway. This location aligns with airport traffic flows. These could reduce fuel burn for each airport arrival flight compared with the baseline for commercial traffic. An independent facility could create network inefficiencies over the current baseline (shared facility). This is due to the extended track distance or inefficient profiles required by the network traffic, to deconflict from the additional arrival structure, resulting in increased fuel burn. This could have a negative impact on all LTMA traffic – commercial and GA.	
Commercial Airlines	Training Costs
Flight procedures change worldwide with each AIRAC cycle and operators would update their procedures accordingly, training staff if required. This option, either shared or independent, is not anticipated to impose additional training cost impacts for operators.	
Commercial Airlines	Other Costs
No other operator costs are foreseen, as either an independent or shared facility.	
Airport / ANSP	Infrastructure Costs
This design option, either shared or independent, is not expected to change airport or ANSP infrastructure impacts, beyond the initial deployment phase which will require some systems engineering adaptations.	
Airport / ANSP	Operational Costs
This design option, either shared or independent, is not expected to change airport or ANSP operational cost impacts.	
Airport / ANSP	Deployment Costs
At this stage it is disproportionate to attempt to quantify deployment costs per design option, either an independent or shared. However, a large LTMA system change would involve training a large number of controllers and assistants via the use of various air traffic simulators (including sim prep, management, and staffing), with additional system engineering costs.	

AMS	Performance against the vision and parameters/strategic objectives of the AMS
AMS Assessment – Independent Option • Safety: maintained • Simplification: could improve disruption recovery and enables airport capacity, maintain delay absorption, maintain network capacity and maintain ATCO workload. Will utilise aircraft performance capabilities • Integration of diverse users: continues to integrate defence and security and GA, subject to constraints of the design • Environmental sustainability: could reduce CO_2 emissions. Could result in network inefficiencies AMS Assessment – Shared Option • Safety: maintained • Simplification: could maintain disruption recovery, delay absorption, airport capacity, network capacity, and ATCO workload. Will utilise aircraft performance capabilities • Integration of diverse users: continues to integrate defence and security and GA, subject to constraints of the design • Environmental sustainability: could reduce CO_2 emissions	
Qualitative Safety Assessment	
A high-level safety appraisal for this proposed option indicates that an Inner Hold to the northeast would at least maintain current safety performance. There are multiple holds within current UK airspace which have a proven safety performance. An arrival structure in this location would need to deconflict with Farnborough departures and all Southampton traffic.	
Conclusion from IOA	
Compared to the baseline, an independent facility could improve disruption recovery, fuel burn, CO_2 emissions, and enable airport capacity. If a shared facility, it could maintain disruption recovery and airport capacity. As either an independent or shared facility, it would maintain safety and MoD access; it could maintain delay absorption, network capacity, and ATCO workload. For either facility, depending on the location, there may be a requirement for additional CAS, which could negatively impact other users. **Therefore, HH – IH – NE (Maybe shared) is progressed to Stage 3 for further development.**	

Table 15 HH-IH-NE (Maybe shared) Initial Options Appraisal

HH - IH – E (DM) (Maybe shared) Qualitative Initial Impacts Assessment		PROGRESSED
Group	**Impact**	
Communities	Noise impact on health and quality of life	
ANG (2017) states "at or above 7,000ft…minimising of noise is no longer a priority". CAP1616 instructs sponsors to consider noise and tranquillity impacts where the proposal has the potential to change overflight of inhabited areas, AONBs and NPs below 7,000ft. In this network-level proposal, changes would not occur below 7,000ft therefore these impacts are not considered.		
Communities	Air Quality	
ANG (2017) states "emissions from aircraft above 1,000 ft are unlikely to have a significant impact on local air quality". Changes would occur at or above 7,000ft, thus in accordance with ANG (2017) there would be no change in local air quality impacts.		
Wider Society	Greenhouse Gas Impacts	
As either an independent or shared facility, an optimised version of today which may reposition the current hold to better align with the traffic flows. However, this location only partially aligns with airport traffic flows. Overall, it could maintain GHG emissions compared with the baseline.		
Wider Society	Capacity / Resilience	
Capacity: If this is an independent facility, as traffic levels increase, this capacity improvement could reduce the frequency of delays/holding compared with the baseline. This location aligns with network traffic flows. Overall, this option could enable airport capacity and maintain network capacity compared with the baseline. Other non-airspace constraints may hinder overall capacity gains at Bournemouth. If a shared facility, there would be no change to airport capacity compared with the baseline. Resilience: If an independent facility, disruption recovery could be improved, if a shared facility this option could maintain disruption recovery resulting from unplanned runway closure. As either an independent or shared facility, this option would also maintain a similar number of holding levels, therefore it could maintain delay absorption compared with the baseline.		
General Aviation (GA)	Access	
As either an independent or shared facility, a holding facility to the east may require additional CAS, the extent is not yet known. As a result, the access impact on GA traffic may be worse compared with the baseline.		
GA/Commercial Airlines	Economic Impact from Increased Effective Capacity	
As either an independent or shared facility, this option aligns with network traffic flows, which enables capacity gains across the LTMA from an improved network design. This could positively impact all LTMA traffic – commercial and GA. A shared facility would be similar compared with the baseline. An independent facility could enable airport capacity which could result in an economic benefit over the baseline for commercial traffic. However, other non-airspace constraints may hinder capacity and economic gains at Bournemouth. An independent facility could create network inefficiencies over the current baseline (shared facility). This is due to the extended track distance or inefficient profiles required by the network traffic, to deconflict from the additional arrival structure, resulting in increased fuel burn. This could have a negative economic impact on other LTMA traffic – commercial and GA.		
GA/Commercial Airlines	Fuel Burn	
As either an independent or shared facility, an optimised version of today which may reposition the current hold to better align with the traffic flows. However, this location only partially aligns with airport traffic flows. This could maintain fuel burn for each airport arrival flight compared with the baseline for commercial traffic. An independent facility could create network inefficiencies over the current baseline (shared facility). This is due to the extended track distance or inefficient profiles required by the network traffic, to deconflict from the additional arrival structure, resulting in increased fuel burn. This could have a negative impact on all LTMA traffic – commercial and GA.		
Commercial Airlines	Training Costs	
Flight procedures change worldwide with each AIRAC cycle and operators would update their procedures accordingly, training staff if required. This option, either shared or independent, is not anticipated to impose additional training cost impacts for operators.		
Commercial Airlines	Other Costs	
No other operator costs are foreseen, as either an independent or shared facility.		
Airport / ANSP	Infrastructure Costs	
This design option, either shared or independent, is not expected to change airport or ANSP infrastructure impacts, beyond the initial deployment phase which will require some systems engineering adaptations.		
Airport / ANSP	Operational Costs	
This design option, either shared or independent, is not expected to change airport or ANSP operational cost impacts.		
Airport / ANSP	Deployment Costs	
At this stage it is disproportionate to attempt to quantify deployment costs per design option, either an independent or shared. However, a large LTMA system change would involve training a large number of controllers and assistants via the use of various air traffic simulators (including sim prep, management, and staffing), with additional system engineering costs.		

AMS	Performance against the vision and parameters/strategic objectives of the AMS
AMS Assessment – Independent Option • Safety: maintained • Simplification: could improve disruption recovery and enables airport capacity, maintain delay absorption, maintain network capacity and maintain ATCO workload. Will utilise aircraft performance capabilities • Integration of diverse users: continues to integrate defence and security and GA, subject to constraints of the design • Environmental sustainability: could maintain CO_2 emissions, could result in network inefficiencies AMS Assessment – Shared Option • Safety: maintained • Simplification: could maintain airport capacity, network capacity, disruption recovery, delay absorption and ATCO workload. Will utilise aircraft performance capabilities • Integration of diverse users: continues to integrate defence and security and GA, subject to constraints of the design • Environmental sustainability: could maintain CO_2 emissions	
Qualitative Safety Assessment	
A high-level safety appraisal for this proposed option indicates that an Inner Hold to the east would at least maintain current safety performance. There are multiple holds within current UK airspace which have a proven safety performance. An arrival structure in this location would need to deconflict with other with Farnborough arrivals and all Southampton traffic.	
Conclusion from IOA	
Compared to the baseline, an independent facility could improve disruption recovery and enable airport capacity. A shared facility could maintain airport capacity and disruption recovery compared with the baseline. As either an independent or shared facility, it would maintain safety and any current MoD access; it could maintain delay absorption, fuel burn, CO_2 emissions, network capacity, and ATCO workload. Depending on the location, there may be a requirement for additional CAS, which could negatively impact other users. **Therefore, HH – IH – E (DM) (Maybe shared) is progressed to Stage 3 for further development.**	

Table 16 HH-IH-E (DM) (Maybe shared) Initial Options Appraisal

HH - IH – SE (Maybe shared) Qualitative Initial Impacts Assessment	PROGRESSED
Group	**Impact**
Communities	Noise impact on health and quality of life
ANG (2017) states "at or above 7,000ft…minimising of noise is no longer a priority". CAP1616 instructs sponsors to consider noise and tranquillity impacts where the proposal has the potential to change overflight of inhabited areas, AONBs and NPs below 7,000ft. In this network-level proposal, changes would not occur below 7,000ft therefore these impacts are not considered.	
Communities	Air Quality
ANG (2017) states "emissions from aircraft above 1,000ft are unlikely to have a significant impact on local air quality". Changes would occur at or above 7,000ft, thus in accordance with ANG (2017) there would be no change in local air quality impacts.	
Wider Society	Greenhouse Gas Impacts
As either an independent or shared facility, an optimised version of today which may reposition the current contingency hold to align better with the traffic flows. This location partially aligns with airport traffic flows. Overall, could maintain GHG emissions compared with the baseline.	
Wider Society	Capacity / Resilience
Capacity: If this is an independent facility, as traffic levels increase, this capacity improvement could reduce the frequency of delays/holding compared with the baseline. This location aligns with network traffic flows. Overall, this option could enable airport capacity and maintain network capacity compared with the baseline. Other non-airspace constraints may hinder overall capacity gains at Bournemouth. If a shared facility, there would be no change to airport capacity compared with the baseline. Resilience: If an independent facility, disruption recovery could be improved, if a shared facility this option could maintain disruption recovery resulting from unplanned runway closure. As either an independent or shared facility, this option could also maintain a similar number of holding levels, therefore it could maintain delay absorption compared with the baseline.	
General Aviation (GA)	Access
As either an independent or shared facility, a holding facility to the southeast may require additional CAS, the extent is not yet known. As a result, the access impact on GA traffic may be worse compared with the baseline.	
GA/Commercial Airlines	Economic Impact from Increased Effective Capacity
As either an independent or shared facility, this option aligns with network traffic flows, which enables capacity gains across the LTMA from an improved network design. This could positively impact all LTMA traffic – commercial and GA. A shared facility would be similar compared with the baseline. An independent facility could enable airport capacity which could result in an economic benefit over the baseline for commercial traffic. However, other non-airspace constraints may hinder capacity and economic gains at Bournemouth. An independent facility could create network inefficiencies over the current baseline (shared facility). This is due to the extended track distance or inefficient profiles required by the network traffic, to deconflict from the additional arrival structure, resulting in increased fuel burn. This could have a negative economic impact on other LTMA traffic – commercial and GA.	
GA/Commercial Airlines	Fuel Burn
As either an independent or shared facility, an optimised version of today which may reposition the current contingency hold to better align with the traffic flows. This location partially aligns with airport traffic flows. Overall, could maintain fuel burn compared with the baseline for commercial traffic. Depending on the location, may increase track miles and fuel burn for transiting GA traffic. An independent facility could create network inefficiencies over the current baseline (shared facility). This is due to the extended track distance or inefficient profiles required by the network traffic, to deconflict from the additional arrival structure, resulting in increased fuel burn. This could have a negative impact on all LTMA traffic – commercial and GA.	
Commercial Airlines	Training Costs
Flight procedures change worldwide with each AIRAC cycle and operators would update their procedures accordingly, training staff if required. This option, either shared or independent, is not anticipated to impose additional training cost impacts for operators.	
Commercial Airlines	Other Costs
No other operator costs are foreseen, as either an independent or shared facility.	
Airport / ANSP	Infrastructure Costs
This design option, either shared or independent, is not expected to change airport or ANSP infrastructure impacts, beyond the initial deployment phase which will require some systems engineering adaptations.	
Airport / ANSP	Operational Costs
This design option, either shared or independent, is not expected to change airport or ANSP operational cost impacts.	

Airport / ANSP Deployment Costs

At this stage it is disproportionate to attempt to quantify deployment costs per design option, either an independent or shared. However, a large LTMA system change would involve training a large number of controllers and assistants via the use of various air traffic simulators (including sim prep, management, and staffing), with additional system engineering costs.

AMS Performance against the vision and parameters/strategic objectives of the AMS

AMS Assessment – Independent Option

- Safety: maintained
- Simplification: could improve disruption recovery and enables airport capacity, maintain delay absorption, maintain network capacity and maintain ATCO workload. Will utilise aircraft performance capabilities
- Integration of diverse users: continues to integrate defence and security and GA, subject to constraints of the design
- Environmental sustainability: could maintain CO_2 emissions. Could result in network inefficiencies

AMS Assessment – Shared Option

- Safety: maintained
- Simplification: could maintain airport capacity, network capacity, disruption recovery, delay absorption, and ATCO workload. Will utilise aircraft performance capabilities
- Integration of diverse users: continues to integrate defence and security and GA, subject to constraints of the design
- Environmental sustainability: could maintain CO_2 emissions

Qualitative Safety Assessment

A high-level safety appraisal for this proposed option indicates that an Inner Hold to the southeast would at least maintain current safety performance. There are multiple holds within current UK airspace which have a proven safety performance. An arrival structure in this location would need to deconflict with Farnborough arrivals and all Southampton traffic.

Conclusion from IOA

Compared to the baseline, an independent facility could improve disruption recovery and enable airport capacity. A shared facility could maintain airport capacity and disruption recovery. As either an independent or shared facility, it would maintain safety and any current MoD access; it could maintain delay absorption, fuel burn, CO_2 emissions, network capacity, and ATCO workload. Depending on the location, it could negatively impact other users.

Therefore, HH – IH – SE (Maybe shared) is progressed to Stage 3 for further development.

Table 17 HH-IH-SE (Maybe shared)

HH - IH – S (Maybe shared) Qualitative Initial Impacts Assessment	PROGRESSED
Group	**Impact**
Communities	Noise impact on health and quality of life
ANG (2017) states "at or above 7,000ft…minimising of noise is no longer a priority". CAP1616 instructs sponsors to consider noise and tranquillity impacts where the proposal has the potential to change overflight of inhabited areas, AONBs and NPs below 7,000ft. In this network-level proposal, changes would not occur below 7,000ft therefore these impacts are not considered.	
Communities	Air Quality
ANG (2017) states "emissions from aircraft above 1,000ft are unlikely to have a significant impact on local air quality". Changes would occur at or above 7,000ft, thus in accordance with ANG (2017) there would be no change in local air quality impacts.	
Wider Society	Greenhouse Gas Impacts
As either an independent or shared facility, an optimised Inner Hold which may be positioned to align with the traffic flows. This location partially aligns with airport traffic flows. Overall, could maintain GHG emissions compared with the baseline.	
Wider Society	Capacity / Resilience
Capacity: If this is an independent facility, as traffic levels increase, this capacity improvement could reduce the frequency of delays/holding compared with the baseline. This location aligns with network traffic flows. Overall, this option could enable airport capacity and maintain network capacity compared with the baseline. Other non-airspace constraints may hinder overall capacity gains at Bournemouth. If a shared facility, there would be no change to airport capacity compared with the baseline. Resilience: If an independent facility, disruption recovery could be improved, if a shared facility this option could maintain disruption recovery resulting from unplanned runway closure. As either an independent or shared facility, this option could also maintain a similar number of holding levels, therefore similar level of delay absorption compared with the baseline.	
General Aviation (GA)	Access
As either an independent or shared facility, a holding facility to the south may require additional CAS, the extent is not yet known. As a result, the access impact on GA traffic may be worse compared with the baseline.	
GA/Commercial Airlines	Economic Impact from Increased Effective Capacity
As either an independent or shared facility, this option aligns with network traffic flows, which enables capacity gains across the LTMA from an improved network design. This could positively impact all LTMA traffic – commercial and GA. A shared facility could be similar compared with the baseline. An independent facility could enable airport capacity which could result in an economic benefit over the baseline for commercial traffic. However, other non-airspace constraints may hinder capacity and economic gains at Bournemouth. An independent facility could create network inefficiencies over the current baseline (shared facility). This is due to the extended track distance or inefficient profiles required by the network traffic, to deconflict from the additional arrival structure, resulting in increased fuel burn. This could have a negative economic impact on other LTMA traffic – commercial and GA.	
GA/Commercial Airlines	Fuel Burn
As either an independent or shared facility, an optimised Inner Hold which may be positioned to align with the traffic flows. However, this location only partially aligns with airport traffic flows. This could maintain fuel burn for each airport arrival flight compared with the baseline for commercial traffic. An independent facility could create network inefficiencies over the current baseline (shared facility). This is due to the extended track distance or inefficient profiles required by the network traffic, to deconflict from the additional arrival structure, resulting in increased fuel burn. This could have a negative economic impact on other LTMA traffic – commercial and GA.	
Commercial Airlines	Training Costs
Flight procedures change worldwide with each AIRAC cycle and operators would update their procedures accordingly, training staff if required. This option, either shared or independent, is not anticipated to impose additional training cost impacts for operators.	
Commercial Airlines	Other Costs
No other operator costs are foreseen, as either an independent or shared facility.	
Airport / ANSP	Infrastructure Costs
This design option, either shared or independent, is not expected to change airport or ANSP infrastructure impacts, beyond the initial deployment phase which will require some systems engineering adaptations.	
Airport / ANSP	Operational Costs
This design option, either shared or independent, is not expected to change airport or ANSP operational cost impacts.	
Airport / ANSP	Deployment Costs
At this stage it is disproportionate to attempt to quantify deployment costs per design option, either an independent or shared. However, a large LTMA system change would involve training a large number of controllers and assistants via the use of various air traffic simulators (including sim prep, management, and staffing), with additional system engineering costs.	

AMS	Performance against the vision and parameters/strategic objectives of the AMS

AMS Assessment – Independent Option

- Safety: maintained
- Simplification: could improve disruption recovery and enables airport capacity, maintain delay absorption, maintain network capacity and maintain ATCO workload. Will utilise aircraft performance capabilities
- Integration of diverse users: continues to integrate defence and security and GA, subject to constraints of the design
- Environmental sustainability: could maintain CO_2 emissions. Could result in network inefficiencies

AMS Assessment – Shared Option

- Safety: maintained
- Simplification: could maintain airport capacity, network capacity, disruption recovery, delay absorption and ATCO workload. Will utilise aircraft performance capabilities
- Integration of diverse users: continues to integrate defence and security and GA, subject to constraints of the design
- Environmental sustainability: could maintain CO_2 emissions

Qualitative Safety Assessment

A high-level safety appraisal for this proposed option indicates that an Inner Hold to the south would at least maintain current safety performance. There are multiple holds within current UK airspace which have a proven safety performance. An arrival structure in this location would need to deconflict with all Southampton traffic.

Conclusion from IOA

Compared to the baseline, an independent facility could improve disruption recovery and enable airport capacity. A shared facility could maintain airport capacity and disruption recovery. As either an independent or shared facility, it would maintain safety and any current MoD access; it could maintain delay absorption, fuel burn, CO_2 emissions, network capacity, and ATCO workload. Depending on the location, it could negatively impact other users.

Therefore, HH – IH – S (Maybe shared) is progressed to Stage 3 for further development.

Table 18 HH-IH-S (Maybe shared)

4. Step 2B Conclusion and Next Steps

4.1.1 There is not yet enough detailed quantified data to make a statement on preferred option(s). Compromises and trade-offs may be necessary between airports taking part in the FASI regional airspace change. Appropriate quantitative assessments and trade-offs will be carried out as part of Stage 3 to allow a preferred option to be selected prior to consultation.

4.1.2 This table provides a summary of the Stage 2 design work undertaken for Bournemouth, showing how the number of design options has changed through the design development stages as described above.

Module	Initial Long List	Comprehensive List	Progress to IOA	Progress to Stage 3
Bournemouth	11	11	4	4

Table 19 Count of Design Options for each module through option development stages

4.1.3 These shortlisted viable options have been carried forward to Stage 3:

Bournemouth Design Options progressed to Stage 3
Inner Holds - Northeast (Maybe shared)
Inner Holds – East (DM) (Maybe shared)
Inner Holds – Southeast (Maybe shared)
Inner Holds – South (Maybe shared)

Table 20 Summary of design options progressed to Stage 3

5. APPENDIX 1: Arrival Structure Concepts

5.1.1 Arrival structure types identified as being viable options for potential airspace designs across the LTMA airports:

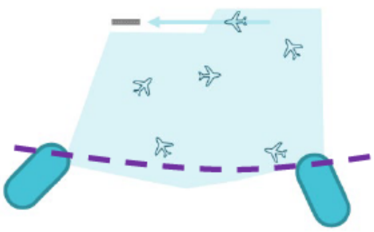
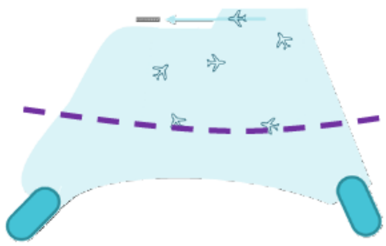
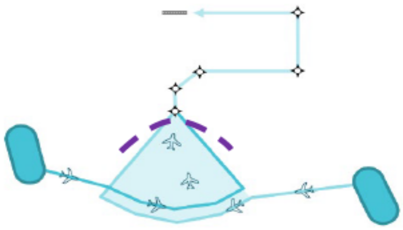
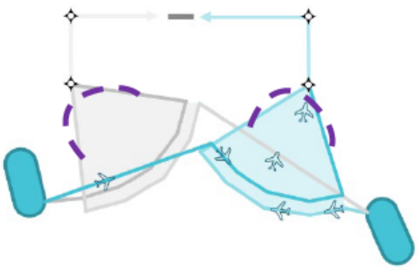
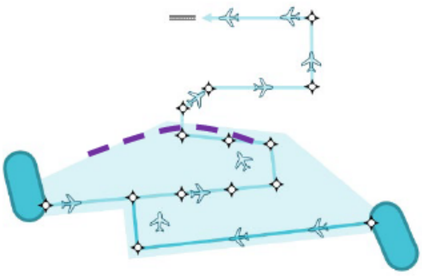
Structure	Diagram	Description
Optimised[4] Holds llustration of network/airport boundary (indicative c.7,000ft)		A holding pattern is used to delay aircraft from landing, in a vertically separated stack. ATC control entry to, and exit from, the stack; and aircraft are vectored to the runway or may use a transition. Linked with either a traditional Radar Manoeuvring Area (RMA) or Transitions. This design is for holds within c.30nm of the airport.
Holds Further Out llustration of network/airport boundary (indicative c.7,000ft)		As above but would typically be higher. This design is for holds c.30nm-60nm from the airport.
Point Merge llustration of network/airport boundary (indicative c.7,000ft)		Point Merge (PM) is a systemised method for sequencing arrival flows, allowing controllers to sequence and merge arrivals without vectoring, whilst enabling continuous descent operations and maintaining runway throughput. This design has a fixed location regarding the merge legs and merge point.
Switch Merge llustration of network/airport boundary (indicative c.7,000ft)		SM is a concept not currently in UK operation, whereby two separate PM structures exist within a given airspace volume to serve different runway directions for the same airport. The merge legs and merge point (the tip of each triangle) is angled to favour the runway in use, but only one of the merge structures is in operation at any time; they are 'switched' when the runway direction changes. The holds do not change.
Trombone llustration of network/airport boundary (indicative c.7,000ft)		A 'snake-like' PBN transition which can be closed (fixed) which aircraft must fly; or open, whereby tactical flexibility is retained with defined short cuts.

Figure 6 Arrival structure concepts (at and above 7,000ft)

[4] See paragraph 2.2.10 of Master document for explanation of 'Optimised'

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