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
Manston Airport Arrivals Connectivity Module

To be read in conjunction with Master Document

1. Introduction

1.1 About this document

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

1.1.2 Manston is not currently an operational airport; however, a Development Consent Order (DCO) was approved in August 2022 to bring the airport back in to use. The intention is to provide a mixed mode operation of passenger and cargo flights. The airport is situated on the east Kent coast, approximately 75 miles east of central London.

2. Baseline

2.1.1 Manston Airport has been closed since 2014, so there is no baseline traffic picture or forecast available.

2.1.2 Manston is progressing an ACP to become operational again in 2025, before this FASI programme begins implementation.

2.1.3 If this is the case, Manston traffic will utilise the current airspace network. It is assumed that connectivity will involve delay absorption and disruption recovery occurring outside of the network. This connectivity would become the baseline 'Do Nothing' option for this ACP.

2.1.4 A 'Do Minimum' option would be to implement the minimum changes required to integrate the airport operations within the future airspace structure introduced by this ACP.

2.1.5 With no current traffic, the NERL forecast (derived from the EUROCONTROL STATFOR October 2022) cannot be applied to Manston. Therefore, SME design work has been based on the airport's traffic forecast which maintains extremely low traffic volumes to ten years post-implementation.

3. Design Development

3.1.1 Working with the airport, NERL developed 7 high-level concept options for Manston[1], in addition to the 'Do Nothing' and 'Do Minimum' options as described above. Initial viability assessments were produced for location and structure type and presented to stakeholders in formal engagement (Ref 7). Feedback was requested through the engagement response questionnaire.

3.2 Stakeholder engagement

3.2.1 We received 4 responses from 4 different stakeholders related to the Manston design concepts. Table 1 presents a summary of the feedback and how this has influenced the design.

3.2.2 Feedback was generally in support of the design options.

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

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.
BGA	Solutions appear to sensibly suggest the use of airspace over the sea would suit this airport.	We used this feedback to inform our evaluation of DP5 and DP6.
British Airways	Considering the number of movements at Manston, 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 development work will identify prioritisation needs.
Manston Airport	Design envelope and viability matrix fit with airport aspirations. Inner Holds sufficient for forecasted traffic.	No changes as a result of this feedback. However, viability matrix altered to remove Inner Holds based on ongoing SME development deeming this disproportionate to Manston's forecast traffic volumes. As a result, there is no need for a network level design envelope and it has been removed.

Table 1 Engagement feedback and NERL response

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

3.3 Manston Design Concepts

3.3.1 SME design development determined that holding facilities outside of CAS[2], as provided in 'Do Nothing' and 'Do Minimum' would be sufficient for the traffic volumes forecast at Manston. It has been determined that no other network level arrival structure[3] is required and all Inner Hold concepts were removed at this stage.

3.3.2 As a result, 'Do Nothing' and 'Do Minimum' are the only viable concepts for Manston taken forward as the comprehensive list to Design Principle Evaluation. Neither a viability table nor a design envelope are provided.

3.3.3 For clarity, where Manston connects into the current network (the 'Do Nothing') is still unknown[4], and remains possible through all cardinal / intercardinal points. The 'Do Minimum' is the minimal change required to provide connectivity into the NERL Network ACP, if 'Do Nothing' is no longer possible. Therefore, 'Do Minimum' remains possible through all cardinal / intercardinal points. The concepts will be assessed, going forward, not their geography.

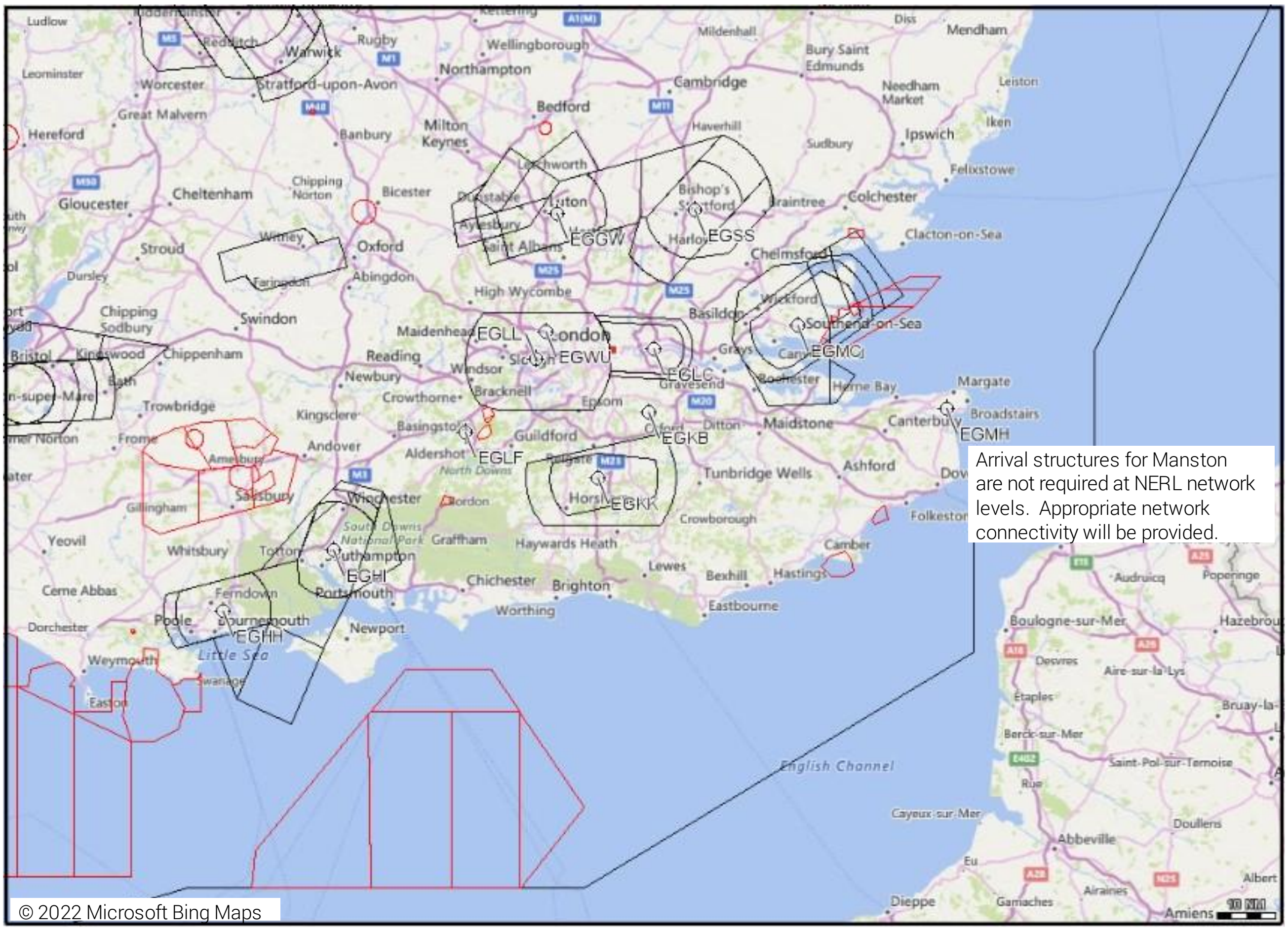


Figure 1 Manston location – no network-level design envelope post-SME development

[2] This will include access to existing network contingency holds in case of runway closure or extreme weather events etc

[3] For completeness, a detailed description of each structure can be found in Section 5 Appendix 1.

[4] The decision as to how to incorporate Manston into the current network is outside the scope of this ACP.

3.4 Design Principle Evaluation

3.4.1 Table 2 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 decrease efficiency and 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 2 Design Principle Evaluation Assessment Criteria

3.4.2 Table 3 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 3 - AMS Assessment Criteria

3.4.3 The criteria in Table 4 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 4 - 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. MH) - Structure Type (DN = Do Nothing / DM = Do Minimum).

DP	Priority	MH - DN	MH - DM
RESULT		ACCEPT	ACCEPT
DP0 Safety	A AMS	Maintained: Assume the current operation includes a safe transfer of traffic to and from Manston outside CAS	Maintained: Assume the operation provides a safe transfer of traffic, outside CAS, via the future network
DP1 Operational (Delay Absorption)	B AMS	Assume delay absorption is not required or is contained outside the network and would remain so. No change	Assume delay absorption is not required or is contained outside the network and would remain so. No change
DP1 Operational (Disruption Recovery)	B AMS	Assume disruption recovery is outside the network and would remain so. No change	Assume disruption recovery is outside the network and would remain so. No change
DP2 Economic (Fuel)	B	Same as assumed baseline	Assumed minimal change from baseline, therefore fuel performance similar
DP3 Environmental (CO_2)	B AMS	Same as assumed baseline	Assumed minimal change from baseline, therefore CO_2 emissions per flight similar
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
DP5 Technical (CAS)	C	Today's operation, no change from baseline	Design likely to be within current day CAS; ability to return CAS will be assessed in Stage 3
DP6 Technical (Other Users)	C AMS	Today's operation, no change from baseline	Likely to be in current day CAS, no anticipated change in impacts
DP7 Technical (MoD)	C AMS	Assumed operations will commence with no impact on MoD activities as no military-use areas in the vicinity	Assumed operations will commence with no impact on MoD activities as no military-use areas in the vicinity
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
DP8 Operational (Efficiency)	B AMS	Similar concept to today's operation, therefore no change in ATCO workload anticipated	Similar concept to today's operation, therefore no change in ATCO workload anticipated
DP9 Technical (Route Spacing)	B AMS	Assumed direct routes would be used to link current network to airport interface. Therefore, would not allow optimal spacing, in future airspace, to be applied	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, DP8 Amber: DP1, DP1, DP3, DP6, DP8 Red: DP9	Green: DP0, DP7, DP8, DP9 Amber: DP1, DP1, DP3, DP6, DP8 Red: None

Table 5 Design Principle Evaluation

3.4.5 Both the 'Do Nothing' and 'Do Minimum' were assessed as meeting the Design Principles and progress to Step 2B Options Appraisal.

3.5 Initial Options Appraisal

Table 6 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 6 Initial Options Appraisal Assessment Criteria

MH – DN 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. 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
Manston airport is currently not operational, however, has an active ACP to open prior to the completion of this ACP. The network changes made when Manston becomes operational will become the 'Do Nothing' as part of this ACP. Therefore, GHG emissions would be maintained for this option. Any GHG impacts as a result of Manston airport becoming operational can be found in the airport's ACP.	
Wider Society	Capacity / Resilience
Manston airport is currently not operational, however, has an active ACP to open prior to the completion of this ACP. The network changes made when Manston becomes operational will become the 'Do Nothing' as part of this ACP. It is assumed that connectivity will involve delay absorption and disruption recovery occurring outside of the network. Therefore, capacity / resilience would be maintained for this option. Any capacity / resilience impacts as a result of Manston airport becoming operational can be found in the airport's ACP.	
General Aviation (GA)	Access
Manston airport is currently not operational, however, has an active ACP to open prior to the completion of this ACP. The network changes made when Manston becomes operational will become the 'Do Nothing' as part of this ACP. Therefore, GA access would be maintained for this option. Any GA access impacts as a result of Manston airport becoming operational can be found in the airport's ACP.	
GA/Commercial Airlines	Economic Impact from Increased Effective Capacity
Manston airport is currently not operational, however, has an active ACP to open prior to the completion of this ACP. The network changes made when Manston becomes operational will become the 'Do Nothing' as part of this ACP. Therefore, economic impacts would be maintained for this option for LTMA traffic – commercial and GA. Any economic impacts as a result of Manston airport becoming operational can be found in the airport's ACP.	
GA/Commercial Airlines	Fuel Burn
Manston airport is currently not operational, however, has an active ACP to open prior to the completion of this ACP. The network changes made when Manston becomes operational will become the 'Do Nothing' as part of this ACP. Therefore, fuel burn would be maintained for this option. Any fuel burn impacts as a result of Manston airport becoming operation can be found in the airport's ACP.	
Commercial Airlines	Training Costs
Flight procedures change worldwide with each AIRAC cycle and operators would update their procedures accordingly, training if required. If this baseline system was retained, the same flight procedures would be used, and training cost impacts would not change. Any training costs as a result of Manston airport becoming operational can be found in the airport's ACP.	
Commercial Airlines	Other Costs
No change in airspace design from 'Do Nothing' – no changes to other commercial operator costs. Any other costs as a result of Manston airport becoming operational can be found in the airport's ACP.	
Airport / ANSP	Infrastructure Costs
No change in airspace design from 'Do Nothing' – 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. Any infrastructure costs as a result of Manston airport becoming operational can be found in the airport's ACP.	
Airport / ANSP	Operational Costs
No change in airspace design from 'Do Nothing' – 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. Any infrastructure costs as a result of Manston airport becoming operational can be found in the airport's ACP.	
Airport / ANSP	Deployment Costs
If this baseline system was retained, there would be no change, hence no associated costs. Any infrastructure costs as a result of Manston airport becoming operational can be found in the airport's ACP.	
AMS	Performance against the vision and parameters/strategic objectives of the AMS
In the 'Do Nothing' option there would be no change in airspace design at Manston once it becomes operational. The airspace connectivity implemented at the time of Manston becoming operational is not expected to contradict the objectives of the AMS.	

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. Connectivity for Manston would need to deconflict with Biggin Hill and London City arrivals. A safety assessment as a result of Manston becoming operational can be found in the airport's ACP.
Conclusion from IOA
Compared to the baseline, there will be no change. Any changes as a result of Manston becoming operational can be found in the airport's ACP. Therefore, MH – DN is progressed to Stage 3 for further development.

Table 7 MH-DN Initial Options Appraisal

MH – DM 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. 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
'Do Minimum' will be providing negligible changes to GHG emissions from the baseline. This location is aligned with airport traffic flows. Overall GHG emissions maintained.	
Wider Society	Capacity / Resilience
It is assumed that connectivity will involve delay absorption and disruption recovery occurring outside of the network. There will be no change for the 'Do Minimum'. Other non-airspace constraints may hinder overall capacity and economic gains at Manston.	
General Aviation (GA)	Access
'Do Minimum' connectivity will likely remain within current day CAS, no anticipated change to GA impacts.	
GA/Commercial Airlines	Economic Impact from Increased Effective Capacity
Aligns with network traffic flows, which could enable potential capacity gains across the LTMA from an improved network design. This could positively impact all LTMA traffic – commercial and GA. Supports the airport's required arrival loading; however, other non-airspace constraints may hinder overall capacity and economic gains at Manston.	
GA/Commercial Airlines	Fuel Burn
'Do Minimum' could be providing negligible changes to fuel performance from the baseline. This location is aligned with airport traffic flows. Overall, could maintain fuel burn compared with the baseline.	
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 other operator costs are foreseen.	
Airport / ANSP	Infrastructure Costs
This design option is not expected to change airport or ANSP infrastructure impacts, beyond the initial deployment phase which may require some systems engineering amendments.	
Airport / ANSP	Operational Costs
This design option 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. 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
• Safety: maintained • Simplification: could maintain delay absorption, disruption recovery, 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 maintain CO_2 emissions	
Qualitative Safety Assessment	
A high-level safety appraisal for this proposed option indicates that connectivity to the new network design would at least maintain current safety performance. Connectivity for Manston would need to deconflict with Biggin Hill and London City arrivals.	
Conclusion from IOA	
Compared to the baseline, this option aligns with network traffic flows and supports the required airport capacity. There may be no change in other impacts. Therefore, MC – DM is progressed to Stage 3 for further development.	

Table 8 MH-DM Initial Options Appraisal

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 design option concepts for Manston, 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
Manston	9	2	2	2

Table 9 Count of Design Option Concepts for each module through option development stages

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

Manston Option Concepts progressed to Stage 3
'Do Nothing'
'Do Minimum'

Table 10 Options Taken to Stage 3

5. APPENDIX 1: Arrival Structure Concepts

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

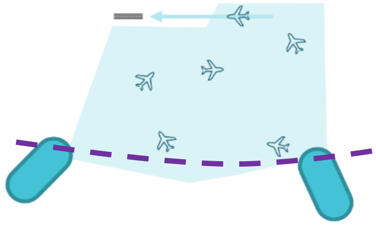
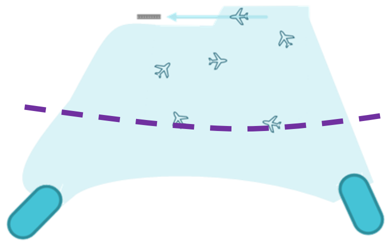
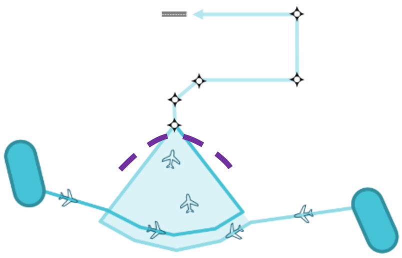
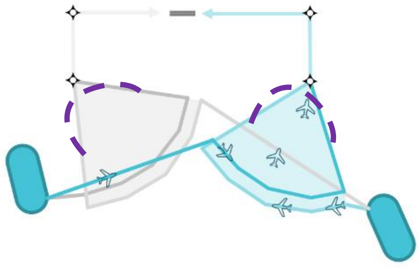
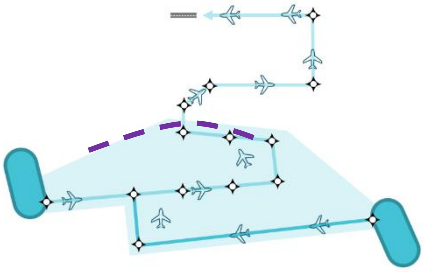
Structure	Diagram	Description
Optimised[5] Holds Illustration of network/airport boundary (indicative c.7,000ft)		A holding pattern is used to delay aircraft from landing, in a vertically separated stack. ATC control entry to, and exit from, the stack; and aircraft are vectored to the runway or may use 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 Illustration 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 Illustration 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 Illustration 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 Illustration 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 2 Arrival structure concepts (at and above 7,000ft)

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

End of document