INITIAL OPTIONS APPRAISAL

KEY		
	Carry Forward	Meets objectives, insignificant impact, and is the Preferred Option for this procedure
	Carry Forward	Meets objectives or has an insignificant impact but is less attractive
	Reject	Fails to meet one or more objectives or has a significant impact that cannot b

			Reason for Category	Rejected - Does not meet constraints (e.g. airspace modernisation, nor does it meet technical criteria of CAP1616); Will be carried forward to Full Options Appraisal to enable environmental comparison of proposal against the baseline.	Rejected at DPE stage due to non-PANS OPS Compliance	Preferred by stakeholders - This is a Post Engagement option where stakeholders had their input. Fewer track miles and fewer overflown.	Original preferred option of the stakeholders but less attractive than the Post Engagement option (SID 27 AGGER Option 1b)	Preferred option of some non-aviation stakeholders but less attractive than the Post Engagement option (SID 27 AGGER Option 1b)	Represents the most direct route to WAL (replicates current WAL departure) but tracks over more populated areas for longer	Stakeholder preferred option; follows shortest possible route over the residential areas	Only one practical option for direct routing to TEMP2	This option meets objectives but is assessed to expose more people on the ground to noise than SID 09 AGGER Option 2.	Stakeholder preferred option; avoids residential areas and follows the route of the motorway initially	Less attractive to stakeholders; increased noise exposure versus SID 09 CAVEN Option 4 as more people are overflown	Longer - more track miles, and does not minimise noise or people overflown versus other options.	Preferred by some non-aviation stakeholders; fewer people overflown and follows the motorway (higher ambient noise).	Preferred by Stakeholders, and is the option that minimises overflight of people on the ground.	Does not minimises noise or people overflown versus other options	Less attractive to stakeholders; increased noise exposure versus SID 09 CORKA Option 3 as more people are overflown and significant difference in track miles flown	Preferred by Stakeholders, and is the option that minimises overflight of people on the ground.
Group	Impact	Level of Analysis	High-level Appraisal for the introduction of PBN/RNAV	Do Nothing - continue with extant procedures	SID 27 AGGER Option 1	PE SID 27 AGGER Option 1b	SID 27 AGGER Option 2	SID 27 AGGER Option 3	SID 27 WAL Option 1	SID 27 WAL Option 2	SID 27 TEMP2	SID 09 AGGER Option 1	SID 09 AGGER Option 2	SID 09 CAVEN Option 1	SID 09 CAVEN Option 2	SID 09 CAVEN Option 3	SID 09 CAVEN Option 4	SID 09 CORKA Option 1	SID 09 CORKA Option 2	SID 09 CORKA Option 3
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In general RNAV procedures are predicted to reduce noise exposure versus extant conventional procedures due to the facilitation of continuous climb/descent profiles and optimum aircraft performance. However it is not always possible to deliver these characteristics and each Option has been assessed to determine whether noise is minimised through these measures. The assessment also assessed the exposure of communities to noise i.e. whether the option minimises overflight of sensitive areas, public spaces and parks, built up environments and residential areas. Consideration of the altitude and flight profile (below 7000ft) has also been included.	The tracks flown by aircraft using conventional procedures are less predictable; the exact route taken relies on the pilot interpreting ground-based beacon information and therefore the procedures as published often don't represent actual tracks flown and instead, aircraft are spread out over a wider area. Height restrictions (4000ft or below) to deconflict traffic from Manchester Airport means that aircraft can spend extended time in level flight; are unable to fly with optimum power settings potentially creating more noise.	Option rejected at DPE stage due to non-compliance with PANS OPS 8168 (turns/waypoint spacing).	Flown at optimum aircraft performance and with continuous climb profile to minimise noise. The procedure takes a more direct route to AGGER; aircraft remain over the River Mersey during the initial right hand turn after take-off. Routing takes the aircraft over populated areas of Liverpool but will be above approximately 4,000 ft before flying over this area. The procedure avoids direct overflight of sensitive areas although a school and a hospital are close to the planned flightpath; aircraft will be above approximately 4,000 ft at these points. Incorporates a continuous climb profile to minimise noise and minimises residential areas overflown.	Flown at optimum aircraft performance but overflies a school at 2000ft and a hospital at 4000ft within built up areas. Incorporates continuous climb to minimise noise and offers fewer residential areas overflown compared to SID AGGER Option 3.	Flown at optimum aircraft performance; minimises noise. The procedure overflies Eastham Country Park after departure, 3.2 nm on the extended centreline. The route flies over school grounds in Ellesmere Port, at an altitude of approximately 4,500 ft. Incorporates continuous climb to minimise noise and crosses the residential areas of Bebington and Ellesmere Port. The procedure also overflies Capenhurst Nuclear Processing plant, a Restricted area up to 2,200 ft, at an altitude of approximately 4,000 ft.	Flown at optimum aircraft performance; minimises noise. The procedure overflies or is in the vicinity of a number of schools in residential areas of Bebington and Birkenhead. Incorporates continuous climb to minimise noise.	Flown at optimum aircraft performance; minimises noise. The procedure overflies Eastham Country Park after departure, 3.2 nm on the extended centreline and also flies in the vicinity of schools in Bebington. The routing is close to two major hospitals (Clatterbridge and Arrowe Park) in the Wirral. Incorporates continuous climb profile to minimise the impact of noise. Follows the shortest possible route over populated areas of Bebington and avoids most of the populated areas of the Wirral.	Flown at optimum aircraft performance; minimises noise. The procedure overflies Eastham Country Park after departure, 3.2 nm on the extended centreline. The procedure also flies in the vicinity of schools in Bebington. Incorporates continuous climb profile to minimise the impact of noise. Flies over populated areas of Bebington and Raby Mere but follows the most direct route across the populated area to minimise exposure. The route also avoids most of the populated areas in the southern part of the Wirral.	Flown at optimum aircraft performance; minimises noise. The procedure overflies Hale Primary School after departure, 1.5 nm on the extended centreline. The procedure also overflies schools in Runcorn and Frodsham. Incorporates continuous climb but flies over the village of Hale and populated areas of Runcorn, Frodsham and Helsby.	Flown at optimum aircraft performance; minimises noise. This Option amends the routing of Option 1 to avoid sensitive areas in Runcorn and Frodsham. The procedure overflies village of Hale and Hale Primary School after departure, which is unavoidable as the school is at 1.5 nm on the extended centreline. Incorporates continuous climb to minimise noise. This option is assessed to minimise noise for SID 09 via AGGER in so far as is reasonably practicable.	Flown at optimum aircraft performance; minimises noise. The procedure overflies Hale Primary School after departure, 1.5 nm on the extended centreline and also overflies schools in Widnes. Incorporates continuous climb but has been restricted to a maximum altitude of 5,000 ft prior to CAVEN to meet en-route requirements (FASI-N). Routing represents the most direct route to CAVEN but takes the aircraft over populated areas of Widnes, Huyton and Liverpool.	Flown at optimum aircraft performance; minimises noise. The procedure overflies Hale Primary School after departure, 1.5 nm on the extended centreline. The procedure also overflies schools in Runcorn, Frodsham and Ellesmere Port. Incorporates a continuous climb to minimise noise, but is restricted to 5,000 ft maximum altitude for en-route requirements. Routing takes the aircraft over the village of Hale and populated areas of Runcorn, Frodsham, Helsby and Ellesmere Port. Other options have a lower noise impact.	Flown at optimum aircraft performance; minimises noise. Overflies Hale Primary School after departure, which is unavoidable as it is 1.5 nm on the extended centreline. The procedure also overflies schools in Ellesmere Port. Flies over the village of Hale and populated areas of Ellesmere Port. Assessed to affect fewer residential areas than Option 2.	Flown at optimum aircraft performance; minimises noise. The procedure unavoidably overflies Hale Primary School after departure, 1.5 nm on the extended centreline. Flies over populated areas of Huyton and Liverpool. Assessed to affect fewer residential areas than SID CAVEN Options 1 and 2. Incorporates continuous climb but with altitude restrictions at 5000ft.	Flown at optimum aircraft performance; minimises noise. Unavoidably overflies Hale Primary School after departure, 1.5 nm on the extended centreline. The procedure also overflies schools in Runcorn and Frodsham. Overflies the village of Hale and populated areas of Runcorn and Frodsham. Incorporates continuous climb but other options have a lower noise impact on sensitive and residential areas.	Flown at optimum aircraft performance; minimises noise. Overflies Hale Primary School after departure, 1.5 nm on the extended centreline, and schools in Widnes. Incorporates continuous climb but over populated areas of Widnes, Huyton and Liverpool.	Flown at optimum aircraft performance; minimises noise. The procedure overflies Hale Primary School after departure, but this is unavoidable as the school is at 1.5 nm on the extended runway centreline. This procedure flies over the village of Hale but the option represents the minimum number of people overflown versus options 1 and 2.
Communities	Air Quality	Initial Options Appraisal: Qualitative	Most of the area around LJLA is within an Air Quality Management Area (AQMA) and the airport has partnered with Liverpool City Council (LCC) to measure AQ for over 10 years. Engagement to date with the environmental health authorities at Halton Borough Council and LCC suggests that no changes are expected as no changes to the baseline are expected below 1000ft for any of the options; therefore no change in air quality is predicted. Aircraft currently descend below 1000ft on final approach commensurate with runway orientation; and Aircraft depart up to 1000ft on the same track as they do currently. One of the stated benefits of the introduction of RNAV procedures is reduced environmental impact due in part to continuous climb/descent. It is predicted that the initial climb/ final approach segments of flight will be the same as extant procedures but this will be tested during the full options appraisal in order to quantify any change in air quality.	No change to air quality predicted in maintaining baseline conditions		No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Reduced environmental impact is one of the benefits listed by ICAO of introducing PBN, and RNAV flight procedures. The Options have been assessed individually to determine whether they have the potential to minimise emissions through optimum aircraft configuration (engine power settings), use of continuous climb/descent profiles, utilisation of shortest practical routes etc. In general, the introduction of RNAV flight procedures is predicted to reduce environmental impact over extant ground/equipment based navigation procedures.	Extant procedures do not support optimum performance of aircraft and therefore predicted to have a greater environmental impact compared to proposed options; routes unpredictable in length; continuous climb/descent not supported, extended periods of level flight; radar vectoring to join airways; height restrictions and clearance delays - all contributing to higher engine settings/more track miles and greater emissions.		Minimises track miles - this option offers the shortest practical route to AGGER. Continuous climb enables optimum aircraft performance and fuel burn (lower emissions predicted versus SID 27 AGGER Option 2.)	Minimises track miles compared to Option 3; Although this is not the most direct route to AGGER, it is a viable route that allows the aircraft to fly at optimum performance levels to be PANS-OPS compliant. It is longer than Option 1b.	Continuous climb enables optimum aircraft performance and fuel burn but a left turn initially after take-off increases the track miles flown to AGGER.	Minimises track miles - this option offers the shortest practical route to WAL. Continuous climb enables optimum aircraft performance and fuel burn.	Continuous climb enables optimum aircraft performance and fuel burn. This option is 0.8NM longer than SID 27 WAL Option 1 and which will require more fuel and therefore increase aircraft emissions.	Continuous climb enables optimum aircraft performance and fuel burn. This option represents the only practical routing to TEMP2.	This procedure has been designed to be flown in a clockwise direction around LJLA to enable aircraft to obtain the correct height prior to AGGER. Is negligibly longer than Option 2 due to wider initial turn but remains a viable and practical route to enable continuous climb to correct height.	This procedure has been designed to be flown in a clockwise direction around LJLA to enable aircraft to obtain the correct height prior to AGGER. Is the shortest practical route to enable continuous climb to correct height. Offers a tighter initial turn than Option 1 which may require slightly increased engine power setting.	Procedure unavoidably restricted to 5,000 ft maximum altitude to comply with FASI (N) but represents a short practical route to CAVEN. Aircraft will remain at this altitude for a number of track miles thus potentially not minimising emissions.	Procedure unavoidably restricted to 5,000 ft maximum altitude to comply with FASI (N) and represents increased track miles over other options to CAVEN. Aircraft will remain at this altitude for a greater number of track miles thus not minimising emissions.	Procedure unavoidably restricted to 5,000 ft maximum altitude to comply with FASI (N) and represents increased track miles over options 1 due to right hand turn after take-off. Aircraft will remain at this altitude for a greater number of track miles thus not minimising emissions.	Procedure unavoidably restricted to 5,000 ft maximum altitude to comply with FASI (N) but represents a short practical route to CAVEN. Aircraft will remain at this altitude for a number of track miles thus potentially not minimising emissions. This option is longer than Option 1.	Represents the shortest practical route to CORKA thus minimising emissions	DPE states that this procedure goes to TEMP2 rather than CORKA. TEMP2 has been used as an alternate position for this SID and is located within 1NM of CORKA but not over a populated area. The precise location of the waypoint will be rationalised during the detailed technical design. Increased track miles over Option 1 due to initial left turn. Not a direct route thus not minimising emissions.	Most direct route to TEMP2 incorporating continuous climb profile therefore minimises emissions.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Generally, the introduction of PBN is based on delivering benefits in terms of increasing airspace capacity leading to more predictable routes, fewer on-ground and in-air delays experienced by airlines. The completion of the entire route from airport to destination via PBN leads to a more effective route structure. The implementation of PBN is currently the highest priority for the global aviation community.	Maintaining extant procedures would maintain current capacity however resilience would be significantly affected. LJLA would fail to meet regulatory requirements, and would fail to meet the airspace modernisation priorities including coordination with FASI-N		The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements. Access to the runway may be slightly improved via a reduction in on-ground and in-air delays brought about by the introduction of PBN.	No change to existing airspace arrangements. GA users of LJLA will continue to arrive and depart under extant operational arrangements.		No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	Generally, the introduction of PBN is based on delivering benefits in terms of increasing airspace capacity leading to more predictable routes, fewer on-ground and in-air delays experienced by airlines. This may have an economic benefit to airlines in the context of being an enabler for increased air transport movements, passenger numbers and cargo tonnage carried. It is not proportionate for LJLA to predict the precise economic benefit to commercial airlines using the new procedures as any increase in individual airline capacity will depend on private commercial business characteristics. It is not proportionate for LJLA to assess the economic benefit to the GA community however they are expected to benefit from increased predictability of commercial airline movements which is predicted to lead to reduced on-ground and in-air delays for all users which may have a positive impact on GA costs.	No increase to effective capacity anticipated for continued use of extant procedure, therefore no economic benefit for GA/airlines.		This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	Each option has been assessed against other options based on whether any factors of the design might contribute to increased fuel burn. In general the introduction of RNAV procedures and associated predictability of tracks, continuous climb/descent, reduction in tactical intervention is predicted to result in reduced fuel burn versus the baseline.	Fuel burn predicted to be greater (and less predictable) for conventional procedures due to height restrictions and clearance delays; potential extended track miles in level flight; tactical ATC intervention; continuous climb/descent unsupported; exact route depends on pilot/on-board system interpretation of navigation equipment.		Track Length 20.8NM This options represents the shortest practical route with a continuous climb profile enabling optimum engine settings. The route integrates aircraft into the airways structure; predicted to minimise fuel burn.	Track Length 22.4NM This option is not the most direct route but it incorporates a continuous climb profile enabling optimum engine settings. The route integrates aircraft into the airways structure; predicted to minimise fuel burn but due to slightly increased track miles compared to SID 27 AGGER Option 1b, is less attractive.	Track Length 25NM This option increases the track miles due to the initial left turn after take off. The route integrates aircraft into the airways structure; due to increased track miles compared to SID 27 AGGER Option 1b, and Option 2, this option is predicted to require more fuel.	Track Length 10.4NM This Option is 0.8NM shorter than SID 27 WAL Option 2 and therefore may require negligibly less fuel.	Track Length 11.2NM This Option is 0.8NM longer than SID 27 WAL Option 1 and therefore may require negligibly more fuel.	Track Length 14.7NM Only one practical option; track length will inform the Full Options Appraisal stage to determine Fuel Burn.	Track Length 31.7NM This Option is 1.6NM longer than Option 2 and may result in negligible additional fuel burn.	Track length 29.1NM Shortest practical route; track length will inform the Full Options Appraisal stage to determine Fuel Burn.	Track Length 15.4NM Shortest practical route predicted to result in lowest fuel burn. Necessary height restrictions for all practical routes to CAVEN may result in comparatively greater fuel burn versus other procedures.	Track Length 20.4NM Longest route; predicted to result in greatest fuel burn. Necessary height restrictions for all practical routes to CAVEN may result in comparatively greater fuel burn versus other procedures.	Track Length 17.9NM 2.5NM Longer than Option 1 representing increased fuel burn. Necessary height restrictions for all practical routes to CAVEN may result in comparatively greater fuel burn versus other procedures.	Track Length 17.9NM 2.5NM Longer than Option 1 representing increased fuel burn. Necessary height restrictions for all practical routes to CAVEN may result in comparatively greater fuel burn versus other procedures.	Track Length 13.5NM 2.4NM longer than Option 3 but continuous climb enables optimum aircraft performance minimising fuel burn.	Track Length 23.9NM This option is double the length of Option 3 due to initial left hand turn routing aircraft to the north before tracking south for TEMP2.	Track Length 11.1NM Shortest Track length due to right hand turn south direct to TEMP2, continuous climb enables optimum aircraft performance minimising fuel burn.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved e.g. number of pilots requiring training (some may already be competent), variables in pilot competence (i.e. how much training the individual will require), airline policies on training in simulator versus live flight training, variables in aircraft performance, variables in on-board equipment and aircraft controls etc.	No additional training predicted.		It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for LJLA to assess the 'other costs' to commercial airlines of flying RNAV procedures due to significant variables; some airlines may already be 'PBN ready' whereas others may not.	It is not proportionate for LJLA to assess potential other costs for commercial airlines - there may be costs associated with maintaining legacy systems to continue flying conventional navigation but there are too many variables (e.g. aircraft types, on-board system capability etc.) to consider these effectively.		Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for LJLA to assess the 'other costs' to commercial airlines of flying RNAV procedures due to significant variables; some airlines may already be 'PBN ready' whereas others may not.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for LJLA to assess the 'other costs' to commercial airlines of flying RNAV procedures due to significant variables; some airlines may already be 'PBN ready' whereas others may not.	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Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	All options relate to the implementation of PBN and no additional infrastructure is required. The introduction of PBN reduces the reliance on infrastructure, in particular ground based navigation aids are no longer needed. The foundation for PBN is 'area navigation' or RNAV; aircraft arriving and departing LJLA using the proposed RNAV procedures will do so based on their performance based navigation capability.	Existing infrastructure is subject to rationalisation programme - no additional infrastructure is required to maintain extant conventional procedures however maintaining access to ground-based equipment may be prohibitively expensive.		No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	ICAO list Improved Operational Efficiency as a benefit delivered by the introduction of PBN. In general LJLA predicts that operational efficiency will improve and that there may be potential for a net reduction in operational costs. It is expected that any change in operational costs will be the same regardless of which option is chosen. This will be considered further at Full Options Appraisal stage.	No change to operational costs are attributable to maintaining the extant procedures except possibly in the case of infrastructure (see above).		Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	Deployment costs are attributable to the introduction of PBN/RNAV procedures rather than the individual IFP options themselves. Costs will include ATCO training and competency (based on understanding aircraft performance and ATC procedures relating to RNAV), Aerodrome documentation and procedures updates (e.g. MATS Pt2 updates, chart updates, payment to CAA, Procedure Validation and Simulator Costs).			Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	One benefit of the introduction of PBN is the improvement in safety and in fact ICOA declare it as is one of the primary reasons for a state to implement PBN. An individual safety assessment has been carried out for each option but in general, LJLA's intention to introduce RNAV approaches delivers a safety benefit to the airport and its users.	The baseline assumption is that current operations at LJLA are safe including use of the extant conventional and RNAV procedures.	Not assessed, rejected at DPE stage	Not Significant Conflict with transition procedures managed by vertical separation. Conflict with Hawarden traffic to be managed by climb gradient and minimum altitude waypoint.	Not Significant Conflict with transition procedures managed by vertical separation. Some conflict with Manchester current procedures; managed through coordination with Manchester ACP development.	Not Significant Conflict with transition procedures managed by vertical separation. Conflict with Hawarden traffic managed by climb gradient requirement and minimum altitude waypoint.	Not Significant Conflict with transition procedures managed by vertical separation.	Not Significant Conflict with transition procedures managed by vertical separation.	Not Significant Conflict with transition procedures managed by vertical separation. Conflict with Hawarden traffic managed by climb gradient requirement and minimum altitude waypoint.	Not Significant Conflict with 09 Approach MAP managed by vertical separation. Conflict with Manchester MIRSI hold to be managed through coordination with Manchester ACP development. Conflict with Hawarden traffic managed by climb gradient requirement and minimum altitude waypoint.	Not Significant Conflict with 09 Approach MAP managed by vertical separation. Conflict with Manchester MIRSI hold to be managed through coordination with Manchester ACP development. Conflict with Hawarden traffic managed by climb gradient requirement and minimum altitude waypoint.	Not Significant Conflict with Manchester IFPs to be managed by coordination with Manchester ACP development.	Not Significant Conflict with 09 Approach MAP managed by vertical separation. Conflict with Manchester IFPs to be managed through coordination with Manchester ACP development. Conflict with Hawarden traffic managed by climb gradient requirement and minimum altitude waypoint.	Not Significant Conflict with 09 Approach MAP managed by vertical separation. Conflict with Manchester IFPs to be managed through coordination with Manchester ACP development. Conflict with Hawarden traffic managed by climb gradient requirement and minimum altitude waypoint.	Not Significant Conflict with Manchester IFPs to be managed through coordination with Manchester ACP development.	Not Significant Conflict with Manchester IFPs to be managed through coordination with Manchester ACP development. Conflict with Hawarden traffic managed by climb gradient requirement and minimum altitude waypoint.	Not Significant Conflict with 09 Approach MAP managed by vertical separation. Conflict with Manchester IFPs to be managed through coordination with Manchester ACP development.	Not Significant Conflict with Manchester IFPs to be managed through coordination with Manchester ACP development. Conflict with Hawarden traffic managed by climb gradient requirement and minimum altitude waypoint.

INITIAL OPTIONS APPRAISAL

KEY		Reason for Category
	Carry Forward	Meets objectives, insignificant impact, and is the Preferred Option for this procedure
	Carry Forward	Meets objectives or has an insignificant impact but is less attractive
	Reject	Fails to meet one or more objectives or has a significant impact that cannot b

				Only one practical option for most direct transition.	Only one practical option for most direct transition.	Track miles and noise are as low as reasonably practicable within the constraints. Preferred Option.	Less attractive, greater track miles and more people overflown however this option is required as an alternative when MAN using Runway 05.	Only one practical option for most direct transition.	Only one practical option for most direct transition.	Only one practical option for most direct transition.	Replaced by Post Engagement Approach 27 Option 1b - new hold position preferred by stakeholders and met more objectives	Offers fewest practical track miles, the minimal exposure to noise and people over the ground - amended original Option 1 with stakeholder input.	This Option was rejected at the DPE stage due to unacceptable safety impact on Hawarden Aerodrome.	Does not minimise noise or overflight of residential areas; potential for increased fuel burn due to continuous descent not always being possible	Does not minimise noise or overflight of residential areas; Option 3 position of hold preferred over this option, subsequently replaced by post engagement Approach 09 Option 3b	Does not minimise noise or overflight of residential areas; Option 3 position of hold preferred over this option, subsequently replaced by post engagement Approach 09 Option 3b	Replaced by post engagement Approach 09 Option 3b with new hold over the sea	Preferred by stakeholders following amendment to the position and orientation of the hold to keep aircraft over the sea
Group	Impact	Level of Analysis	High-level Appraisal for the introduction of PBN/RNAV	Trans 27 DIOUF	Trans 27 NOMSU	Trans 27 VEGUN	Trans 27 VEGUN (CC05)	Trans 09 DIOUF	Trans 09 NOMSU	Trans 09 VEGUN	Approach 27 Option 1	Post Engagement Approach 27 Option 1b	Approach 27 Option 2	Approach 27 Option 3	Approach 09 Option 1	Approach 09 Option 2	Approach 09 Option 3	Post Engagement Approach 09 Option 3b
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	In general RNAV procedures are predicted to reduce noise exposure versus extant conventional procedures due to the facilitation of continuous climb/descent profiles and optimum aircraft performance. However it is not always possible to deliver these characteristics and each Option has been assessed to determine whether noise is minimised through these measures. The assessment also assessed the exposure of communities to noise i.e. whether the option minimises overflight of sensitive areas, public spaces and parks, built up environments and residential areas. Consideration of the altitude and flight profile (below 7000ft) has also been included.	Flown at optimum aircraft performance; minimises noise. The procedure passes over two small country parks, above 2,000 ft. Overflies residential areas of Crosby and Liverpool in the vicinity of a number of schools and close to hospitals, but aircraft will be at above 5,000 ft and in the descent, so will have reduced noise commensurate with lower power settings. Routing is planned over industrial areas and close to the motorways, with higher ambient noise. The procedure has been designed to enable a more continuous descent but height restrictions at NEW3 to deconflict from Manchester arrival traffic means the descent profile flown is not optimum. Only one option available to provide most direct route and to comply with en-route structure - FASI(N).	Procedure has been designed to be flown at optimum aircraft performance and includes an improved descent profile, although height restrictions at NEW3 due to Manchester arrival traffic restricts the use of a continuous descent profile which prevents minimising of noise. The procedure also passes over two small country parks, above 2,000 ft. The procedure overflies residential areas of Liverpool in the vicinity of a number of schools and close to hospitals, but at altitudes greater than 4,000 ft. Overflies residential areas of Wallasey, Liverpool and Huyton during the descent, so will have lower power settings. Routing is planned over industrial areas and close to the motorways, with higher ambient noise.	The procedure routes close to schools in Broughton and Chester, but at heights in excess of 3,000 ft. The procedure overflies Delamere Forest Park. The procedure routes over mainly rural locations, with the exception of residential areas in Broughton and Chester, where aircraft will be at, or above, 3,000 ft. The procedure does not incorporate a continuous descent profile due to a height restriction of 3,000 ft at NEW7 to deconflict from Manchester departures, requiring an increased engine power setting. This restriction is to comply with enroute requirements (FASI (N)). Two options for transition via VEGUN are available with this option (18) having the lower impact – however both are required – Trans 27 VEGUN (CC05)	Overflies two schools and the periphery of Clatterbridge Hospital in the Wirral, although aircraft will be above 5,000 ft at this point. Overflies residential areas of Liverpool, Birkenhead, and Huyton, in the vicinity of schools and hospitals, but at altitudes greater than 4,000 ft. Passes over two small country parks, above 2,000 ft. Height restriction of 4,000 ft at NEW3 due to Manchester arrival traffic restricts the use of a continuous descent profile, requiring an increased engine power setting. Increased track miles versus other option; increases the time below 7,000 ft. Although the other option has a lower noise impact that this one, this alternative routing is required for use when Manchester Airport is operating on Runway 05 to deconflict with Manchester arrivals.	The routing of this procedure is in the vicinity of several schools, in particular in the Crosby area. However, at this stage aircraft will be at, or above, 7,000 ft. Aircraft will descend below 7,000 ft in the vicinity of Crosby, just prior to coasting out. Aircraft will be a continuous descent so will have a minimum engine power setting. The aircraft will remain over the sea for the remainder of the Transition to the IAP. The design of this option minimises noise in so far as reasonably practicable. Only one option is available to meet enroute requirements.	The procedure remains over the sea at all times therefore noise impact is negligible. Only one option is available to meet enroute requirements.	The procedure does not directly overfly any sensitive areas but routes in the vicinity of a number of schools in rural villages. Incorporates a continuous descent profile to reduce engine power settings. The route represents the minimum practicable route to reduce track miles flown although passes over several small village locations at approximate altitudes of 3,000 ft and above. Only one practical option is available to meet enroute requirements.	Flown at optimum aircraft performance and with continuous descent profile to minimise noise. The procedure flies over, or close to, a number of schools in the built-up areas of Warrington and Runcorn on final approach. This is unavoidable as aircraft must line up to the runway. The missed approach procedure routes in the vicinity of a number of schools, hospitals and residential areas in Liverpool at 2,000 ft; The MAP is an emergency procedure rarely used so low probability of noise impact for this element of the procedure.	Flown at optimum aircraft performance and with continuous descent profile to minimise noise. The procedure flies over, or close to, a number of schools in the built-up areas of Warrington and Runcorn on final approach. The missed approach procedure routes over Eastham Country Park and in the vicinity of a number of schools in Bebington and Birkenhead at or above 2,500 ft. The missed approach procedure briefly overflies a residential area of Bebington and Birkenhead. The majority of the missed approach procedure is flown over rural parts of the Wirral and the hold is positioned over the sea. The MAP is an emergency procedure rarely used so low probability of noise impact for this element of the procedure.	Rejected at DPE/Safety Assessment Stage	Potential for aircraft to spend extended periods in level flight at 2,000 ft on the approach with increased engine power setting. Continuous descent profile not always possible due to sequencing with other traffic and so does not minimise noise. The procedure overflies residential areas of Warrington and Runcorn, potentially in level flight at 2,000 ft. The missed approach procedure overflies residential areas of Liverpool, also at 2,000 ft. The MAP is an emergency procedure rarely used so low probability of noise impact for this element of the procedure.	Flown at optimum aircraft performance and with continuous descent profile to minimise noise. The procedure flies over, or close to, a number of schools in residential areas of Heswall and Bebington on final approach. The missed approach procedure routes in the vicinity of a number of schools in Runcorn and Frodsham, not below 2,500 ft. The MAP is an emergency procedure rarely used so low probability of noise impact for this element of the procedure. This option is the shortest possible route for approach to runway 09 so minimises noise versus the other options.	Flown at optimum aircraft performance and with continuous descent profile to minimise noise. The procedure flies over, or close to, a number of schools in residential areas of Heswall and Bebington on final approach. The missed approach procedure routes in the vicinity of a number of schools and residential areas in Runcorn, Warrington and Widnes, not below 2,500 ft. Incorporates a continuous descent profile and represents the most direct routing to minimise people overflown.	Flown at optimum aircraft performance and with continuous descent profile to minimise noise. However, this Option flies over, or close to, a number of schools in residential areas of Heswall and Bebington on final approach. The missed approach procedure routes in the vicinity of a number of schools and residential areas in Runcorn, Warrington, Huyton, Liverpool and Birkenhead, and over or close to hospitals in Prescot and Liverpool, including Alder Hey Children’s Hospital, not below 2,500 ft. Does not minimise noise for sensitive areas.	Flown at optimum aircraft performance and with continuous descent profile to minimise noise. The procedure flies over, or close to, a number of schools in residential areas of Heswall and Bebington on final approach. The missed approach procedure routes in the vicinity of a number of schools in Runcorn, Warrington, Huyton, Liverpool and Birkenhead, and over or close to hospitals in Prescot and Liverpool, including Alder Hey Children’s Hospital, not below 2,500 ft. The MAP is an emergency procedure rarely used so low probability of noise impact for this element of the procedure. The procedure has been designed to incorporate a continuous descent profile and represents the most direct routing to minimise track miles flown, but overflies residential areas of Runcorn, Warrington, Huyton, Liverpool and Birkenhead, not below 2,500 ft. The hold is positioned so aircraft remain over the sea to minimise noise exposure.
Communities	Air Quality	Initial Options Appraisal: Qualitative	Most of the area around LJLA is within an Air Quality Management Area (AQMA) and the airport has partnered with Liverpool City Council (LCC) to measure AQ for over 10 years. Engagement to date with the environmental health authorities at Halton Borough Council and LCC suggests that no changes are expected as no changes to the baseline are expected below 1000ft for any of the options; therefore no change in air quality is predicted. Aircraft currently descend below 1000ft on final approach commensurate with runway orientation; and Aircraft depart up to 1000ft on the same track as they do currently. One of the stated benefits of the introduction of RNAV procedures is reduced environmental impact due in part to continuous climb/descent. It is predicted that the initial climb/ final approach segments of flight will be the same as extant procedures but this will be tested during the full options appraisal in order to quantify any change in air quality.	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline.		No change to baseline	No change to baseline	No change to baseline	No change to baseline	No change to baseline
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	Reduced environmental impact is one of the benefits listed by ICAO of introducing PBN, and RNAV flight procedures. The Options have been assessed individually to determine whether they have the potential to minimise emissions through optimum aircraft configuration (engine power settings), use of continuous climb/descent profiles, utilisation of shortest practical routes etc. In general, the introduction of RNAV flight procedures is predicted to reduce environmental impact over extant ground/equipment based navigation procedures.	The procedure has been designed to be flown at optimum aircraft performance and includes a continuous descent profile. The extended ‘S’ profile increases track miles flown but this is required to allow the improved descent profile given the aircraft’s altitude at the beginning of the Transition. Height restrictions at NEW3 to deconflict from Manchester arrival traffic means the descent profile flown is not optimum. This restriction is to comply with FASI (North) requirements. Aircraft in descent with lower power settings. Minimise emissions so far as is practicable based on FASI (N) constraints.	This procedure represents the most direct route from NOMSU to the IAP. The procedure has been designed to be flown at optimum aircraft performance and includes an improved descent profile, although height restrictions at NEW3 due to Manchester arrival traffic restricts the use of a continuous descent profile. This restriction is to comply with FASI (North) requirements. Aircraft in descent with lower power settings. Minimise emissions so far as is practicable based on FASI (N) constraints.	The procedure represents the most direct routing from VEGUN, minimising the track miles flown. The height restriction of 3,000 ft at NEW7 is required to separate from Manchester departures and hence the descent profile is not continuous, requiring an increased engine power setting. This restriction is to comply with FASI (North) requirements. Aircraft in descent with lower power settings. Minimise emissions so far as is practicable based on FASI (N) constraints	This procedure routes to the north of the airport, increasing the track miles flown. A height restriction of 4,000 ft at NEW3 due to Manchester arrival traffic restricts the use of a continuous descent profile. This routing is required when Manchester Airport is operating on Runway 05 to deconflict with Manchester arrivals. The height restriction is to comply with FASI (North) requirements.	Represents shortest safe route from DIOUF; A more direct track could reduce the number of track miles flown by approximately 4 nm but would require more turns by the aircraft during a busy period of the flight, so could have an adverse effect on Safety. Therefore minimises emissions through the use of continuous descent and incorporating fewer turns to reduce impact on safety.	The procedure incorporates a continuous descent profile at optimum aircraft performance and minimises the track miles flown; Minimises emissions.	The procedure incorporates a continuous descent profile at optimum aircraft performance and minimises the track miles flown; Minimises emissions.	The procedure has been designed to be flown at optimum aircraft performance and with the minimum practicable track miles flown.	The procedure has been designed to be flown at optimum aircraft performance. Extended track miles are flown due to positioning the hold over the sea to the west of the Airport. However, the MAP is an emergency procedure, seldom used, but will allow the crew a period of stable flight in order to deal with any issues.		This procedure uses the existing waypoint INVEB as an Intermediate Fix, thus increasing the number of track miles flown. There is also the potential for aircraft to spend extended periods in level flight at 2,000 ft on the approach (depending on clearances) leading to increased power settings and greater emissions. The missed approach procedure represents the minimum practicable track miles flown; ; The MAP is an emergency 'go-around' procedure seldom used, but by its nature may require maximum engine power setting.	The procedure incorporates a continuous descent profile, to be flown at optimum aircraft performance and represents the most direct flight path. Minimises track miles and emissions. The MAP is an emergency 'go-around' procedure seldom used, but by its nature may require maximum engine power setting.	The procedure incorporates a continuous descent profile, to be flown at optimum aircraft performance and represents the most direct flight path. The final and missed approach procedure represents the minimum number of track miles flown and minimises emissions; The MAP is an emergency 'go-around' procedure seldom used, but by its nature may require maximum engine power setting.	The procedure incorporates a continuous descent profile, to be flown at optimum aircraft performance and represents the most direct flight path. The Missed Approach Procedure routes the aircraft back to the re-join the approach procedure which is a greater distance than the current hold. The MAP is an emergency 'go-around' procedure seldom used, but by its nature may require maximum engine power setting.	The procedure incorporates a continuous descent profile, to be flown at optimum aircraft performance and represents the most direct flight path. The approach procedure represents the minimum number of track miles flown. Although the Hold for the Missed Approach Procedure is further than the current conventional hold position; The MAP is an emergency 'go-around' procedure seldom used, but by its nature may require maximum engine power setting.
Wider Society	Capacity and resilience	Initial Options Appraisal: Qualitative	Generally, the introduction of PBN is based on delivering benefits in terms of increasing airspace capacity leading to more predictable routes, fewer on-ground and in-air delays experienced by airlines. The completion of the entire route from airport to destination via PBN leads to a more effective route structure. The implementation of PBN is currently the highest priority for the global aviation community.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.		The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	The procedure has been designed to integrate with the en-route structure.	No change to baseline
General Aviation	Access	Initial Options Appraisal: Qualitative	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements. Access to the runway may be slightly improved via a reduction in on-ground and in-air delays brought about by the introduction of PBN.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.		No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.	No change to existing airspace arrangements. Procedure wholly contained within extant CAS; no change to GA access to airspace. GA users of LJLA will continue to arrive and depart under extant operational arrangements.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Initial Options Appraisal: Qualitative	Generally, the introduction of PBN is based on delivering benefits in terms of increasing airspace capacity leading to more predictable routes, fewer on-ground and in-air delays experienced by airlines. This may have an economic benefit to airlines in the context of being an enabler for increased air transport movements, passenger numbers and cargo tonnage carried. It is not proportionate for LJLA to predict the precise economic benefit to commercial airlines using the new procedures as any increase in individual airline capacity will depend on private commercial business characteristics. It is not proportionate for LJLA to assess the economic benefit to the GA community however they are expected to benefit from increased predictability of commercial airline movements which is predicted to lead to reduced on-ground and in-air delays for all users which may have a positive impact on GA costs.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.		This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.	This is a PBN/RNAV procedure and contributes to the delivery of associated benefits including increased effective capacity which is predicted to have direct and indirect economic benefits for airlines and general aviation.
General Aviation / commercial airlines	Fuel burn	Initial Options Appraisal: Qualitative	Each option has been assessed against other options based on whether any factors of the design might contribute to increased fuel burn. In general the introduction of RNAV procedures and associated predictability of tracks, continuous climb/descent, reduction in tactical intervention is predicted to result in reduced fuel burn versus the baseline.	Most practical and expeditious route, continuous descent, optimum aircraft performance minimises fuel burn for this procedure.	Only one practical and expeditious route; however continuous descent is limited by necessary height restrictions to coordinate with Manchester arrivals and comply with FASI (N) constraints, optimum aircraft performance may not be possible and increased fuel burn versus other transitions.	Most practical and expeditious route; however continuous descent is limited by necessary height restrictions to coordinate with Manchester arrivals and comply with FASI (N) constraints, optimum aircraft performance may not be possible and increased fuel burn versus other transitions is predicted.	Longer route required to coordinate with Manchester arrivals when Manchester are using runway 05; continuous descent is limited by necessary height restrictions to coordinate with Manchester and comply with FASI (N) constraints, optimum aircraft performance may not be possible and increased fuel burn versus other transitions is predicted.	Most practical and expeditious route, continuous descent, optimum aircraft performance minimises fuel burn for this procedure.	Most practical and expeditious route, continuous descent, optimum aircraft performance minimises fuel burn for this procedure.	Most practical and expeditious route, continuous descent, optimum aircraft performance minimises fuel burn for this procedure.	Flown at optimum aircraft performance and with continuous descent profile to minimise fuel burn.	Flown at optimum aircraft performance and with continuous descent profile to minimise fuel burn. Offers fewest possible track miles for 27 Approach.		Continuous descent profile not always possible due to coordination with other airspace users, leading to increased fuel burn over other options.	Flown at optimum aircraft performance and with continuous descent profile to minimise fuel burn.	Flown at optimum aircraft performance and with continuous descent profile to minimise fuel burn.	Flown at optimum aircraft performance and with continuous descent profile to minimise fuel burn. Represents shortest route for this procedure.	Flown at optimum aircraft performance and with continuous descent profile to minimise fuel burn. Represents shortest route for this procedure although possible increased fuel burn for the missed approach procedure to reach new hold over the sea. The MAP is an emergency procedure requiring maximum engine power settings but it is typically rarely used.
Commercial airlines	Training costs	Initial Options Appraisal: Qualitative	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved e.g. number of pilots requiring training (some may already be competent), variables in pilot competence (i.e. how much training the individual will require), airline policies on training in simulator versus live flight training, variables in aircraft performance, variables in on-board equipment and aircraft controls etc.	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)		It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)	It is expected that Pilot/Crew Training will be required to enable pilots to flight the new RNAV procedures. It is not proportionate for LJLA to assess training costs for individual commercial airlines due to the significant variables involved (see General Appraisal of PBN/RNAV)
Commercial airlines	Other costs	Initial Options Appraisal: Qualitative	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for LJLA to assess the 'other costs' to commercial airlines of flying RNAV procedures due to significant variables; some airlines may already be 'PBN ready' whereas others may not.	Other costs to commercial airlines may include updates to Flight Management Systems (FMS), navigation databases and operating procedures, increased pilot hire costs versus training etc. It is not proportionate for LJLA to assess the 'other costs' to commercial airlines of flying RNAV procedures due to significant variables; some airlines may already be 'PBN ready' whereas others may not.	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Airport / Air navigation service provider	Infrastructure costs	Initial Options Appraisal: Qualitative	All options relate to the implementation of PBN and no additional infrastructure is required. The introduction of PBN reduces the reliance on infrastructure, in particular ground based navigation aids are no longer needed. The foundation for PBN is 'area navigation' or RNAV; aircraft arriving and departing LJLA using the proposed RNAV procedures will do so based on their performance based navigation capability.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.		No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.	No additional infrastructure required (see High Level Appraisal of PBN/RNAV.
Airport / Air navigation service provider	Operational costs	Initial Options Appraisal: Qualitative	ICAO list Improved Operational Efficiency as a benefit delivered by the introduction of PBN. In general LJLA predicts that operational efficiency will improve and that there may be potential for a net reduction in operational costs. It is expected that any change in operational costs will be the same regardless of which option is chosen. This will be considered further at Full Options Appraisal stage.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.		Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.	Operational Costs are not predicted to vary by individual option.
Airport / Air navigation service provider	Deployment costs	Initial Options Appraisal: Qualitative	Deployment costs are attributable to the introduction of PBN/RNAV procedures rather than the individual IFP options themselves. Costs will include ATCO training and competency (based on understanding aircraft performance and ATC procedures relating to RNAV), Aerodrome documentation and procedures updates (e.g. MATS Pt2 updates, chart updates, payment to CAA, Procedure Validation and Simulator Costs).	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.		Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.	Deployment costs are not predicted to vary by individual option.
Safety Assessment	Safety Assessment	Initial Options Appraisal: Qualitative	One benefit of the introduction of PBN is the improvement in safety and in fact ICOA declare it as is one of the primary reasons for a state to implement PBN. An individual safety assessment has been carried out for each option but in general, LJLA's intention to introduce RNAV approaches delivers a safety benefit to the airport and its users.	Not Significant Conflict with Manchester MIRSI hold to be managed through coordination with Manchester ACP development. Multiple aircraft at different speeds managed tactically through vectoring, sequencing and hold procedures. Conflict with SIDs managed by vertical separation.	Not Significant Conflict with Manchester MIRSI hold to be managed through coordination with Manchester ACP development. Multiple aircraft at different speeds managed tactically through vectoring, sequencing and hold procedures. Conflict with SIDs managed by vertical separation.	Not Significant Multiple aircraft at different speeds managed tactically through vectoring, sequencing and hold procedures. Conflict with Manchester 05 traffic maaged by alternative Transition 27 VEGUN (CC05)	Not Significant Multiple aircraft at different speeds managed tactically through vectoring, sequencing and hold procedures. Conflict with Manchester MIRSI hold to be managed through coordination - thei Transition only used when Manchester on 05. Conflict with SIDs managed by vertical separation.	Not Significant Multiple aircraft at different speeds managed tactically through vectoring, sequencing and hold procedures. Conflict with Manchester MIRSI hold to be managed through coordination with Manchester ACP development. Conflict with new hold for 09 Approach manged through altitude restrictions.	Not Significant Multiple aircraft at different speeds managed tactically through vectoring, sequencing and hold procedures.	Not Significant Multiple aircraft at different speeds managed tactically through vectoring, sequencing and hold procedures.	Not Significant MAP conflict with other aircraft on 27 Approach managed by hold located at WAL. Conflict with GA traffic managed by containment of IFPs in Controlled Airspace (this is a pre-existing hazard, not unique to this option).	Not Significant MAP conflict with other aircraft on 27 Approach managed by hold located at WAL. Conflict with GA traffic managed by containment of IFPs in Controlled Airspace (this is a pre-existing hazard, not unique to this option). Conflict with transition procedures managed by vertical separation.	Unacceptable impact on Hawarden Airport. MAP exits Controlled Airspace to the south and enters Hawarden ATZ/RMZ. MAP conflict with other aircraft on 27 Approach managed by hold located at WAL. Conflict with GA traffic managed by containment of IFPs in Controlled Airspace (this is a pre-existing hazard, not unique to this option).	Not Significant MAP conflict with other aircraft on 27 Approach managed by hold located at WAL. Conflict with GA traffic managed by containment of IFPs in Controlled Airspace (this is a pre-existing hazard, not unique to this option). Conflict with Manchester procedures managed by coordination with Manchester ACP development.	Not Significant MAP conflict with Manchester traffic managed through coordination with Manchester ACP development.	Not Significant MAP conflict with Manchester traffic managed through coordination with Manchester ACP development.	Not Significant MAP conflict with Manchester traffic managed through coordination with Manchester ACP development.	Not Significant New proposed hold conflicts with DIOUF 09 transition managed by altitude restrictions on the transition.