Ministry of Defence

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Defence Equipment & Support

C17 CSAE DT

Aerial Delivery Equipment

LARGE BOAT AERIAL DELIVERY (LBAD)
TOP LEVEL TEST AND EVALUATION PLAN

Doc No: EMP-ADE/LBAD/TEP

Version: 1.1

Effective Date: 19/09/2023

Equipping and Supporting our Armed Forces

Record of Version of the GEAR Review Report

Version No.	Version Date	Brief Version Description	Change Control
1.0			Initial Issue
1.1	19 Sep 23	Updated from signed QQ LR	

References

Source	Reference	Issue	Date
Large Boat Aerial Delivery (LBAD) System Top Level Test Plan Document Set	QinetiQ/EMEA/AS/LR230527/1	1	19 May 23

SIGNATURES PAGE

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Introduction

Document Purpose: All Test and Evaluation activities will be undertaken by an Independent Test and Evaluation (ITE) Organisation contracted by the C17CSAE DT. The Purpose of this high-level plan is for industry to understand what activities will be undertaken during the specified ground assessment and flight test phases for the proposed Large Boat Aerial Delivery System (LBAD).

Additionally, the provision of a high-level test plan will help to ensure that each supplier understands that all systems submitted for evaluation will be assessed using, where possible, comparable activities.

Test Plan Philosophy and Reasoning

The format of the test plan by the ITE, was influenced by the Requirements documents, which enabled the generation of overarching testing requirements; presented below as a three-part document-set. A 'general' philosophy has been applied to allow for the preparation of test serials based on typical attributes of a Heavy Equipment (HE) airdrop system.

The test plan document-set considers desktop analysis, practical ground-based assessments and flight testing of a notional HE airdrop system. Due to the undetermined solution for LBAD, at this planning stage, the breakdown of testing does not attempt to accurately specify the necessary testing period, or the number of test serials required. Instead, the ITE presented information based on its test involvement with other HE airdrop systems (as previously assessed by the Air Test and Evaluation Centre (ATEC)). For example, experience has established that a nine-sortie airdrop programme, which would typically include drops in single, split stick and sequential configurations - at a range of load masses and despatch speeds, could be sufficient. However, it is emphasised that the figure of nine sorties is notional and will increase for some, or all, LBAD contending systems - depending on their complexity and degree of aerial delivery novelty. Conversely, should a contending LBAD system be suitably similar to an in-Service system then the number of incremental steps within its test programme could remain at nine-sorties.

The following test plans have been presented as part of this Top-Level Plan:

- LBAD System Overarching Test and Evaluation (T&E) Plan, presented at Appendix A.
- Estimated Ground Assessment Plan, presented at Appendix B.
- Estimated Flight Test Plan, presented at Appendix C.

In order to accelerate meeting Defence requirements for the LBAD system, the project has been split into 2 distinct Flight Trial objectives.

- LBAD Phase 1
    - Single or double despatch of Maritime Interdiction Craft (Medium) (MIC(M))
        - With and without parachutists following
- LBAD Phase 2
    - Single or double despatch of all specified payloads
        - With and without parachutists following
    - Sequential despatch of applicable payloads

Acronyms/Abbreviations

Acronym	Definition	Acronym	Definition
47 AD	47 Air Despatch Squadron	GRS	Guide and Restraint System
ACHE	Air Cargo Handling Equipment	HE	Heavy Equipment
AD&S	Airbus Defense and Space	IATA DGRs	International Air Transport Association Dangerous Goods Regulations
ADDB	Aerial Delivery Database	IMDG	International Maritime Dangerous Goods
ADEI	Aerial Delivery Equipment Inspector	ICD	Interface Control Document
ADR	International Carriage of Dangerous Goods by Road Regulations	ITE	Independent test and Evaluation
AE	Airborne Equipment	in	inches
agl	Above Ground Level	ITN	Invitation To Negotiate
AMOVP	Allied Movements Publication	JSP	Joint Service Publication
AOC	Air Officer Commanding	KCAS	Knots Calibrated Air Speed
AP	Air Publication	kg	kilogram
AT	Air Transport	LBAD	Large Boat Aerial Delivery
ATEC	Air Test and Evaluation Centre	LM	Load Master
AUM	All Up Mass	LOLER	Lifting Operations and Lifting Equipment Regulations
C17CSAE DT	C17 Combat Support and Airborne Equipment Delivery Team	LPB	Littoral Patrol Boat
CAD	Computer Aided Design	LW	Landing Weight
CARP	Calculated Aerial Release Point	MAA	Military Aviation Authority
cb	centre of balance	MHE	Manual Handling Equipment
CG	Centre of Gravity	MIC	Medium Interdiction Craft
CH	Cargo Hold	MOB	Main Operating Base
CHS	Cargo Hold System	MOD	Ministry of Defence
CLP	Cargo Load Plan	MPRS	Medium Platform Rigging Scheme
COC	Certificate of Conformity	PA	Pressure Altitude
COD	Certificate of Design	RA	Regulatory Article
COSHH	Control of Substances Harmful to Health	RF	Radio Frequency
CST	Chute Selection Table	RID	International Carriage of Dangerous Goods by Rail
daN	DekaNewton	RLC	Royal Logistics Corps
DAOS	Design Approved Organisation Scheme	RPC	Riverine Patrol Craft
DDP	Declaration of Design and Performance	RRS	Roller Restraint System
DE&S	Defence Equipment and Support	RTS	Release To Service
DefCon	Defence Condition	SOD	System Operation Document
DefStan	Defence Standard	SMP	Safety Management Plan
DGM	Dangerous Goods Manual	SR	System Requirement
DO	Design Organisation	SRD	System Requirements Document
DOB	Deployed Operating Base	STANAG	Standard NATO Agreement
DOSG	Defence Ordnance Safety Group	T&E	Test and Evaluation
DSLR	Defence Land Safety Regulator	TOW	Take-Off Weight
DZ	Drop Zone	USL	Underslung Load

EASA CS	European Aviation Standards Agency Certification Specification	USLC	Underslung Load Clearance
EED	Electrical Explosive Device	VfM	Value for Money
EPES	Extraction Parachute Ejector System	V_{LSAD}	Limiting Speed for Aerial Delivery
EW	Electronic Warfare	VMC	Visual Meteorological Conditions
FDM	Flight Data Monitoring	VVRM	Verification and Validation Matrix
ft	Feet	WBM	Weight and Balance Manual
FW	Fixed Wing	ZFM	Zero Fuel Mass
GIP	Ground Impact Point		

Table 1: Acronyms & Abbreviations

ANNEX A – LBAD System Overarching Test & Evaluation (T&E) Plan

1. This table has been developed by the ITE using the Requirements Documents to begin formulation of the Assessment and Test Plans for the LBAD System campaign. The SRD remains the overriding Authority document and the ITE produced documentation will be translated into a resultant score in accordance with the Verification and Validation Matrix (VVRM) Scoring Criteria.

2. The scope of the T&E approach will be to evaluate the LBAD System in the following areas:
    a. Preparation and construction
    b. Installation phase (this T&E Plan assumes that two LBAD loads can be carried and despatched, either singly or as a sequential pair)
    c. Deployment and airdrop phase
    d. Drop zone procedures
    e. Operational Drop Zone (DZ) procedures
    f. Air land and abort options

3. Other boundaries can be considered if required but for the purposes of this matrix are considered out of scope for the initial evaluation of the as-presented LBAD system.

4. ITE envisaged rating, has been derived from experience against previous in-service systems as the priority criteria but does not outweigh the priorities set within the SRD.

5. This table refers to Design Organisation (DO)-supplied documentation, which has should be incorporated into the Supplier Tender response as detailed within the LBAD ITN Pack. Any reference to DO-supplied documentation should not be confused with the ITE derived System Operation Document (SOD) that will be produced using the DO-supplied information to produce and inform the UK specific procedures.

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
1	The Tenderer/Design Organisation (DO) is to be Design Approved Organisation Scheme (DAOS) accredited or national equivalent if non-UK.	Confirmation of accreditation status by MOD Commercial	N/A	• UK DAOS Approval (scope of which is relevant to the product supplied). • Reference associated Military Aviation Authority (MAA) Regulatory Articles (RA)	• A design approved organisations certificate required at Tender submission. • A design approved organisations certificate specific to the scope of supply required before Flight Trials commence.	Mandatory	Supplier is expected to be involved in any modification process to maintain integrity of Certificate of Design. (SRD ID #6.5, 6.29, 7.5)

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
2	The DO will provide documentation detailing: • Method of operation and a system suitability argument. • Pre and post-drop maintenance procedures. • Preparation information. • Load rigging information. • Load installation information. • De-rigging information. • Platform recovery information. • Storage criteria • Serviceability Checklists • Lifing	Desktop evaluation by ITE • Verified during ground assessment • Verified during flight trials	DO-provided documents, as a minimum the DO will stipulate: • Overall system strength. • Payload restraint capability. • System description. • Equipment description. • Limitations/ restrictions of use.	DO-provided report in MS Office format. DefStans	Draft documents to be presented prior to ground assessment. Draft maintenance, pre and post-drop preparation, and rigging instructions will be required ahead of ground assessment. Documents will be used throughout the evaluation and will be used to develop the UK specific LBAD manuals for service use.	Essential	Draft documents will be evaluated and where required clarified by the DO DO to provide documentation and serviceability checklists to enable storage and lifing of equipment. (SRD ID #1.8, 1.9, 1.10, 1.25, 1.29, 5.1, 6.1)
3	The DO is to provide a Certificate(s) of Design (COD) and Certificate(s) of Conformity (COC) - or national equivalent if non-UK - for all items provided (including sub systems provided by sub-contractors) to support ground assessment.	Desktop evaluation of information by ITE	• Design Approval Certificate for Military Aircraft and Airborne Equipment. • Used to support ITE authorisation documents for ground assessments	Declarations of Design and Performance (DDPs), F100As or contractor equivalents which encompasses the presented system required by: • DefStans. • DefCons; • Associated RAs.	DO issued prior to trials to support ITE trials authorisation processes.	Essential	None
4	The DO is to provide a COD and COC for all items provided (including sub systems provided by sub-contractors) to support flight trials.	Desktop evaluation of information by ITE	• Design Approval Certificate for Military Aircraft and Airborne Equipment. • Used to support ITE authorisation documents for ground assessments	Declarations of Design and Performance (DDPs), F100As or contractor equivalents which encompasses the presented system required by: • DefStans.	DO issued prior to trials to support ITE trials authorisation processes.	Essential	None

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
				• DefCons; • Associated RAs.			
5	The platform or any of its ancillary items that may contain hazardous substances are to be listed and supported with appropriate paperwork.	Desktop evaluation of information by ITE	ITE, on behalf of the MoD, to assess the hazardous material contained within the item	• DefStan. • COSHH Regulations. • Air – DGM and IATA DGRs. • Road – ADR. • Rail – RID. • Sea – IMDG	Certification required for ground assessment.	Essential	All environmental aspects are to be iaw the C-17 CSAE DT environmental protocols. (SRD ID #1.15, 1.24, 4.13, 6.9, HF-034)
6	The DO is to provide an approval certificate to show that Explosives, Electro-Explosive Devices (EEDs). Specifications relating to explosives, EEDs, lasers and associated components, circuitry and wiring has been approved prior to issue by the safety regulator, if part of the proposed system.	Desktop evaluation of information by ITE	Acceptance by MOD	Associated RAs.	Certification required for ground assessment.	Essential	None
7	The system will meet existing environmental regulations and have minimal environmental impact.	Desktop evaluation of information by ITE	Acceptance by MOD	• DefStans. • DefCons; • Associated Ras • JSPs • Environmental Protection Act	Certification at tender submission	Essential	All environmental aspects are to be iaw the C-17 CSAE environmental protocols. (SRD ID #4.13)
8	The system shall be operable within the operating environmental limitations	Desktop evaluation of information by the DO	ITE, on behalf of the MoD	Atlas C Mk 1 RTS Figure B 2.1.1	Desktop analysis for ground assessment.	Mandatory	SRD states -54C to +55C outside air temperature dependant on altitude.
9	The platform is dimensionally compatible with the Atlas C Mk 1	• Desktop evaluation of information by ITE. • Measurement by ground assessment	Load to meet UK-Service ready access limits and/or Airbus certification standard	• APs. • DefStan. • A400M WBM	DO provided platform loading manuals required for ground assessment phase	Mandatory	In-Service ready access differs significantly from Airbus requirements for the clearance around a load

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
10	The platform system is to be compatible with and can be restrained in the X, Y and Z axes using the Guide and Restraint System (GRS) and Roller Restraint System (RRS) in conjunction with the X-Locks	• Design assessment via desktop study. • Ground assessment	Evidence from DO to be reviewed by ITE on behalf of the MOD	• DefStan • Demonstrated compatibility with CHS, GRS and ability to engage all X-Lock required (transit). • iaw AD&S design limitations.	DO provided documentation	Mandatory	Roller line loading limits to be respected and the application of a planform load limit needs to be confirmed. Castellation information is provided in ICD pack to DOs to inform their design. To protect the GRS, X-Locks and roller conveyor from excessive line loading during the installation, despatch or offloading of platforms. AD&S certification has been based on the Type V castellation profile. (SRD ID #2.5, 2.6, 2.8, 2.9, 3.7, 3.9, 3.10)
11	The rigged load is able to meet the restraint requirements for aerial delivery systems.	Desktop evaluation of information by ITE	In line with UK service requirements	Airdrop restraint limitations to a minimum acceptable level as currently allowed by AOC 1 Group. • STANAG. • DefStan. • EASA CS	DO evidence required for ground assessment.	Mandatory	The payload must be secured within the platform to meet the required restraint criteria for the aircraft and ensure remains secure through all stages of the LBAD through transit, deployment and where necessary during landing (aborted drop). The System shall be restrained safely in flight up to first movement. (SRD ID# 1.30, 2.9, 3.8)
12	The airdrop system is to be capable of accepting the range of equipment	• Desktop evaluation of information by ITE.	Evidence to be gathered by the ITE on behalf of the MOD.	Computer Aided Design (CAD) drawings together with written evidence in MS Office	DO-evidence required for ground assessment. Confirmatory information to be	Mandatory	The All Up Mass (AUM) of a single platform, including its parachute

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
	requirement's for air transportation and aerial delivery. Mass between 3000 kg and 16 000 kg including parachutes and ancillary. Length between 8 ft and 24 ft	• Ground assessment	Centre of Balance (cb) data and example load rigging manuals to be provided by DO	format, supported by a sound scientific and mathematical argument.	accrued during evaluation		systems will not exceed 16 000 kg. The System shall not exceed the A/C shear and bending moment limitations and should remain within aircraft structural limitations. LBAD will enable the efficient use of load space and maximise the capability of AT to cater for the demands of future operations and equipment. It is envisaged that the system load envelope will allow for future payloads. (SR ID #1.7, 1.13, 3.13) Boats required for airdrop are as follows: Littoral Patrol Boat (LPB) Riverine Patrol Craft (RPC) Maritime Interdiction Craft (Medium) (MIC(M)) Maritime Interdiction Craft (Heavy) (MIC(H))
13	The System shall be compatible with following tailgate parachutist equipment	Desktop study on despatch procedure	Evidence to be gathered by the ITE on behalf of the MOD.	ITE Reporting Process	DO-evidence required for ground assessment.	Mandatory	The tailgate parachutist static lines should be able to be recoverable prior to despatch of a subsequent LBAD. (SRD ID #1.6)
14	The System shall provide multiple omni-directional attachment points at evenly distributed intervals, for the length and width of the platform, for	Desktop study of Platform DO evidence for restraint principle	Evidence to be gathered by the ITE on behalf of the MOD.	• DefStan. • STANAG.	DO-evidence required for ground assessment.	Mandatory	The platform mounted restraint points must be able to provide sufficient all-round restraint to suit the suite of equipment required for airdrop,

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
	payload restraint and development of rigging schemes						whist maintaining the necessary restraint requirements iaw the MPRS. Attachment points evenly spaced across length and width of platform, with identifiable safe working load labels (SRD ID #1.31, 6.2)
15	The System shall include attachment points capable of accepting 2 restraint 'devices', applied in opposite directions	Desktop study of Platform DO evidence for restraint principle	Evidence to be gathered by the ITE on behalf of the MOD.	• STANAG • DefStan.	DO-evidence required for ground assessment.	Highly Desirable	Flexibility in development of rigging schemes to maximise restraint. (SRD ID #1.32)
16	The System shall permit the use of in-Service restraint media used for payload restraint.	Ground assessments	• Evidence from DO to be reviewed by ITE on behalf of the MOD. • Direct assessment by ITE.	• APs	DO to provide evidence of compatibility or demonstration of new restraint media.	Highly Desirable	Tenderers will be required to supply a sample restraint equipment if they deem in- Service equipment unsuitable for evaluation by the authority The ability to utilise in-Service equipment will represent VfM (SRD ID # 2.7)
17	The AD system will not introduce any single points of failure at any point in the loading, transit and airdrop phase that may lead to a catastrophic outcome. The system must meet Safety Target for Airborne Equipment and the A400M	• Desktop study of Platform DO evidence. • Ground assessment. • Flight assessment	• Evidence from DO to be reviewed by ITE on behalf of the MOD. • DO Test evidence.	Atlas C Mk 1 SMP Part 2 Annex C	• DO provided DDP (or equivalent) to satisfy DefStan required for ground assessment phase. • DO provision of F100A and equipment certification documents.	Mandatory	
18	The un-rigged platform, its associated components and all	Desktop study of Platform DO evidence	Evidence to be gathered by the ITE on behalf of the MOD	• JSPs. • DefStan • NATO AMOVP	DO-provided transporting instructions	Essential	The LBAD system once stripped to its component

Serial	Requirement a	Method of Evaluation b	Evidence Condition c	Standard of Evidence and Reference d	Demonstration of Evidence e	ITE Envisaged Rating f	Notes/Remarks g
	ancillary items will be surface and air transportable either as a single entity or in its DO component part state. Appropriate instructions to be supplied.			• DSLR Regulations.	required for ground assessment.		parts or as a complete system must be deployable by air, sea and road transportable or in service UK Military transport, for pre-positioning at a DOB iaw with Operational directives. Once stripped to its component parts the system must be able to be re-constructed. (SRD ID #1.11, 1.12, 1.21, 1.22, 1.23, 1.24)
19	The system shall incorporate a payload specific airdrop cover in order to prevent snagging during the airdrop.	Desktop study of Platform DO evidence.	• Evidence from DO to be reviewed by ITE on behalf of the MOD. • Direct assessment by ITE.	ITE Reporting Process	Ground Assessment	Mandatory	The cover which is provided should not increase the maximum height of the payload to outside of the extraction load height limitations. The cover shall not limit access to the payload deck area when attached to the platform. (SRD ID #1.33, 1.37, 2.11)
20	The System shall be capable of being embarked/disembarked from ship to shore/shore to ship by crane lift and incorporates the suitable lifting points.	Desktop study of Platform DO evidence	• Evidence from DO to be reviewed by ITE on behalf of the MOD. • Direct assessment by ITE.	• JSPs	DO-evidence required for ground assessment	Mandatory	To allow Strategic movement of Materiel Identified and marked lifting points compliant with LOLER. (SRD ID # 1.16, 1.17)
21	The System shall have a minimal footprint and be capable of being moved and stacked for storage	Desktop study of DO-evidence in order to make an informed decision	• Evidence from DO to be reviewed by ITE on behalf of the MOD.	Road Transport regulations	DO provided instructions required for review.	Desirable	Minimum of 3 platforms to be stackable and will not produce undue stress of the lower platforms

Serial	Requirement a	Method of Evaluation b	Evidence Condition c	Standard of Evidence and Reference d	Demonstration of Evidence e	ITE Envisaged Rating f	Notes/Remarks g
	purposes						A minimum of 2 platforms stacked for road transport operations A suitable racking system could be considered, however, all systems must have security systems and the platforms must be compatible with in-Service Mechanical Handling Equipment (MHE). (SRD ID #1.18, 1.19, 1.20, 1.27, 2.10)
22	The System shall be capable of transportation by air as an underslung load by Rotary Wing aircraft.	Desktop study of DO-evidence in order to make an informed decision regarding USL capability (USL assessment not envisaged to be included in ground or flight trials programme)	• Evidence from DO to be reviewed by ITE on behalf of the MOD. • Direct assessment by ITE.	• iaw Under Slung Load Clearance (USLC) requirements	DO-evidence required for ground assessment	Desirable	The system shall be recoverable post airdrop from the DZ. (SRD ID #1.26)
23	The rigged load (at all masses) is able to be ground transported and cross-loaded on to an Atlas C Mk 1 using typical in-Service Aircraft Cargo Handling Equipment (ACHE)	Ground assessments	Evidence to be gathered by the ITE on behalf of the MOD	• JSPs. • DefStan	DO-evidence required for ground assessment	Mandatory	The User requires LBAD to be compatible with in-Service ACHE at the MOB or DOB. Current ACHE held by 47 AD Sqn RLC is the Truck Cargo Aircraft Loading (ATLAS 2000 MRL).
24	When presented with all of the associated platform equipment a single trained Aerial Delivery Equipment Inspector (ADEI) will be able to carry out a pre-drop or post drop inspection within	Rigging and maintenance assessment (as part of ground assessment)	Evidence to be gathered by the ITE on behalf of the MOD	ITE reporting process	• DO-provided servicing instructions required for ground assessment phase. • DO documents will form the basis for UK Service documents and manuals	Essential	However, the system should be, where possible, compatible with in-Service tools and equipment (VfM). (SRD ID #2.16)

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
	5 hours.						
25	Upon receipt of an airdrop-ready equipment and payload, a trained rigging team of 5 will be able to prepare the load for airdrop in 8 hours	• Desktop study of Platform DO evidence. • Demonstration by DO riggers. • Ground assessments	Evidence to be gathered by the ITE on behalf of the MOD	ITE reporting process	• DO-provided rigging instructions required for ground assessment phase. • DO documents will form the basis for UK Service documents and manuals	Essential	The system should also define payload position criteria when fitting to the platform and allow for calculation of overall CG when fully rigged. LBAD loads will be constructed and checked by 47 AD Sqn RLC pers within the required timeframes using standard equipment. These set timings will be stipulated in the ITE report and the 47 AD Ops manual. (SRD ID #1.5, 1.28, 1.34, 1.35)
26	The airdrop system (single platform) can be installed by a trained team of 5 into an Atlas C Mk 1 within 2 hours	• Demonstration by DO personnel, under control of ITE. • Ground assessments by ITE	Evidence to be gathered by the ITE on behalf of the MOD	ITE reporting process	• DO to highlight any aircraft integration limitation/requirements. • ITE will use provided information to develop the aircraft installation procedures that best suit UK needs, and where applicable in line with normal UK practices	Essential	Installation timings specified are from the LBAD arriving at the ac ramp until completion of final checks. Installation timings based on five Army AD pers and one RAF LM (SRD ID #10, SRD ID #53 and SRD ID #223)
27	The airdrop system (Double platform) can be installed by a trained team of 5 into an Atlas C Mk 1 within 4 hours	Ground assessments	Evidence to be gathered by the ITE on behalf of the MOD	ITE reporting process	Compliance with Atlas C Mk 1 limitations: • Loading Limitations • Cargo Compartment Limitations. • Max TOW/LW/ZFM Limitations. • Aircraft CG Limits	Essential	Split stick or Sequential Installation timings specified are from the LBAD arriving at the ac ramp until completion of final checks. Installation timings based on five Army AD pers and one RAF LM (SRD ID #2.1, 2.3, 2.4)

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
28	The System shall be capable of being winded into the aircraft using the aircraft winch system	• Desktop study of Platform DO evidence. • Ground assessments	• Evidence from DO to be reviewed by ITE on behalf of the MOD. • Direct assessment by ITE.		DO provided evidence Ground assessment	Desirable	Documentation to be reviewed to confirm safe working load of attachment points. (SRD ID # 2.2)
29	The airdrop of LBAD, in either a single or double configuration in a single pass of the DZ	• Ground assessment(s) by ITE • Flight Trials by ITE.	Evidence to be gathered by the ITE on behalf of the MOD	ITE reporting process	Flight Trials	Mandatory	T&E results to confirm. Aerial Delivery Database (ADDB) and Chute Selection Table (CST) will inform CARP. A UK-specific CST to be devised if LBAD side rail detents differ from certification platforms. (SRD ID #1.3, 3.1 and 3.2)
30	The System shall not interfere with aircraft emergency systems before deployment	Ground assessments	Evidence to be gathered by the ITE on behalf of the MOD	Within the Atlas C Mk 1 WBM TLL1 Limitations.	Confirmatory information to be accrued during assessment	Essential	Minimum of 5.9 in (0.150 m) during loading and 7.87 in (0.200 m) during aerial delivery operations. The A/C has specific smoke detection and rapid decompression facilities that are stated as geometric clearance requirements. (SRD ID #3.14)
31	Post-airdrop, the equipment can be de-rigged, stripped of all AD equipment and prepared for operation	• Desktop study of Platform DO evidence. • Ground assessment. • Assessment post drop with demo from DO	Determination via trials and/or from evidence from use	ITE reporting process	• Ground assessment. • Flight trials	Essential	De-rigging must be achievable with no specialist tools. The necessary number of trained pers was determined to be no more than two during day and night. The system should provide a bespoke parachute tray (threshold) and universal parachute tray(objective) which is

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
							easily removed from the boat. (SRD ID #1.38, 4.6, 4.7, 4.8)
32	The AD system is able to be safely deployed and shall not damage the aircraft static line anchor cables or any other role equipment parachute assemblies on deployment from the Atlas C Mk 1 by day and by night.	• Ground assessment. • Flight trials to determine suitability at the following heights/altitudes: • Minimum 750 ft AGL. • Maximum 8 000 ft PA	• Evidence to be gathered by the ITE on behalf of the MOD	In line with existing systems	• DO provided F100A and or DDP for flight trials. • Flight trials unlikely to achieve drops above 3000ft on standard UK DZs.	Mandatory	To protect the aircraft's cargo hold and negate attrition to the static line anchor cables, parachute assemblies and role equipment. Compliant where possible with Airbus certified extracted load dimensions. Respect current 500 daN limit on anchor cables. Also, the tip-off limits will need to respected or mitigated (SRD ID #1.14, 3.3 3.4, 3.5, 3.7, 3.9, 3.11, 3.12, 3.13, 3.16)
33	The airdrop of platform can be conducted within an aircraft speed range of 120 -140 KCAS	• Desktop study of Platform DO evidence. • Flight trials to determine suitability across the speed range	Evidence to be gathered by the ITE on behalf of the MOD	In line with the Release To Service (RTS) for airdrop from the Atlas C Mk 1	• DO provided F100A for flight trials. • Flight trial.	Mandatory	Drop speed to respect existing Atlas C Mk 1 V_{LSAD} airdrop limitation. Aircraft airdrop speed in line with the AD&S speed envelope for extracted loads currently set at 130 KCAS ± 5 knots. Note, airdrop speed certification is ongoing and an upper despatch speed of 150 KCAS is expected. (SRD ID #3.6)
34	The LBAD system is able to be employed in surface wind speeds of up to 30 knots	• Desktop study of Platform DO evidence. • Flight Trials to determine suitability in a worst-case scenario (where the	• ITE on behalf of the MOD, to provide advice accordingly • DO evidence of use	In line with existing systems	• DO provided F100A and/or DDP for flight trials. • Flight trial.	Mandatory	To ensure load can be received and derigged within operational parameters. This SR may be driven by the parachute/LBAD system limitations

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
		metrological conditions during the flight test phase exist)					(SRD ID #4.1)
35	The LBAD system is able to be employed in specific seat state conditions.	• Desktop study of Platform DO evidence. • Ground Trials • Flight Trials to determine suitability in a worst-case scenario (where the metrological conditions during the flight test phase exist)	• ITE on behalf of the MOD, to provide advice accordingly DO evidence of use	In line with existing systems	• DO provided F100A and/or DDP for flight trials. Flight trial.	Mandatory	To maintain boat and parachutist safety in various sea states. (SRD ID #4.2)
36	To airdrop the AD system at specified range of altitudes and drop heights in Visual Metrological Conditions (VMC) worldwide day and night.	Desktop study of Platform DO evidence	ITE, on behalf of the MOD, to provide advice on potential for suitability at higher despatch altitudes	ITE reporting process	DO provided F100A and/or DDP for flight trials	Highly Desirable	Select FW a/c might be required to fly at low-level to defeat a RF EW Threat. Airdrop of LBAD as low as possible will minimise a/c exposure time. Wind speed will be measured at 2m from ground level over the preceding 15 mins before drop. (SRD ID #3.16, 3.3)
37	The system should include a parachute release mechanism that is not inhibited by wind speed at the drop zone	• Desktop study of Platform DO evidence. • Ground assessment to determine suitability of disconnect systems. • Flight trials confirmation	Determination via trials and/or from evidence from use	DOSG compliant	DO provided F100A and/or DDP for flight trials	Essential	Parachute disconnects should be capable of releasing in the Threshold and Objective wind speeds
38	Following airdrop the payload must be intact and fully functional	• Desktop study of Platform DO evidence. • Ground assessment. • Static drop. • Flight trials	Determination via trials and/or from evidence from use	DefStan	DO provided F100A and/or DDP for flight trials (or equivalent)	Essential	The system should not damage the boat due to LBAD platform structure. The system shall maintain an

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
							optimum bow down angle to increase survivability. Boat must be serviceable upon derigging. (SRD ID #1.36, 4.5)
39	The System shall allow positive identification of the boat and platform at all times whilst under canopy.	• Ground assessment. • Flight trials	Determination via trials and/or from evidence from use	ITE reporting process	• Ground assessment. • Flight trials	Desirable	Following Parachutists should be able to see the payload and platform. (SRD ID #3.17, 3.18)
40	The System shall permit the inclusion of Flight Data Monitoring (FDM) equipment.	• Ground assessment. • Flight trials	Determination via trials and/or from evidence from use	ITE reporting process	• Ground assessment. • Flight trials	Desirable	The system requires specific points to attach video cameras and acceleration data recorders. (SRD ID #3.19)
41	The airdrop characteristics of the system will be sufficiently consistent so as not to compromise drop accuracy	• Desktop study of Platform DO evidence. • Flight trials	Determination via trials and/or from evidence from use	ITE reporting process	• DO provided F100A and/or DDP for flight trials. • Flight trial.	Essential	To ensure that the load deployment is sufficiently consistent. To avoid confusion Impact Point on the Atlas C Mk 1 is referred to as Ground Impact Point (GIP). From this data, the minimum DZ size is to be calculated. (SRD ID #3.15, 4.3)
42	Requirement to map the ballistic load/chute failure case of LBAD to ensure safety of surrounding population by the means of Airdrop Ballistic Load Calculator methodology or similar	Desktop analysis by ITE	Determination by modelling	ITE reporting process	Ground Assessment	Highly Desirable	Operational DZs cannot assure a cleared area iaw peacetime procedures. Crews must assure that any failed or ballistic airdropped loads will not land close to civilian populated area. Mapping should include the following potential ballistic scenarios for each cleared despatch limitation for height / altitude and weight profiles:

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
							Boat only Platform only Boat and platform (unseparated) (SRD ID #4.7, 4.17)
43	Post Drop LBAD platform must be capable of floating and locatable post airdrop and sinking for OPs	• Static Drop • Flight Trials	• DO provided documentation. • Determination via trials and/or from evidence from use.	ITE reporting process	Ground Assessment	Essential	The System shall float post airdrop for the required time and be locatable using a location aid for any sub-surface floatation. (SRD ID #4.12, 4.14, 4.15)
44	The System shall be capable of being recovered from the DZ to the recovery vessel by crane lift and incorporates the suitable lifting points in order for it to be re-used. There shall be no requirement for additional supports on the recovery vessel and shall ensure the minimum necessity for recovery personnel to enter the water.	• Desktop study of Platform DO evidence. • Ground assessment.	• Evidence to be reviewed by the ITE on behalf of the MOD • Determination via trials and/or from evidence from use	ITE reporting process	DO evidence required for ground assessment	Mandatory	To recovery of system post airdrop during training in order for it to be re-used Identified and marked lifting points. (SRD #4.4, 4.9, 4.10, 4.16, 4.18)
45	The System shall be capable of being towed to a safe location	• Desktop study of Platform DO evidence. • Ground assessment.	• Evidence to be reviewed by the ITE on behalf of the MOD • Determination via trials and/or from evidence from use	ITE reporting process	DO evidence required for ground assessment	Desirable	To aid recovery of system post airdrop during training Provision of towing capability using platform extraction points. Platform should not sink during a towing operation. (SRD #4.11)
46	The DO will be compliant with MOD safety and acquisition policy by provision of a Safety Assessment	Review of DO information.	DO provided documents including Curriculum Vitae of nominated personnel to assist in	DefStan Associated RAs		Mandatory.	None

	Requirement	Method of Evaluation	Evidence Condition	Standard of Evidence and Reference	Demonstration of Evidence	ITE Envisaged Rating	Notes/Remarks
Serial	**a**	**b**	**c**	**d**	**e**	**f**	**g**
	Report to demonstrate that the certified design is tolerably safe for its intended use.		the Ground Assessment/ Flight Trial phases.				

ANNEX B – Estimated Ground Assessment Plan

1. The Table below is a notional ground assessment plan that could form the foundation for System evaluation.

Serial	Notional Dates/Days	Activity	Resources/Remarks
a	b	c	d
1	1 - 2 days	DO presentation/system demonstration	Familiarisation with the presented system, understand component parts and concept of use
		DO led platform construction.	Understand process (Pre-drop maintenance)
		DO led load integration demonstration.	Demonstration of how payloads are physically restrained to the platform
		DO led introduction to parachute systems and their integration to platform.	Demonstration of all equipment integration
		DO led derigging demonstration	Understand any specific techniques/sequences required to remove the restrained boats.
		DO to return all equipment to pre-presentation standard	Allow Ground Assessment activities to commence from a set standard and incorporate all elements of system design and preparation.
2	1 day	Assessment of platform construction procedures	Construct platform iaw DO provided documentation
		Assessment of load to platform integration	Understand concept, understand flexibility of the system Assess restraint capability and conduct payload integration activities
		Assessment of parachute systems and their integration to platform.	Review documentation and conduct integration of equipment Understand main parachute design/capacity/capability
		Introduction to parachute jettison system	Understand any storage/acceptance into service issues (DOSG/EEDs)
		Transfer Loader compatibility	UK Atlas 2000 Transfer loader assessment.
3	4 days	Prepare LBAD system for integration into static aircraft	Iaw DO provided documentation and derived T&E Operating Document
		Initial aircraft integration	Platform presented to the Guide and Restraint System (GRS) - movement of platform through GRS and over the Roller Restraint System (RRS). Ensure no integration issue. DO available for technical advice if required. Look at forward/aft most load locations and integration with GRS/X-Locks. Creation of CLP (CST required). Extraction Parachute Ejector System (EPES) integration (to include the extraction parachute). Integration of any parachute jettison system. Inclusion of any supplementary restraint. Unloading procedures (identify any specific actions required during the off load of a complete system)
		Simulated installation of a double LBAD	As above but to include the re-rigging of a fwd extractor post aft platform drop.
		Simulated installation of a sequential LBAD	As above but to include the rigging of a forward extractor and how it integrates with the aft platform
		Load emergencies	Discuss/understand load emergency situations. Discuss drills, procedures and actions required during a load emergency situation.
4	1 day	Static drop test	Deploy to suitable harbour (QQ Haslar TBC)
		Flotation test of LBAD system in controlled environment	Understand the floatation arrangement and recovery of LBAD system in a controlled environment. Ability to tow and recover the platform.

		Recovery of platform and derigging of boat in controlled environment	Understand the necessity of personnel entering the water upon platform recovery to minimise the risk of drowning
6	1 day	Post airdrop	De-rigging procedures. Understand any post drop recovery action that are required (on the LBAD). Discuss USLC. Recovery Vehicle assessment - TML/Terrex. Post drop maintenance.
7	2 days	Environmental testing (TBC)	Temperature testing at Environmental Test Facility (MOD Boscombe Down)

ANNEX C – Estimated Flight Test Plan

1. The Flight Test Plan and number of sorties required is highly dependent upon the results of any Medium Weight Aerial Delivery (MWAD) flight trials, if MWAD Flight Trials have taken place before LBAD it is expected for one boat platform to be around eight to ten sorties over a five-week period (this assumes no delays). Testing of additional boats will require a further two or three sorties each. Additional testing to account for novel design features is almost unquantifiable at this stage but for the sake of the top-level plan it is considered that up to three sorties (with multiple serials) may be needed.

   NOTE: LBAD is a higher priority project for Defence and LBAD Flight Trials may occur first, in which case the number of sorties and duration may be expected to be longer.

2. Flight Test Objective can be expected to include:

   a. Single System Despatch
      i. Forward CH Position
      ii. Mid CH Position
      iii. Aft CH Position
   b. Double System Despatch
   c. Sequential System Despatch
   d. Parachutist following on specific configurations

3. Specific Flight Test Plan for each Phase will be developed once the selected solution is determined.