

This risk assessment covers the operation of an AK-47 rifle during live-fire exercises at a designated military test range. While considering military and civilian personnel as well as the public and the environment. The risk ratings are informed by a 5x5 matrix assessing Likelihood (L) and Impact (I) of harm. Likelihood and impacts are multiplied together to calculate the overall risk. <i>The objective is to accurately determine and record the risks, ensuring that the presented risk levels are a true reflection of the analysis, not solely a pursuit of lower ratings.</i>	1	Rare	exceptional circumstances
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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
Ref Oper ation	Activity / element	Hazards identified	What and who may be harmed and how Military personnel Fatality – injury Civilian personnel Fatality – injury external contractors Fatality – injury General public Fatality – injury Environment	Causes of hazard	Assessment pre control measures			Considered control/mitigation measures rejected	Reasonable control measures that can reduce risk to ALARP	assessment post control measures			
					L (1 –5)	I (1 –5)	overall (L X I)			L (1 –5)	I (1 –5)	overall (L X I)	
OP-1	Live Fire on a range	Unintended Discharge	Who: Military, Civilian personnel, as well as external contractors participating in any form. General public in the vicinity of the range. What: Fatality, serious injury How: Incorrectly directed fire, misdirected fire leading to small arms fire striking unintended target	Cook-off, Poor training, ammunition quality, incompetence, negligence, slips, trips and falls, dropping, human error, safety lever slips	5	5	25	Use of blank rounds, no personnel on base during live fire tests, restrain firearm while firing, evacuate surrounding civilian areas, Electronic Trigger Locking System	Before ammunition is added ensure Firearm is clear and its safety works. appropriate Training, authorised personnel operate firearm Check the ammunition for grade, identification markings, and serviceability Controlled site, firing on suitable terrain controlling what beyond target, Operate firearm in conditions of moderate temperature and humidity, Check the weapon for correct assembly and proper operation,	2	4	8	

OP-2	Live Fire on a range	Bullet does not Reach its intended target	Who: Military, Civilian personnel, as well as external contractors participating in any form. General public in the vicinity of the range. What: Fatality, serious injury How: Incorrectly directed fire, misdirected fire leading to small arms fire striking unintended target	Equipment failure, Incorrect handling, Damaged equipment, Incorrect/Inferior component, Tampering, worn components, Obstructed barrel, Misaligned sights/ broken, improper training, human error	5	5	25	Bring target to firearm, enlarge target, no personnel on base during live fire tests, evacuate surrounding civilian areas	Proper maintenance. zeroing weapons, sight testing, clear backstop, target in controlled area, firing range perimeter secured, firearm fundamentals training, SME overlooking the operation of firearm	3	3	9	
OP-3	Live Fire on a range	Toxic substances	Who: Military, Civilian personnel, as well as external contractors participating in firing/ handling of firearm Environment What: Fatality, serious injury environmental damage How: When ammunition is ignited during functional operation of the firearm toxic gasses are produced through the chemical reaction while toxic particulate matter is spread out leaving toxic residues Toxic substances also include oils lubricants and cleaning products used in upkeep and maintenance.	Firing of firearm/ignited ammunition Handling of firearm	4	5	20	Use ammunition that does not produce toxic gasses, modify firearm to capture toxic gasses, Operators use hazardous materials suit with oxygen tank,	Operate firearm in ventilated areas, don't operate firearm in enclosed spaces for prolonged periods, wear appropriate PPE when handling/operating, safety training, wash hands after operation, no consumables near firearm, use of approved safe cleaning products and lubricants,	2	3	6	
OP-4	Live Fire on a range	Hot/cold components	Who: Military, Civilian personnel, as well as external contractors participating in handling of firearm.	Successive fire, Incorrect storage, Improper environment, improper handling,	4	2	8	Only single shot firing	Operate firearm in conditions of moderate temperature and humidity, Check the weapon for correct	3	1	3	

			What: Injury, Burns How: Incorrect storage before operation, successive fire resulting in firearm getting hot	improper training, Human error, operation of firearm					assembly and proper operation, operation of firearm Training, control rate of fire to reduce heat, ensure firearm is stored in an environment of moderate temperature and humidity, PPE				
OP-5	Live Fire on a range	Barrel Breach	Who: Military, Civilian personnel, as well as external contractors participating in firing of the firearm. What: Fatality, Injury, Burns How:	Obstructed barrel, Inadequate parts/materials used, Excessive pressure, poor maintenance	2	4	8	Unmanned firing of firearm, increase barrel thickness, low pressure rounds for testing	Barrel inspections, use authorized ammo, cleaning checks, pre-fire inspection, Check the weapon for correct assembly and proper operation, control rate of fire, PPE, Operate firearm in conditions of moderate temperature and humidity	1	4	4	
OP-6	Live Fire on a range	Range Incursion	Who: Military, Civilian personnel, as well as external contractors on site. General public trespassing or lost What: Fatality, Injury, How: During live firing of weapon an individual or individuals are found in the area designated for live Fire.	Unrestricted access to range, Human error, lack of warnings, lack of communication, Lack of security	3	5	15	Range located on isolated island/area, Date of live fire will be broadcasted on local information platforms, no personnel on base during live fire tests, evacuate surrounding civilian areas,	Trespassing And Warning signs posted around perimeter, inform personnel on base that live firing will take place on the day, security to protect the perimeter, Alarm if range Incursion happens	1	4	4	

OP-7	Live Fire on a range	Ejected cases	Who: Military, Civilian personnel, as well as external contractors close to the operating firearm. Environment What: injury, burns environmental damage How: After the successful operation of the firearm a hot case is ejected from the firearm.	Successful operation of firearm ejects hot case.	4	1	4	Don't allow left hand shooters, modify weapon for case ejection collector,	Left hand shooter training, Firarm safety courses, controlled shooter zone, PPE, Environment: Collect used cases, ensure ground is suitable for cases to land on i.e. (non-flammable ground)	2	1	2	
OP-8	Live Fire on a range	Hang fire	Who: Military, Civilian personnel, as well as external contractors participating in any form. General public in the vicinity of the range. What: Fatality, serious injury How: Delay from trigger pull to round being fired	Poor quality ammunition, faulty firing pin, Improper reloading practices, Extreme temperatures, Old or deteriorated ammunition, Human error, poor training	2	5	10	Use bank rounds, no personnel on base during live fire tests, evacuate surrounding civilian areas, restrain firearm while firing	Quality ammunition, use ammunition with known history, correct training, Use of support documents (army equipment support publication), Implement test range controls to prevent range incursion,	1	4	4	

ALARP Justification

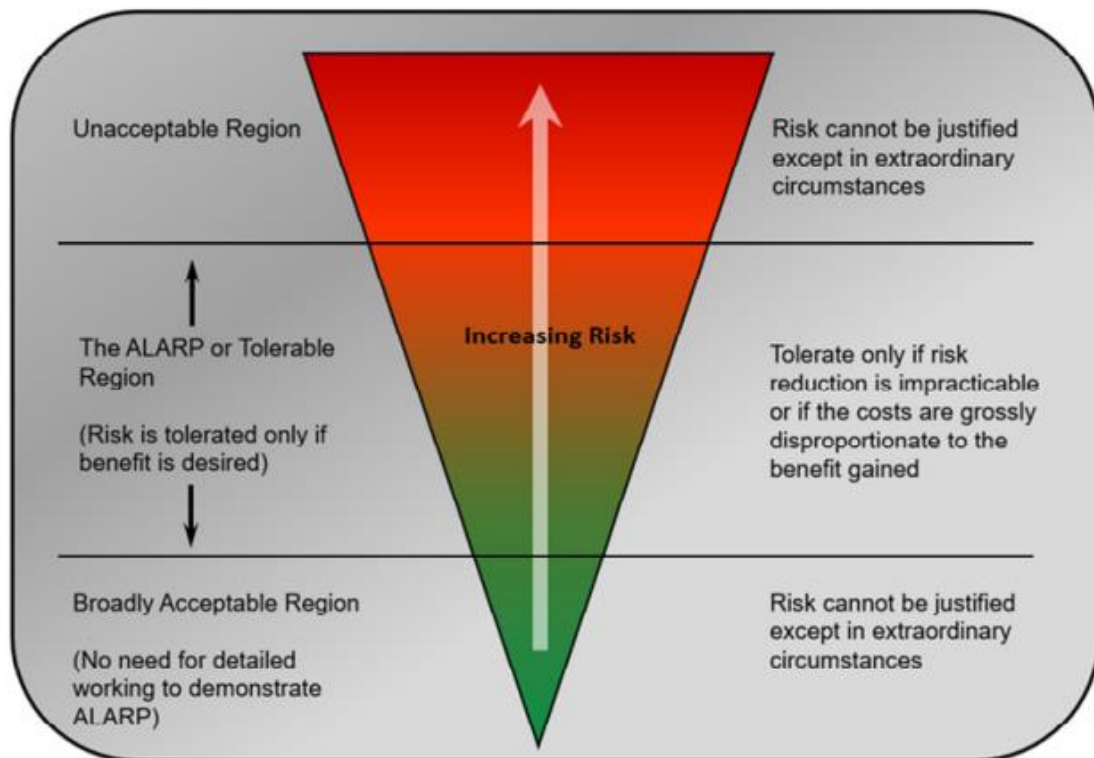
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Introduction

The intent of this ALARP Evaluation of the Live firing of an AK-47 (Avtomat Kalashnikova model 1947) is to insure that “when it has been demonstrated that the cost of any further Risk Reduction, where the cost includes the loss of defence capability as well as financial, time, or other resource costs, is grossly disproportionate to the benefit obtained from that Risk Reduction.” as defined by Def Stan 00-056 [1].

This document intends to provide agreement with this definition.



[1]

Activity/task description

The activity this encompasses the live firing of an AK-47 (Avtomat Kalashnikova model 1947) on a military base with the assumption being that no controls/mitigations are currently in place to reduce any/all risks of fulfilling this task [2].

Task includes:

Transitioning the firearm from Safe to desired Firing mode, then back to safe once activity has been completed

Discharging the weapon with the intent to hit a desired target: Single shot, fully automatic

Hazard identified: Unintended Discharge

Description of hazard

Unintended Discharge is defined as an event where the weapon fires because of accidental/negligent activation of the firing mechanism (trigger) or the ammunition due to other stimuli being activated at an unintended event.

Causes of hazard outlined in Annex A

Incident caused by unintended discharge

The worst-case credible impact of an unintended discharge is the death of multiple individuals in the vicinity of the activity.

		Vicinity includes
Individuals include	Military personnel;	Operator, Spectator, range Incursion, beyond target
	Civilian personnel;	Operator, Spectator, range Incursion, beyond target
	External contractors;	Operator, Spectator, range Incursion, beyond target
	General public;	Spectator, range Incursion, beyond target

Controls

For a control to be implemented in accordance with ALARP it shall first state the purpose of Implementation and how, while being measured against its Reasonable Practicability I.e. Time, Effort, Cost

Control 1. Mandatory Operator Training and Competency Certification [3]

- Purpose: To ensure operators possess the knowledge and skills required for safe firearm use. Control 1 acts as the core for safe personal firearm operation.
- Implementation: Establish training on the AK-47 encompassing, operating (shooting), upkeep/maintenance, common faults, key components, safe weapon use and handling, once training is completed a formal assessment and certification of competency is issued. Refresher courses and on-site supervision as well as Army Equipment Support Publications (AESPs) will maintain continued competence

Reasonable Practicability:

- Time: Requires initial and periodic refresher courses taking a significant amount of time.
- Effort: Moderate, administrative management needed for tracking certification and qualifications, as well as creation of training material.
- Cost: Moderate, covering instructors, materials, and administrative support

Summary: While this control takes a significant amount of time moderate effort and cost this control is an industry standard and a core requirement for safe operations, entirely justifying these factors given the magnitude of prevented risk, making it reasonably practicable

Control 2. Pre-Firing Weapon Checks

- Purpose: To prevent accidental discharge caused by mechanical faults, assembly errors, blockages, human error.
- Implementation: Mandate detailed pre-firing checks covering weapon assembly, orientation, operation of the safety lever, and trigger mechanism. Operators will use provided checklists based on Infantry training publication for the use of the AK-47 and manufacturer documentation. [4][5]

Reasonable Practicability:

- Time: Minimal adds only a few minutes to pre-shooting routines.
- Effort: Creation of training material for the AK-47 for tasking, shooting, safe weapon use and handling. Operators may already be familiar with such procedures, only minor adaptations or refresher training are needed.
- Cost: Negligible checklists and guidance can be adapted from existing procedures.

Control 3. Verifying Firearm Status Before Loading and after magazine ejection

- Purpose: To minimize the risk of negligent discharge by ensuring weapon status awareness before ammunition is loaded and after magazine ejection.
- Implementation: Enforce a standard operating procedure requiring confirmation that the firearm is clear and its safety engaged prior to loading and after magazine ejection. This will be reinforced through range orders and on-site supervision [4].

Reasonable Practicability:

- Time: Minimal incorporated into weapon handling sequence.
- Effort: Training may be required dependent on operator. Implemented as a standard part of firearm handling, qualification required to prove competency.
- Cost: low part of initial training, supervision is standard in firearm operation on ranges.

Control 4: Firing on Suitable Terrain

- Purpose: To reduce the likelihood of slips, trips, and falls that could result in unintentional firing.
- Implementation: Only permit live firing on ranges that meet Defence Safety Authority (DSA) and JSP 403 standards. Ranges will be regularly inspected and maintained to ensure stable, debris-free operating surfaces [5][6].

Reasonable Practicability:

- Time: Minimal time for implementation can be integrated into existing maintenance routines.
- Effort: Minimal effort creates new minor responsibility for Maintenance.
- Cost: Low can form part of existing range maintenance budgets.

Control 5. Authorised personnel

- Purpose: To control risk by limiting weapon handling and live firing to those who are trained, cleared, and authorized.
- Implementation: Use administrative controls vetting, security passes, and certification checks to ensure only authorized individuals can access and operate firearms on the range [5][7].

Reasonable Practicability:

- Time: Minimal, adoption of standard MOD security protocols.
- Effort: Low, integrated into existing personnel checks with robust understood security protocols.
- Cost: Low, administrative costs only.

Control 6. Ammunition Inspection

- Purpose: To prevent accidents caused by defective, degraded, or incorrectly stored ammunition.
- Implementation: Conduct mandatory visual and handling inspection of all ammunition before use, only serviceable rounds are to be used. This is required prior to ammunition being on the range under JSP 482 detailing MOD Ammunition Safety and Logistics procedures as “No ammunition should be held that does not support the mission” however the requirement of inspection of ammunition prior to firing is considered best practice [8].

Reasonable Practicability:

- Time: Adds a few minutes per supply batch, easily incorporated into existing workflows.
- Effort: Low, part of ammunition handling best practice and ensures traceability.
- Cost: Minimal, requires only trained staff and documentation tools.

Control 7. Controlled Range Environment

- Purpose: To safeguard all personnel and the public from live fire on range
- Implementation: Maintain secure perimeters, controlled access points, real time surveillance, and ballistic containment in line with JSP 403. Conduct regular range risk assessments and update Range Standing Orders annually or as hazards evolve [5][6].
- Warning device to be used to inform firearm operators in case of breach of range in the event of control failures.

Reasonable Practicability:

- Time: Ongoing infrastructure and administrative commitment, due to live safety documents and evolving risk mitigation controls.
- Effort: Moderate, due to compliance updating live documents and the need for coordinated security practices
- Cost: Moderate range security and adequate infrastructure require constant reinvestment, but this is proportionate to the critical risk mitigated.

Control 8. Environmental Controls (Temperature and Humidity)

- Purpose: To minimize risk of cook-off or firing-system malfunction under extreme conditions.
- Implementation: Enforce operational limits on firing activity dictated by environmental conditions within the weapon system's tested tolerance provided by manufacture when first procured. Alternatively, trials and technical reports should be created detailing weapon safety [9].

Reasonable Practicability:

- Time: operational flexibility may be required for adverse weather
- Effort: Minimal, climactic operation environments should be detailed by manufacture during procurement,
- Cost: Negligible; uses existing monitoring tools and staff.

Overview table in Annex B

Discounted Controls and Gross Disproportionality

Discounted Controls 1 Controlling what's beyond target

This is already addressed by established controlled range boundaries, access restrictions, and Danger Area designations per JSP 403 and Range Standing Orders. Implementing further layers would duplicate controls (control 7) without benefit.

Discounted Controls 2 Removal of all Personal from base before live firing

Grossly disproportional act, Loss of operating hours due to personal off base, Loss of credibility as a competent test range while also duplicating the responsibility of control 7. Controlled Range Environment.

Discounted Controls 3 Electronic Trigger Locking System

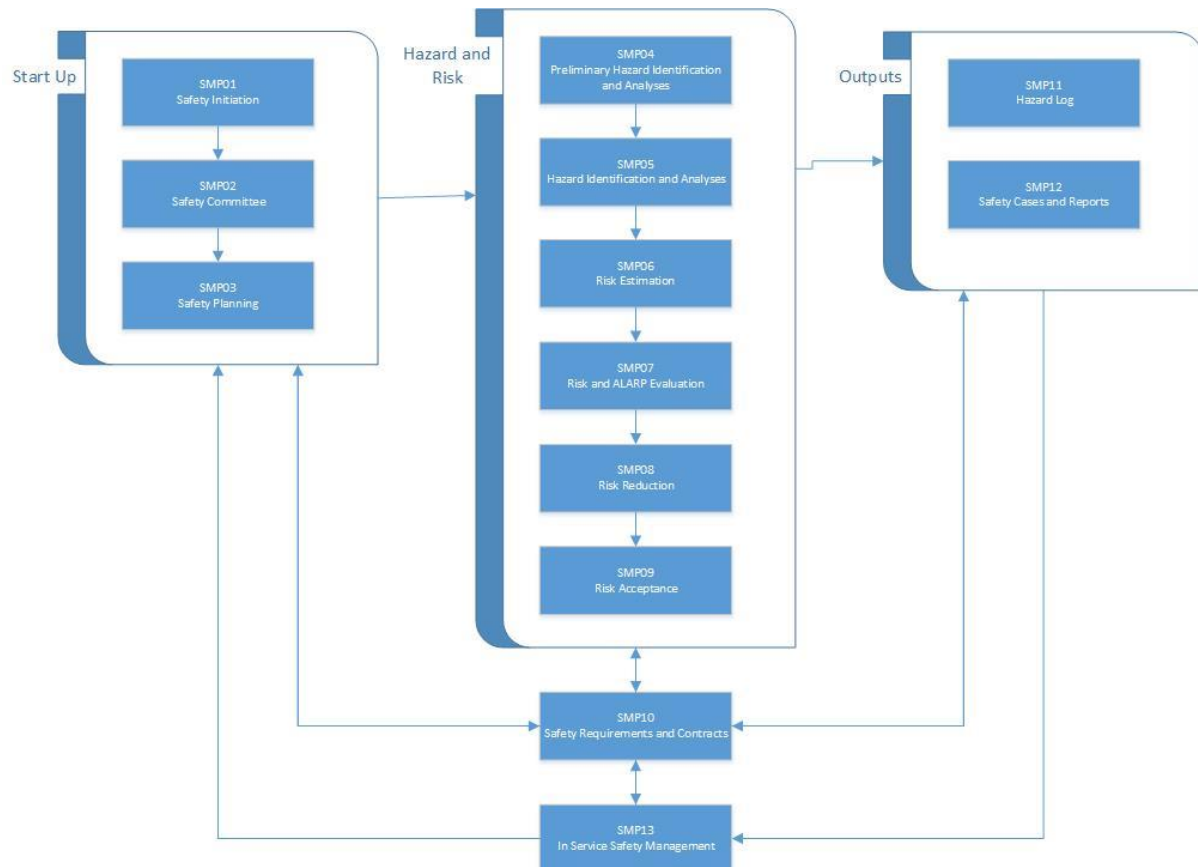
Proposal: Retrofit the AK-47 with a biometric or Radio Frequency Identification (RFID) controlled trigger lock.

To retrofit the AK-47 with this new and costly technology that has not proven its ability to demonstrably reduce the risk of accidental/unintended discharge would be grossly disproportionate to the decrease of risk it would impose.

On the other hand, as this technology develops, the normalization of its uses could cause further consideration in the future, where it's possible future safety records and decreased pricing make the cost-benefit proportional to the safety advantages posed. [10]

Continuous commitment to ALARP

Continuous ALARP assurance is provided by the Safety Management Procedures (detailed in reference [11]). These procedures are fundamental to proactively capturing and updating safety information across the Manufacture to Target Disposal Sequence (MTDS) and the Concept, Assessment, Demonstration, Manufacture, In-Service and Disposal (CADMID) cycle.



[11]

Components to ensure AK-47 live fire task stays ALARP:

- To maintain operator competency, training and testing will take place to ensure the continues commitment to safety.
- Incident and near-miss reporting will be used to identify voids in hazards this then provides feedback for continuously updating documentation and procedures, this process is seen as best practices and ensures compliance with evolving standards.
- Monitor technological developments for the potential adoption of future controls, while engaging with SMEs and operational personnel to ensure practical risk management for practical implementation when controls are deemed ALARP.

ALARP Statement

The hazard of an unintended AK-47 discharge on a live firing range has been reduced to ALARP by integrating best practice controls including personnel training with certification for demonstrating firearm competency, and implementation of regulation to create a controlled range for firearm operation. This document has outlined its justification for the residual risks to be deemed tolerable for the crucial operation of live fire testing of the AK-47 to take place and that any additional controls/mitigations at this time would be grossly disproportionate to the risk reductions imposed, while capturing the understanding and importance of future technological advances which may provide future risk reduction to an ALARP standard.

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Annex

Annex A

Hazard causes	Descriptions
Poor Training	Due to quality of training operators lack the fundamental knowledge needed to safely operate a firearm
Incompetence	After receiving all relevant/required training user cannot demonstrate the ability to safely operate a firearm
Negligence	As a result of lack of care of the user's firearm is discharged
slips, trips and falls	Uneven terrain, unkept firing area, sudden lack of bodily coordination causes the involuntary act of firearm operation by the user
Dropping	Loss of grip or lack of attention results in firearm dropping causing firearm to function
human error	Human factors cause an Unintended Discharge
Safety lever slips	The unintended movement of safety lever causes firearm to be put in an armed state.
Cook-off	The premature explosion of a cartridge due to excessive heat, often from the gun's chamber or surrounding environment
Ammunition quality	Reliability and consistency are the most important factors of Ammunition quality this is because there are so many variables that can affect reliability and consistency such as materials, fill type, storage conditions, age so having constant Ammunition quality allows for a known performance and safety for a firearm

Annex B

Control No.	Description	Effect on Risk	Reference/Standard	Cost-Benefit Summary
1	Mandatory operator training and competency certification	Ensures knowledgeable safe handling	Adoption of infantry small arms training qualification standards [2]	Moderate cost; fundamental to safe operations
2	Pre-fire weapon checks including assembly and operation verification	Prevents malfunction-related discharge	Infantry training adaptation equipment support publication (AESP), DSA 03.OME Part 3 (JSP 403) [4], DSA 03.OME Part 3 Volume 2 [5]	Negligible cost; critical safety assurance measure
3	Verifying Firearm Status Before Loading and after magazine ejection	Minimizes negligent discharges	DSA 03.OME Part 3 (JSP 403) [4]	Low cost; essential procedural standard
4	Firing on suitable, well-maintained terrain	Reduces slips/trips, minimizing accidental firing	Defence Safety Authority (DSA) 03.OME Part 3 (JSP 403) [5] Range Safety Management System [6]	Low cost; uses existing safety procedures
5	Only authorised personnel operation	Controls access and ensure responsible handling	UK MOD security policies and clearance procedures, Defence Safety Authority (DSA) 03.OME Part 3 (JSP 403) [5], JSP 822 Defence Training and Education [7]	Low cost; administrative control
6	Ammunition inspection for grade, markings, and serviceability	Prevents use of defective ammo that could cause unintended discharge	JSP 482 Ammunition Safety and Logistics procedure [8]	Minimal cost; critical quality assurance
7	Conduct firing on a controlled range with secure perimeter and defined danger areas	Limits risk to personnel and public, contains projectiles	JSP 403 Vol 2 Chapter 2; DSA Code of Practice [5] JSP 403 Volume 2 [6]	Moderate cost; capital and operational expense justified by safety
8	Conduct firing under environmental conditions within weapon tolerances	Minimizes cook-off or malfunction risk due to extremes	Manufacturer specifications; technical trials reports JSP 403 Volume 4 Glossary of terms and definitions [9]	Negligible cost; procedural adherence

