INTERNATIONAL AMMUNITION TECHNICAL GUIDELINES

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Ammunition accidents and incidents: unit reporting and technical investigation methodology

UN SaferGuard
Securing ammunition, protecting lives

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Warning

The International Ammunition Technical Guidelines (IATG) are subject to regular review and revision. This document is current with effect from the date shown on the cover page. To verify its status, users should consult www.un.org/disarmament/ammunition

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Foreword

Ageing, unstable and excess conventional ammunition stockpiles pose the dual risks of **accidental explosions at munition sites** and **diversion to illicit markets**.

The humanitarian impact of ammunition-storage-area explosions, particularly in populated areas, has resulted in death, injury, environmental damage, displacement and disruption of livelihoods in over 100 countries. Accidental ammunition warehouse detonations count among the heaviest explosions ever recorded.

Diversion from ammunition stockpiles has fuelled armed conflict, terrorism, organized crime and violence, and contributes to the manufacture of improvised explosive devices. Much of the ammunition circulating among armed non-State actors has been illicitly diverted from government forces.[1] In recognition of these dual threats of explosion and diversion, the General Assembly requested the United Nations to develop **guidelines for adequate ammunition management**.[2] Finalized in 2011, the International Ammunition Technical Guidelines (IATG) provide voluntary, practical, modular guidance to support national authorities (and other stakeholders) in safely and securely managing conventional ammunition stockpiles. The UN SaferGuard Programme was simultaneously established as the corresponding knowledge-management platform to oversee and disseminate the IATG.

The IATG also ensure that the United Nations entities consistently deliver high-quality advice and support – from mine action to counter-terrorism, from child protection to disarmament, from crime reduction to development.

The IATG consist of 12 volumes that provide practical guidance for 'through-life management' approach to ammunition management. The IATG can be applied at the guidelines' **basic, intermediate, or advanced levels**, making the IATG relevant for all situations by taking into account the diversity in capacities and resources available. Interested States and other stakeholders can **utilize the IATG for the development of national standards and standing operating procedures**.

The IATG are reviewed and updated at a minimum every five years, to reflect evolving ammunition stockpile-management norms and practices, and to incorporate changes due to changing international regulations and requirements. The review is undertaken by the UN SaferGuard Technical Review Board composed of national technical experts with the support of a corresponding Strategic Coordination Group comprised of expert organizations applying the IATG in practice.

The latest version of each IATG module can be found at www.un.org/disarmament/ammunition.

[1] S/2008/258.

[2] See also the urgent need to address poorly-maintained stockpiles as formulated by the United Nations Secretary-General in his Agenda for Disarmament, *Securing Our Common Future* (2018).

Introduction

The reporting and investigation of conventional ammunition accidents and incidents is a key component in ensuring the safety of the conventional ammunition stockpile during storage, handling and use. As there is no such thing as perfect safety, it is inevitable that personnel using conventional ammunition during training, or on operations, will themselves be at risk of fatality or injury. Accidents or incidents[3] involving conventional ammunition are a regular occurrence, even in the best trained military and security forces, yet most of them are preventable. Reporting and investigating accidents and incidents will establish lessons for others to learn and ultimately contribute to improved safety for all.

As a fundamental preventative measure any accidents or incidents should be immediately reported and investigated in order that the appropriate action can be taken to prevent reoccurrences. Such actions may include the revision of operating systems and procedures, rectification of ammunition faults, and/or the imposition of bans or constraints on the use, storage, handling, transport or disposal of the ammunition type involved. The use of an ammunition accident reporting system assists the development of such actions; the aim is safety improvement not the allocation of blame.

The use of a proven and agreed methodology to technically investigate all ammunition accidents and incidents: 1) supports the consistency of investigation standards between individuals; 2) ensures that the appropriate actions are taken, and questions asked by the investigator; and 3) improves the quality of investigation reports.

[3] Details on the appropriate response to ammunition incidents is contained within IATG 01.60 *Ammunition faults and performance failures.*

Ammunition accidents and incidents: unit reporting and technical investigation methodology (LEVEL 1)

1 Scope

This IATG module introduces and explains the methodology and techniques for ammunition accident investigation in order to contribute to an overall safe, effective and efficient conventional ammunition management system.

2 Normative references

A list of normative references is given in Annex A. These documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

A further list of informative references is given in Annex B in the form of a bibliography, which lists documents that contain additional information related to the contents of this IATG module.

3 Terms and definitions

For the purposes of this module the following terms and definitions, as well as the more comprehensive list given in IATG 01.40 *Glossary of terms, definitions and abbreviations,* shall apply.

The term ‘ammunition accident’ refers to *any incident involving ammunition or explosives that results in, or has potential to result in, death or injury to a person(s) and/or damage to equipment and/or property, military or civilian.*

The term ‘incident’ refers to *a generic term that includes all accidents, performance failures and faults involving ammunition or where ammunition is present.*

In all modules of the International Ammunition Technical Guidelines, the words 'shall', 'should', 'may' and 'can' are used to express provisions in accordance with their usage in ISO standards.

a) **'shall' indicates a requirement**: It is used to indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

b) **'should' indicates a recommendation**: It is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that (in the negative form, 'should not') a certain possibility or course of action is deprecated but not prohibited.

c) **'may' indicates permission**: It is used to indicate a course of action permissible within the limits of the document.

d) **‘can’ indicates possibility and capability**: It is used for statements of possibility and capability, whether material, physical or casual.

4 General

As a fundamental preventative measure to support safe conventional ammunition stockpile management any accidents or incidents involving ammunition and explosives should be immediately reported by users and appropriately investigated in order that the appropriate action can be taken to prevent reoccurrences. Such actions may include:

A) the revision of operating systems and procedures, including training;

B) the imposition of a ban on the use, storage, handling, transport or disposal of the ammunition type involved;

C) after investigation, the imposition of constraints on the use, storage, handling, transport or disposal of the ammunition type involved;

D) rectification of the fault by repair; or

E) withdrawal of the ammunition from service use.

The national authority or ammunition stockpile management organisations should nominate an appropriate investigating authority and ensure that it is provided with technically qualified staff and resources that are necessary to provide an effective and efficient capability.

It shall be a mandatory requirement for users or stock-holding units to report any accidents or incidents involving ammunition and explosives to the investigating authority. All accidents and incidents should be reported, and users or stock-holding units shall not make the decision that accidents are minor or not worth reporting.

Ammunition accidents arising out of manufacturing and/or technical inspection failures are shown, by experience, to be rare. The majority of reported cases are usually due to a functioning failure in the combination of weapon and ammunition and, in the majority of instances, this is aggravated by mishandling on the part of the user.

Notwithstanding the previous comment, in the investigation of any accident or incident involving ammunition or explosives, all possible causes are to be considered, particularly when a straightforward explanation is not at once apparent. It is essential to remain objective and open-minded about the causes of any accident. The most probable causes must first be eliminated using positive factual evidence before speculation into remote possibilities. Even then, theories are not to be advanced unless a reasoned case can be made fully supported by evidence.

Factual evidence supported by witnesses' statements, preferably corroborated and carefully examined, shall be the basis of all conclusions.

Ammunition accident/incident investigations should be conducted by a qualified Technical Investigator nominated by the appropriate national authority. The Technical Investigator should determine what happened and why, and not attribute blame or negligence to any named individual.

5 Ammunition accidents

An ammunition accident, irrespective of cause or however minor, is any incident involving ammunition and explosives that results in death or injury to a person(s) and/or damage to equipment and/or property, military or civilian.

Examples of ammunition accidents are:

A) a breech explosion occurs in a weapon, injures the firer and causes damage to the working parts;

B) a battle simulation charge explodes in close proximity to a soldier causing flash burns and temporary deafness; or

C) a ricochet of a small arms bullet hits and damages a vehicle parked on the range.

6 Rationale for reporting ammunition accidents

There are a number of reasons why an effective system for the reporting and investigation of ammunition accidents should be developed and utilised by national authorities:

A) safety can be improved as immediate action[4] and may be taken to prevent a reoccurrence;

B) hazardous practices, which are not necessarily the fault of the user, may have developed in the use of the ammunition that have not previously been identified. Improved safety practices can be developed to prevent a reoccurrence;

C) to meet the requirements of safety legislation;

D) to provide information for potential use in possible claims procedures;

E) to be acceptable to employees, members of the public and management as a fair, thorough and impartial procedure for the investigation of an accident; and

F) information may be obtained than can lead to improvements in training, weapon and ammunition design.

The implications of failure to report an ammunition accident or incident can have lethal consequences. For example, the failure of a user to report could result in a recurrence that may result in fatalities and/or injuries to personnel in other units. In such circumstances, the organisation investigating the first occurrence would have banned the use by forces under its controls of that particular type, lot or batch ammunition worldwide. Therefore, the second accident with fatalities and injuries to personnel could have been prevented. In this instance, the failure to report the initial accident could be considered to be criminally negligent.

It should be noted that many incidents occur that do not result in injury or damage, but which had the potential to do so (a 'near miss'). Consideration should be given to capturing these incidents as well as they can provide similar benefits.

7 Reporting of ammunition accidents (LEVEL 1)

The national authority or the organisation responsible for the stockpile management of conventional ammunition should ensure that a system of reporting and investigating ammunition accidents/incidents is developed, promulgated to all users and is then effectively used. Users should be instructed to immediately report the following information on an ammunition accident or incident to the appropriate investigating authority:[5]

A) name of individual reporting fault or performance failure;

B) user unit;

C) user unit contact person;

D) date and time of ammunition accident;

E) details of any fatalities and/or injuries;

F) location where the ammunition accident has occurred, including map grid reference;

G) type of ammunition involved (full technical name);

[4] Including the use of bans and constraints. See IATG 01.70 *Bans and constraints*.

[5] An example form is at Annex D, which is replicated in IATG 01.60 *Ammunition faults and performance failures.*

H) weapon type involved (full technical name);

I) batch, lot and/or serial number of the ammunition involved;

J) brief description of accident;

K) weather conditions; and

L) action taken by user unit.

8 Actions by user unit (LEVEL 1)

The unit using the ammunition should take the following actions in the event of an ammunition accident/incident:

A) cease firing;

B) give immediate first aid to any injured personnel. In the case of fatal accidents, bodies should not be touched except to confirm death. Out of respect, bodies should be covered until they can be removed from the scene;

C) summon medical assistance if required;

D) cordon off the area to preserve evidence for the investigating authority. Nothing should be moved and everything should remain as it is in situ;[6]

E) record the names of potential witnesses;

F) make safe the individual weapon involved and secure it for the investigating authority. The weapon should only be touched if there is a requirement to make it safe to prevent further injuries;

G) if RF hazards are a potential cause, take immediate action to characterize the RF environment (IATG 5.60 provides further detail); and

H) immediately report the ammunition incident in accordance with the instructions developed as a result of Clause 7 and wait for further guidance from the nominated technical investigator.

Firing may recommence before the arrival of the investigating authority provided there have been no injuries, a different lot, batch or type of ammunition or explosive is used and the scene of the incident remains undisturbed.

9 Actions of the technical investigator (LEVEL 1)

The technical investigator appointed by the investigating authority should:

A) examine the scene of the ammunition accident;

B) examine any weapon involved;[7]

C) visually inspect any pieces of the ammunition involved;

D) recover any pieces of the ammunition that was involved for further technical investigation or destroy, after consultation with the appropriate technical authority, if unsafe to move;

[6] Photographs should be taken prior to moving the casualty for medical treatment if at all possible.

[7] The support of a specialist armourer may be needed to determine that performance failure is not the fault of the weapon.

E) examine other ammunition of the same type, and lot, batch or serial number being used at the same time;

F) question any appropriate witnesses;

G) make an initial technical appraisal of the cause of the ammunition accident and recommend any appropriate bans or constraints to the investigating authority;

H) if appropriate, impose an immediate local ban on the use of the ammunition (by lot, batch or serial number) involved in the ammunition accident; and

I) submit a written ammunition accident report to the investigating authority in the appropriate format.

The ammunition accident should be investigated in accordance with this IATG module.

It is not the job of the Technical Investigator to attribute blame or negligence to any individual.

10 Classification of incidents

The severity of an incident should be classified in accordance with the guidance at Table 1. Any incident in which a munition 'functions' other than in design mode, and as intended by the operator, should be subject to a formal investigation and is to be classified as at least a major accident, irrespective of any lack of injury or damage. This is, technically, also a performance failure but the potential for further incidents of this type means that it shall be investigated as an accident rather than as a performance failure.

Category	Definition for Explosives Incidents
Fatal (personnel) **Critical (equipment)**	An occurrence involving ammunition which causes one or more of the following: ▪ A fatality or severe injuries resulting in long term illness or disability to military personnel or members of the public. ▪ Extensive loss, damage to, or contamination of military or civilian equipment or property at multiple facilities, or to the environment.
Major	An occurrence involving an ammunition which causes one or more of the following: ▪ Severe injuries resulting in hospital treatment to military personnel or members of the public. ▪ Loss, damage to, or contamination of the munition or explosive, or to military or civilian equipment or property at a single facility.
Serious	An occurrence involving ammunition which causes one or more of the following: ▪ Injury requiring medical treatment and time off work but which does not require hospital treatment. ▪ Minor loss, damage to the munition or explosive or minor contamination of, military or civilian equipment, property, or the environment.
Minor	An occurrence involving ammunition which causes one or more of the following: ▪ An injury or illness to military personnel or members of the public. ▪ Cosmetic damage to ammunition not affecting performance or safety.
Near Miss	An occurrence, or potential occurrence, involving ammunition, or an occurrence potentially involving ammunition, which could have caused: ▪ Damage to the ammunition. ▪ Damage to, or contamination of, military or civilian equipment, property or the environment. ▪ Injury to, or illness of, military personnel or members of the public. ▪ Threat to the structural integrity of, or to cause damage to, military or civilian equipment, property or the environment. ▪ Free From Explosives (FFE) Violation.

Category	Definition for Explosives Incidents
Negligent Discharge[8]	A discharge of small arms ammunition (SAA) up to and including 14.5mm calibre[9] from a weapon as a result of preventable human failing, where no injury or damage has occurred and the weapon and munition performed to the designed specification.
Free From Explosive (FFE) Violation	The discovery of ammunition item(s) within containers that have been certified FFE.

Table 1: Classification of ammunition incidents

11 Advice and assistance from, and cooperation with, other agencies

By definition, the Technical Investigator is qualified to make a technical judgement on whether the explosives may have caused the accident, contributed to the accident occurring or contributed to the consequences of the accident. However, in a complex situation where other factors may have contributed to the accident, additional specialist assistance may be essential in determining the true events.

Accidents involving the firing of ammunition in weapons are commonly reported as an ammunition accident even though in the final analysis the weapon, or the user, is found to be at fault. Care is therefore to be taken to ensure that the investigation covers both the weapon and the ammunition. Whenever possible, investigations should be undertaken jointly with an experienced weapon system specialist.[10] This ensures the best knowledge and experience available are brought to bear to establish the factual evidence and relevant details are not overlooked.

Additional specialist assistance could include:

A) more experienced technical investigators;

B) ammunition and weapon system designers;

C) explosive chemists;

D) forensic scientists

E) technical specialists when RF hazards are a potential cause;

F) weapon system specialists, (including gunnery instructors); and

G) police and/or military police.

These specialists may also be required to present reports and evidence in a subsequent legal process, therefore it is important that the Technical Investigator works with them to produce a co-ordinated and factual report.

The need to cooperate with investigators from other agencies, which may well have different terms of reference, powers and objectives, can pose a challenge to the statement in Section 4 “The Technical Investigator should determine what happened and why, and not attribute blame or negligence to any named individual.” Nations, with their individual legal systems and standards, need to be aware of and address this challenge.

[8] Some countries use the term Accidental Discharge until such time as investigation has eliminated ammunition defects and weapon faults as potential causes.

[9] Up to and including 14.5mm calibre has been selected as these weapons are usually manually as opposed to system operated.

[10] Armourers for small arms and light weapons.

12 Evidence

The Technical Investigator should not be constrained into only looking at the evidence that can be seen at the scene. The course of events immediately prior to the accident shall always be investigated. Many serious accidents are preceded by a stoppage or misfire, therefore the sequence and cause of these stoppages or misfires and the drill taken to resolve them often lead to a better understanding of the cause of the accident.

12.1 Witness evidence

Eyewitness evidence is often the most important type of evidence available in establishing the actions and procedures being used immediately prior to the incident. Technical Investigators should therefore:

A) make it clear from the start of the interview that the Technical Investigator is there primarily to ascertain the cause of the incident and not to apportion blame;

B) interview witnesses, as soon as possible after the event, while due regard is given to the effects of shock on the personnel involved. Shock can eliminate all memory of events immediately before the accident. Any lapse of time before a witness is questioned may well result in speculation on the cause, thus leading to inaccurate evidence being given without deliberate intent. An examination of the factual evidence visually available may well enable the investigator to spot such inaccuracies immediately; and

C) consider the credibility of the information being given by the witness. If the information is in conflict with the facts, or does not fit into place, this shall be taken into account when compiling the final report.

Witnesses are not necessarily infallible and can sometimes have their own agenda, including a perceived need to defend their part in the accident: Eyewitnesses of ammunition accidents and incidents during storage, transportation, operations and firing ranges are generally from the same group of people. They may have common interests and sympathy for their comrades, which may tempt them to speak defensively in order to reduce any impact on their colleagues. This is a common human behaviour that the technical investigator should be aware of. Even should neutral eyewitnesses be found, they are mostly laypersons and their evidence may not contain the technical level of information necessary to resolve the cause of the incident or accident. Technical investigators should use their professional skills, (analysis of material and forensic evidence, technical knowledge, knowledge of previous accidents etc), to identify the likely cause of the accident or incident

12.2 Collection of forensic evidence

Evidence recovered from the scene is most valuable and will assist the technical investigator to determine the cause of the accident. Although the immediate priorities after an incident are to treat the injured, deal with the immediate emergency and make the workplace safe, care shall be taken to avoid the destruction of any evidence that may be required during investigation. The Technical Investigator should therefore:

a) first determine whether any evidence has been disturbed or removed prior to his/her arrival so that the positioning of items in relation to the incident can be properly established;

b) ensure that the area of the incident is cordoned off to prevent the removal of evidence. Where evidence is scattered over a wide area, or other agencies are on scene, a common approach path shall be established to prevent evidence being destroyed; and

c) where applicable, search the area to ensure that all available evidence is located. The position of each item in relation to the incident must be noted before it is collected.

12.3 Preservation of forensic evidence

The Technical Investigator shall always be aware of the need to preserve forensic evidence. This need may arise from the need for further technical investigation or for use in other investigations. Due regard should be given to the continuity of evidence.[11]

Where evidence is retained by another agency, details shall be included in the report and photographs obtained of what has been retained, by whom, where and their contact details.

Where evidence is to be collected and passed on by the Technical Investigator it shall be bagged and marked to show the details of the accident, the date and a unique serial number.

12.4 Photographic evidence

Photographic evidence is invaluable and should accompany a report whenever possible. Consider pictures of the scene from all angles with posts to show positions of witnesses and other items. A ruler positioned next to small items gives a good idea of scale.

12.5 Comparison firing evidence

A comparison firing of the same ammunition, but of a different lot or batch number, using the same weapon, may give valuable information on whether ammunition production or the weapon may be the cause of the incident.

12.6 X-Ray evidence

Where X-ray equipment is available it may be used to, for example: 1) establish the contents of the ammunition if it is not marked; and 2) establish the condition of mechanical fuzes.

13 Initial investigation actions

13.1 Safety and casualty handling

On arrival at the incident location, the Technical Investigator should first try to get a quick picture of the whole scene before starting the detailed investigation. Priority for action is safety and casualties, but any ammunition and explosives remaining at the scene shall be made safe.

Casualties shall be treated and removed and their positions at the scene noted. Similarly, bodies are a source of evidence and should initially remain at the scene until a doctor has examined them and preliminary investigations are complete. Due regard shall be given to covering the body with a suitable cover.

13.2 Immediate bans and constraints

For incidents involving small arms ammunition (SAA), the Technical Investigator should make an immediate assessment of whether the ammunition is safe to continue being used so as not to disrupt training or operations. If there is no doubt about safety the unit may continue using the ammunition. If there are any indications that continued use of the ammunition could put the user at risk, then a local ban shall be imposed (see IATG 01.70 *Bans and constraints*). This may be the whole stock of the involved nature or just the particular lot number involved. If in doubt, the Technical Investigator

[11] Continuity of evidence is a concept that ensures a formally documented continuity of possession, and proof of integrity of evidence collected. It establishes each person having custody or being in possession of the evidence at each point of the forensic chain.

shall ban the ammunition. This information should be passed to the relevant technical authority to consider if a total ban in accordance with IATG 01.70 *Bans and constraints* should be implemented.

If a local ban is imposed, the Technical Investigator shall explain what actions are needed. The affected ammunition should be segregated in store and appropriately marked.

13.3 Accidental discharges

A Accidental Discharge is a term that is only used with small arms ammunition (SAA) up to and including 14.5 mm in calibre. An Accidental Discharge is deemed to have occurred when:

A) the initiation of the SAA is unauthorised and unintentional or inadvertent;

B) no death, injury or damage to equipment or property is to have occurred; and

C) the weapon and ammunition performed to the designed specification.

If any death, injury or damage has occurred, no matter how minor, or the weapon was found to be at fault, the incident shall be reported as an ammunition accident.

Although the cause of an Accidental Discharge is normally human error, it is still important to report all such occurrences. What may be a 'one-off' to an individual unit may be one of many more occurrences elsewhere. If a large number of Accidental Discharges occur in a similar fashion it may indicate a design fault with the weapon, an error in the drills or possibly a training weakness in the case of an error of drill.

14 Further investigation actions

14.1 Checklist

After the initial investigation, the investigation should proceed in accordance with the checklist at Table 2. It is intended as a guideline to supporting further investigation, which should follow this generic sequence:

A) establish at an early stage whether immediate action is needed, such as banning further firing;

B) gather key facts about the event and circumstances surrounding it by interviewing witnesses before their recollection of events alters;

C) gather all necessary physical evidence; and

D) identify and secure key documents (i.e. recent inspection records, training records etc).

REQUIREMENT	CHECK
Obtain basic facts	
▪ Record the names of the injured people / witnesses / people first to the scene.	
▪ Record details of place, time and conditions of the accident.	
▪ Record full details of the ammunition, including exact type, lot, batch or serial number.	
▪ Record substances in use or present (this may just be the explosives involved but could also include other substances such as inflammable cleaners).	
▪ Check that the ammunition was not subject to any bans or constraints.	
▪ Record the quantities of ammunition issued, total fired and, where applicable, that fired through the weapon involved in the accident, any defective and any remaining stock.	
▪ The remaining stock is to be inspected for visible faults.	

REQUIREMENT	CHECK
▪ Record the layout of the area – a sketch will be useful. If possible photographs should be taken.	
▪ Verify the condition of any plant or equipment involved - eg under maintenance, in operation etc.	
Establish circumstances	
▪ What was being done at the time and what happened?	
▪ What were the immediate causes of the incident?	
▪ What were the events leading up to the incident?	
▪ Verify health of individuals prior to accident. Required in order to consider if tiredness or ill health could have been a contributing factor.	
▪ Competence. What instructions and training were given before the event and how much experience in the job did the people involved (including managers and supervisors) have?	
▪ What were the established methods of work and procedures? Were up to date work instructions in use?	
▪ In what way could the behaviour and actions of individuals have influenced the accident?	
▪ What supervision was in place – how effective was it?	
▪ Has something similar happened (or nearly happened) before?	
▪ Identify the preventive measures – did they operate correctly?	
Assess or reassess the risk	
▪ Question the adequacy of existing physical safeguards and work methods.	
▪ Reappraise the intended safeguards and work methods – do they satisfy the intentions of the explosives safety policy, do they meet the appropriate national standards or other authoritative guidance?	
Establish whether initial management response was adequate	
▪ Was the initial reaction adequate?	
▪ Was prompt and appropriate action taken such as: 1) making safe and dealing with any continuing risks; 2) electrical isolation; 3) suitable fire fighting; and 4) effective first-aid response?	
Identify the underlying causes (*Possibilities follow*)	
▪ *Management or supervision failure?*	
▪ *Lack of competence?*	
▪ *Inadequate or incorrect training?*	
▪ *Shortcomings in original design?*	
▪ *Inadequate performance standards?*	
▪ *Absence of an adequate system for maintenance?*	
Determine action needed to prevent a recurrence (*Possibilities follow*)	
▪ *Improve physical safeguards?*	
▪ *Use mechanical handling aids?*	
▪ *Introduce better test and maintenance arrangements?*	
▪ *Improve work methods?*	
▪ *Provide and use personal protective equipment?*	
▪ *Make changes to supervision and training arrangements?*	
▪ *Review similar risks in other departments?*	
▪ *Set up a system to assess the risks from new plant and substances at the planning stage?*	
▪ *Review procedures involving contractors?*	
▪ *Update standards and policies?*	
Does the national authority need to (*Possibilities follow*)	

REQUIREMENT	CHECK
▪ *Identify underlying causes and corrective action?*	
▪ *Implement follow -up action promptly?*	
▪ *Check that follow-up action has been taken?*	
▪ *Analyse data systematically to identify trends and features?*	

Table 2: Ammunition Incident Investigation Checklist

14.2 Detailed questions

The purpose of this sub-clause is to provide guidance on the more detailed questions that need to be asked in investigating an incident. Not all of the questions will be relevant to all incidents.

14.2.1 Ammunition

Table 3 suggests a range of questions relating to the ammunition that may be applicable to ammunition incident investigations.

QUESTION	CHECK
▪ Was the ammunition subject to any bans, constraints or limitations in use at the time of the accident? Were they being followed?	
▪ Are there any known faults or defects with the ammunition?	
▪ Were any faults found with the remaining or unfired stock?	
▪ Were any faults found with the previously fired or affected stock?	
▪ Where applicable, was the ammunition assembled correctly? Were any problems experienced with assembly? Were all the correct components used? Were fuze settings correct?	
▪ Was there any evidence of modification? Was any modification authorised? Where is the modification laid down?	
▪ Was there any evidence of tampering?	
▪ Was any difficulty experienced in chambering or loading of the ammunition? Is there any evidence to suggest the item had not chambered properly? Is there any evidence to suggest a double feed?	
▪ How long had the ammunition been loaded into the weapon prior to the accident?	
▪ How many rounds had been fired without problems prior to the accident? How many rounds were fired without problem after the accident?	
▪ Had there been any stoppages prior to the accident? What was done to rectify the problem?	
▪ Is the damage pattern consistent with any known defect or fault?	
▪ Had the primer or cap been struck? Did it misfire? Was it well struck or lightly struck? Had more than one attempt been made to fire?	
▪ Did the propulsion seem normal when compared to other firings? Is there any evidence of incomplete burning of propellants? Is there any evidence of late functioning of the propellant?	
▪ Was the muzzle flash different compared to other firings?	
▪ Was the recoil abnormal?	
▪ Was the sound of firing different?	
▪ Was the flight normal?	
▪ Was the safety pin removed correctly? Was it difficult to do so? Did it break when removed?	
▪ Did the fly-off lever function as intended? Did the spring reassert itself correctly?	
▪ Was the electrical continuity checked prior to use? Was the electrical continuity checked after use?	
▪ Were there any radio frequency (RF) hazards in the area? What precautions were being taken?	
▪ For igniferous fuses, were the rates of burning within acceptable limits? Did the fuse burn through to the end? Were there any signs of flash through?	

QUESTION	CHECK
▪ When issued, what type of packaging was the ammunition in? Was it unsealed or temporary sealed? Was it damaged in any way?	
▪ Prior to issue, how had the ammunition been stored? Had it been under temporary cover prior to the accident? Had it been carried by the firer in pouches or back packs?	
▪ How had the ammunition been transported to the area? Had it been subjected to excessive movement or rough handling?	
▪ What conditions had the ammunition been through? Had it been subjected to extreme conditions?	

Table 3: Ammunition Incident Investigation – Ammunition Related Questions

14.2.2 Weapon system

Table 4 suggests a range of questions relating to the weapon system that may be applicable to ammunition incident investigations.

QUESTION	CHECK
▪ Was the weapon subject to any limitations in use at the time of the accident? Were the limitations being enforced?	
▪ When was the weapon last formerly inspected?	
▪ Were there any known faults or defects with the weapon type? Were any faults found with the weapon?	
▪ Was there any evidence of wear in the weapon?	
▪ Was the damage consistent with known defects or faults in the weapon?	
▪ When was the weapon last cleaned? Was it prepared for firing? Was it cleaned between firings? Was there any evidence of fouling?	
▪ Was there any evidence of sand, dirt or water in the weapon?	
▪ Was there any evidence of un-burnt propellant in the weapon?	
▪ Had the weapon been correctly assembled? Were the correct fittings used?	
▪ Had the weapon been modified in any way? Was it authorised?	
▪ Was there any evidence of tampering?	
▪ Was the round power rammed?	
▪ Was any problem experienced in chambering or loading?	
▪ Was there any evidence of double loading?	
▪ How many rounds had been fired through the weapon prior to the accident?	
▪ Were there any previous stoppages? Were they caused by the weapon? What did the firer do to clear the weapon?	
▪ Was there any evidence of hard extraction?	
▪ Were any rounds fired through the weapon after the accident?	
▪ What rates of fire were being used? Were they excessive?	
▪ Had the weapon been subjected to extreme temperatures?	
▪ Had the weapon been used in extreme conditions?	
▪ Was the muzzle flash different?	
▪ Was the recoil abnormal?	
▪ Was the sound of firing different?	
▪ How many other weapons of the same type were being used? Did they experience any faults with them?	

Table 4: Ammunition Incident Investigation – Weapons System Related Questions

14.2.3 Drills and procedures

Table 5 suggests a range of questions relating to the drills and procedures used that may be applicable to ammunition incident investigations.

QUESTION	CHECK
▪ Where are the drills or procedures laid down?	
▪ Does the unit hold copies of the relevant publications? Are they up to date and fully amended?	
▪ Was the correct drill or procedure being followed? If not, what drill or procedure was being used?	
▪ What commands were given?	
▪ Were they as laid down in the publication?	
▪ Had any other drill or procedure been demonstrated or taught? If so, when, why and upon whose authority?	
▪ Were the weapon settings correct? Were they checked?	
▪ Was there any evidence of inappropriate behaviour?	

Table 5: Ammunition Incident Investigation – Drills and Procedures Related Questions

14.2.4 Qualifications and authorization

QUESTION	CHECK
▪ Was the firer qualified to use the weapon?	
▪ Was the firer under instruction or supervision?	
▪ Was the loading of the weapon authorised?	
▪ Was the firing of the weapon authorised?	

Table 6: Ammunition Incident Investigation – Qualification and Authorization Related Questions

14.2.5 Skills and experience

QUESTION	CHECK
▪ What qualifications did the user have allowing them to be carrying out the activity which led to the incident?	
▪ How often had the firer handled the weapon or munition?	
▪ What previous experience did the firer have?	
▪ Is it the firer's personal weapon? Was the firer issued it for a particular role?	
▪ When was the last time the firer had used the weapon or ammunition?	
▪ Had refresher training been carried out?	
▪ Were the range staff competent in the weapon or ammunition? What experience had they?	
▪ When was the last time the range staff used the weapon or ammunition?	

Table 7: Ammunition Incident Investigation – Skills and Experience Related Questions

14.2.6 Circumstances and conditions

QUESTION	CHECK
▪ Under what climatic conditions was the ammunition being used? Wet or dry? Hot or cold?	
▪ Any extremes of conditions?	
▪ Was the ammunition authorised for use in the climatic conditions?	
▪ What were the weather conditions like?	

QUESTION	CHECK
▪ Was it day or night? What were the light conditions? Was artificial light being used?	
▪ What was the type of terrain, flat, mountainous, wooded, built up, desert?	
▪ What was the condition of the area, stony, sandy, muddy or icy?	
▪ Had the weather made conditions worse?	
▪ Did local vegetation get in the way? Were there any overhanging branches?	
▪ Was there any wildlife in the area? Did the wildlife interfere?	
▪ Was the person on duty? How long for? Was he/she under pressure of any sort?	
▪ What was the condition of the range? When was it last inspected? Were there any faults with it?	
▪ Was he/she suffering from worry, stress, illness or fatigue? Were there other problems?	

Table 8: Ammunition Incident Investigation – Circumstance and Conditions Related Questions

14.2.7 Trials

QUESTION	CHECK
▪ What was the aim of the trial?	
▪ Was the trial process adequately defined?	
▪ Was the risk assessment adequate?	
▪ Were appropriate control measures in place taking account of the risks identified in the risk assessment?	
▪ Were the weapon / ammunition under development?	
▪ Was the range authorised for this activity?	
▪ Had a danger area template been established for the weapon and ammunition type?	
▪ Did the accident occur within the danger area template?	

Table 9: Ammunition Incident Investigation – Trials Related Questions

15 Reporting

The Technical Investigator should submit a full technical report to the appropriate national authority as soon as possible. Preliminary reports should be submitted if there is a need for urgent action to immediately improve safety.

Confidentiality during the whole reporting process shall be maintained, as the technical investigation and it results may form part of potential future legal processes.

Annex A
(normative)
References

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this module . For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this module are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO maintain registers of currently valid ISO or EN:

IATG 01.40 *Glossary of terms, definitions and abbreviations*. UNODA.

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UNODA) holds copies of all references[12] used in this guideline and these can be found at: www.un.org/disarmament/un-saferguard/references. A register of the latest version/edition of the International Ammunition Technical Guidelines is maintained by UNODA, and can be read on the IATG website: www.un.org/disarmament/ammunition. National authorities, employers and other interested bodies and organisations should obtain copies before commencing conventional ammunition stockpile management programmes.

[12] Where copyright permits.

Annex B
(informative)
References

The following informative documents contain provisions, which should also be consulted to provide further background information to the contents of this module:

a) IATG 01.70 *Bans and constraints.* UNODA;

b) IATG 07.10 *Surveillance and in-service proof*. UNODA.

c) DSA03.OME part 2 provides for the safe storage and processing of Ordnance, Munitions and Explosives (OME). UK MOD. November 2020;[13] and

d) NATO AC/326 Subgroup C document, *Procedures for the Collection, Analysis, and Interpretation of Explosion-Produced Debris - Revision 1*, 27 May 2008 (currently being revised)

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UNODA) holds copies of all references[14] used in this guideline and these can be found at: www.un.org/disarmament/un-saferguard/references. A register of the latest version/edition of the International Ammunition Technical Guidelines is maintained by UNODA, and can be read on the IATG website: www.un.org/disarmament/ammunition. National authorities, employers and other interested bodies and organisations should obtain copies before commencing conventional ammunition stockpile management programmes.

[13] Used extensively as a source document for information.

[14] Where copyright permits.

Annex C
(informative)
Example Cause and Closure Codes[15]

Table C.1 contains an example system of Cause and Closure Codes that Investigating Authorities may use to promulgate the results of technical investigations and as a simple reference system for the conventional ammunition stockpile management system.

More than one cause or closure code may be awarded to an incident, and the code may be changed as more evidence becomes available during the technical investigation.

Cause or Closure Code	Description	Remarks
0	Open – Under Investigation	
0A	Not Known – Ammunition item not available for examination	
0B	Not Known – Cause can not be identified with available evidence	
0C	Not Known – Cause can not be identified with available evidence, but ammunition item is suspected	
0D	Not Known – Not investigated as Fault or Performance Failure within Acceptable Limits	
0E	Not Known – Cancelled – Re-categorized	
0F	Not Known – Cancelled	
0G	Not Known – Fault or Performance Failure not related to ammunition item, weapon or drill	
1A	Storage – Army Depot	
1B	Storage – Army Unit	
1C	Storage – Field or Emergency	
1D	Storage – On Range	
1E	Storage – On Navy Vessel	
1F	Storage – Navy Depot	
1G	Storage – Transit by Road / Rail/ Air / Sea Stationary Parked	
1H	Storage – Temporary Authorised Location	
1J	Storage – Air Force Depot	
1K	Storage – Air Force Unit	
1L	Storage – Other	Specify on report.
2A	Handling – Mechanical Handling Equipment – Accident	
2B	Handling – Mechanical Handling Equipment – Negligent	
2C	Handling – Manual Handling – Accident	
2D	Handling – Manual Handling – Negligent	
2E	Transportation – Road	
2F	Transportation – Rail	
2G	Transportation – Sea	
2H	Transportation – Air	
2J	Handling – Air Dropped	
2K	Transportation – Cross Country	
2L	Handling – Cause Not Known	
2M	Handling – User Negligent	
2N	Handling – Crane or Overhead Gantry	
2O	Handling – Vertical (VERTRAS) or At Sea (RAS) Replenishment	
2P	Handling – Other	Specify on report.
2Q	Handling – Loading on/off Operating Aircraft	
3A	Design – Ammunition Item Design Fault	
3B	Design – Ammunition Packaging Fault	
3C	Design – Equipment (Ammunition not at fault)	
3D	Design – Range Construction or Maintenance	
3E	Design – Range Construction or Maintenance Suspected	
3F	Design – Inert Component	
3G	Design – Other	Specify on report.

[15] These example Clause and Closure Codes are also contained as an Annex to IATG 01.60 *Ammunition faults and performance failures* to allow for consistency in use.

Cause or Closure Code	Description	Remarks
4A	Tampering – Malicious (Military)	
4B	Tampering – Malicious (Civilian)	
4C	Tampering – Prank (Military)	
4D	Tampering – Prank (Civilian)	
4E	Tampering – Experimental / Curiosity (Military)	
4F	Tampering - Experimental / Curiosity (Civilian)	
4G	Tampering – No evidence to assign other closure code	
4H	Tampering – Other	Specify on report.
5A	Error of Drill – Ammunition Loading / Unloading / Firing	
5B	Error of Drill – Ammunition Handling	
5C	Error of Drill – Equipment	
5D	Error of Drill – Negligent Discharge	
5E	Error of Drill – Incorrect Instruction(s)	
5F	Error of Drill – Malicious	
5G	Error of Drill – Prank	
5H	Error IN Drill	
5J	Error of Drill – Miscellaneous	
5K	Error of Drill – Negligent Supervision	
6A	Equipment / Platform Only Failure – Broken / Damaged / Unserviceable	
6B	Equipment / Platform Only Failure – Poor Maintenance	
6C	Equipment / Platform Only Failure – Ingress of Water / Moisture	
6D	Equipment / Platform Only Failure – Ingress of Dirt / Grit	
6E	Equipment / Platform Only Failure – Design	
6F	Equipment / Platform Only Failure – Production by Manufacturer	
6G	Equipment / Platform Only Failure – Cause Not Known	
6H	Equipment / Platform Failure – Small Calibre Trapped Link	Chain Guns.
6J	Equipment / Platform Failure – Firing Circuit	
6K	Equipment / Platform Failure – Maintenance Error	
7A	Production – Ammunition Item Fault (Not Design)	
7B	Production – Ammunition Packaging Fault (Not Design)	
7C	Production – Incorrect or Temporary Ammunition Packaging	
7D	Production – Inert Component Fault	
7E	Certified Free From Explosive (FFE) Violation	
8A	Defect Points	
8B	Packaging	
8C	Track Spread	
8D	Split Points	
8E	Spread Points	
8F	Missile / Torpedo / Guided Weapon – Guidance Failure	
8G	Missile / Torpedo / Guided Weapon – Hardware / Software Failure	
8H	Missile / Torpedo / Guided Weapon – In Flight / Run Failure	
8J	Missile / Torpedo / Guided Weapon – Explosive Component Failure	
8K	Missile / Torpedo / Guided Weapon – Test Failure	
9A	In Service Deterioration – Beyond Design Shelf / Service Life	
9B	In Service Deterioration – Approaching Design Shelf / Service Life	
9C	In Service Deterioration – Packaging Open and Ammunition Returned	By user unit.
9D	In Service Deterioration – Prolonged Use / Handling by Unit	
9E	In Service Deterioration – No Cause Known	
9F	In Service Deterioration – Prolonged Exposure to Unprescribed Climatic Conditions	
10A	Unauthorised – Incident/Accident/Performance Failure caused by Unauthorised Planning Activities	
10B	Unauthorised – Incident/Accident/Performance Failure caused by Unauthorised Supervision	
10C	Unauthorised – Incident/Accident/Performance Failure caused by Unauthorised Firing	
10D	Unauthorised – Incident/Accident/Performance Failure caused by Unauthorised Other	Specify on report.
Z1	Provisionally Closed – Awaiting Legal Judgement	
Z2	Provisionally Closed – Awaiting Full Written Report	Verbal report only received.

Table C.1: Example Cause or Closure Codes

Annex D
(informative)
Example Ammunition Incident Reporting Form

Ammunition Accident/Incident Reporting Form			
Serial			**IATG Form 11.10 / 01.60**
1	**Person reporting the accident**		
1.1		Name:	
1.2		Rank / Appointment:	
1.3		Unit:	
1.4		Unit Address:	
1.5		Unit Telephone Number:	
2	**Accident details:**		
2.1		Date:	
2.2		Time:	
2.3		Location:	
2.4		Point of Contact *(if different from Serial 1)*	
2.5		Ammunition Type *(including Batch Key Identity)*	
2.6		Fatalities	
2.7		Injuries	
2.8		Weapon Type	
2.9		Weapon Damage	
3	**Action taken by unit**		
3.1		Firing stopped	
3.2		Ammunition of same type isolated	
3.3		Forensic evidence secured	
3.4		Any other information	
4	**Other agencies informed**		
4.1		Service Police	
4.2		Civilian Police	
4.3		Others	

Amendment record

Management of IATG amendments

The IATG are subject to formal review on a five-yearly basis. This does not preclude amendments being made within these five-year periods for reasons of operational safety, efficacy and efficiency or for editorial purposes.

As amendments are made to this IATG module they will be given a number, and the date and general details of the amendment will be shown in the table below. The amendment will also be shown on the cover page of the IATG by the inclusion of the amendment number and date.

As the formal reviews of each the IATG module is completed, new editions will be issued. Amendments will be incorporated into the new edition and the amendment record table cleared. Recording of amendments will then start again until a further review is carried out.

The most recently amended, and thus extant, IATG module is posted on www.un.org/disarmament/ammunition

Number	Date	Amendment Details
0	01 Feb 15	Release of Edition 2 of IATG.
1	31 March 21	Release of Edition 3 of IATG.