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**Ammunition faults and performance
failures**

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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Contents

Contents.....	ii
Foreword.....	iii
Introduction.....	iv
Ammunition faults and performance failures.....	1
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 General (LEVEL 2).....	2
4.1 Ammunition faults.....	2
4.2 Ammunition performance failures.....	3
5 Rationale for reporting faults and performance failures.....	3
6 Reporting of ammunition faults and performance failures (LEVEL 2).....	3
7 Actions by user unit (faults) (LEVEL 2).....	4
8 Actions by user unit (performance failures) (LEVEL 2).....	4
9 Investigating authority (LEVEL 2).....	5
10 Actions of the technical investigator (LEVEL 2).....	5
Annex A (normative) References.....	6
Annex B (informative) References.....	7
Annex C (informative) Example Ammunition Incident Reporting Form.....	8
Annex D (informative) Example Cause and Closure Codes.....	9
Amendment record.....	11

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 faults or performance failures 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. Accidents³ or incidents involving conventional ammunition are a regular occurrence, even in the best-trained military and security forces, yet most of them are preventable.

As a fundamental preventative measure any faults or performance failures should be immediately reported and investigated in order that the appropriate action can be taken to prevent reoccurrence. Such actions may include the revision of operating systems and procedures, rectification of ammunition faults, and/or the imposition of bans or constraints⁴ on the use, storage, handling, transport or disposal of the ammunition type involved. The use of an ammunition fault and performance failure reporting system assists the development of such actions.

³ Details on the appropriate response to ammunition accidents is contained within IATG 11.10 *Ammunition accidents, reporting and investigation*.

⁴ See IATG 01.70 *Bans and constraints*.

Ammunition faults and performance failures

1 Scope

This IATG module introduces and explains the concept of ammunition faults and performance failures and the responses necessary to ensure a 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 'blind' refers to *ammunition, which, though initiated, has failed to arm as intended or which has failed to explode after being armed. Alternatively, an explosives item that fails to function correctly after initiation.*

The term 'fault' refers to *any error in the make-up and/or marking and/or deterioration in the physical state of the ammunition, explosives, ammunition packages or ammunition containers.*

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

The term 'misfire' refers to *ammunition which, when initiated, fails to fire or launch as intended.*

The term 'performance failure' refers to *the failure of the ammunition or any of its constituent parts, including the explosives, to function as designed. Blinds and misfires are included within performance failures.*

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 (LEVEL 2)

As a fundamental preventative measure to support safe conventional ammunition stockpile management, any faults or performance failures 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;
- 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.

This will require that an appropriate investigating authority is nominated, staffed and resourced. Therefore, ammunition stockpile management organisations should nominate an appropriate investigating authority and ensure that it is provided with the technically qualified staff and resources that are necessary to provide an effective and efficient capability in this area.

It should be a mandatory requirement for users or stock-holding units to report any ammunition faults or performance failures to the investigating authority. All incidents of this type should be reported, and users or stock-holding units shall not make the decision that incidents are minor or not worth reporting.

If any damage or injury has occurred, no matter how minor, the event shall be reported as an ammunition accident in line with the requirements of IATG 11.10 *Ammunition accidents, reporting and investigation*.

4.1 Ammunition faults

An ammunition fault is deemed to have occurred when a fault is found with the explosives or their containers, and they were sealed by the manufacturer or authorised technical personnel when received by the user unit.

Ammunition faults should normally be detected by ammunition technical personnel at storage depots and corrected before issue to user units. However, on occasions some faults may go unnoticed. User units will probably detect a fault while receipting or issuing ammunition from unit ammunition stores or while distributing ammunition on a range or training area. User units should ensure that all personnel involved in the distribution of ammunition during training are fully conversant with the procedures recommended at Clause 7 of this guideline. Ammunition faults would include, for example:

- a) the safety pin is found to be missing from a mortar bomb when it is removed from its packaging;
- b) the quantity of rounds of ammunition in a sealed package is found to be different from that marked on the package; or
- c) the percussion cap is found to be missing from a round of small arms ammunition.

4.2 Ammunition performance failures

Ammunition performance failures most frequently occur when user units are on a range or training area and away from their barracks. In these instances, safety staff are unlikely to be carrying a full set of publications. Hence, user units should ensure that safety and supervisory staff are fully conversant with the procedures at Clause 8 to this guideline. Ammunition performance failures would include, for example:

- a) after throwing a smoke grenade it bursts into flames;
- b) after firing a mortar bomb it does not reach the required range and drops short; or
- c) any blinds or misfires.

5 Rationale for reporting faults and performance failures

There are a number of reasons why an effective system for the reporting and investigation of ammunition faults and performance failures should be developed and utilised by States:

- a) safety can be improved as immediate action⁵ to prevent a reoccurrence may be taken;
- b) ammunition may degrade in storage at a faster rate than predicted. When combined with the results of in-service proof⁶ quality trends can be identified. These trends are of significant value in calculating the efficiency and reliability of operational and war stocks. In addition, the life of the explosives can be estimated and future buys influenced. The reporting of faults and performance failures is therefore essential feedback to identify whether unexpected degradation is occurring;
- c) hazardous practices, which are not necessarily the fault of the user, may have developed in the use of the ammunition that has not previously been identified.⁷ Improved safety practices can be developed to prevent a reoccurrence; and
- d) information may be obtained that can lead to improvements in weapon and ammunition design.

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

6 Reporting of ammunition faults and performance failures (LEVEL 2)

The organisation responsible for the stockpile management of conventional ammunition should ensure that a system of reporting and investigating ammunition fault and performance failures is developed, promulgated to all users and is then effectively used. Users should be instructed to immediately report the following information on an ammunition fault or performance failure to the appropriate investigating authority:⁸

⁵ Including the use of bans and constraints. See IATG 01.70 *Bans and constraints*.

⁶ See IATG 07.20 *Surveillance and proof*.

⁷ For example, fast loading drills for mortars.

⁸ An example form is at Annex C, which is replicated in IATG 11.10 *Ammunition Accidents and Reporting*.

- a) name of individual reporting fault or performance failure;
- b) user unit;
- c) user unit contact person;
- d) date and time of fault or performance failure;
- e) location where the ammunition fault or performance failure has occurred, including map grid reference;
- f) type of ammunition involved (full technical name);
- g) weapon type involved (full technical name, condition of weapons, year of manufacture, serial number etc);
- h) batch, lot and/or serial number of the ammunition involved;
- i) brief description of fault or performance failure; and
- j) action taken by user unit.

7 Actions by user unit (faults) (LEVEL 2)

The unit using the ammunition should take the following actions in the event of an ammunition fault:

- a) secure all ammunition of that particular lot, batch and/or serial number for the technical investigator;
- b) use another batch, lot or serial number of the same type of ammunition for further training; and
- c) immediately report the ammunition fault in accordance with the instructions developed as a result of Clause 6 and wait for further guidance from the technical investigator.

8 Actions by user unit (performance failures) (LEVEL 2)

The unit using the ammunition should take the following actions in the event of an ammunition performance failure:

- a) cease firing. If there are no injuries or fatalities firing may recommence providing a different lot or batch of ammunition is used, or if the number of performance failure(s) does not exceed between 1% and 4% of the total quantity of ammunition⁹ of the lot or batch involved;
- b) cordon off the area to preserve evidence for the investigating authority;
- c) record the names of potential witnesses;
- d) make safe the individual weapon involved and secure it for the investigating authority; and
- e) immediately report the ammunition performance failure in accordance with the instructions developed as a result of Clause 6 and wait for further guidance from the nominated technical investigator.

⁹ The exact % level to be selected shall be at the discretion of the appropriate national authority.

9 Investigating authority (LEVEL 2)

The investigating authority nominated by the conventional ammunition stockpile management organisation should have the following responsibilities:

- a) appoint a technical investigator to each ammunition fault or performance failure incident;
- b) examine the reports submitted by technical investigators on ammunition faults and performance failures;
- c) consult with other appropriate organisations (manufacturers, designers, procurement agencies etc.) to obtain further information as necessary;
- d) make a technical judgement as to the cause¹⁰ of the fault or performance failure;
- e) initiate remedial action (in accordance with Clause 4) to prevent a reoccurrence;
- f) inform the user unit of the results of the investigation;
- g) maintain records of all ammunition faults and performance failures; and
- h) provide technical advice to the conventional ammunition stockpile management organisation as appropriate.

10 Actions of the technical investigator (LEVEL 2)

The technical investigator appointed by the investigating authority should:

- a) examine the scene of the performance failure;
- b) examine any weapon involved;¹¹
- 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 if unsafe to move;
- e) examine other ammunition of the same type, and the same lot, batch or serial number being used;
- f) question appropriate witnesses;
- g) make an initial technical appraisal of the cause of the performance failure 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 performance failure; and
- i) submit a written ammunition performance failure report to the investigating authority in the appropriate format.

¹⁰ Investigating authorities may wish to consider the use of 'Cause Codes' as a simplified means of notifying organisations of the results of their investigation. An example of such a system is at Annex D.

¹¹ The support of a specialist armourer may be needed to determine that performance failure is not the fault of the weapon.

Annex A

(normative)

References

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of the guideline. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the guideline 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:

- a) IATG 01.40 *Glossary of terms, definitions and abbreviations*. UNODA. 2020; and
- b) IATG 11.10 *Ammunition accidents, reporting and investigation*. UNODA. 2020.

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UNODA) holds copies of all references¹² used in this guideline and these can be found at: www.un.org/disarmament/un-safeguard/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 guideline:

- a) IATG 01.70 *Bans and constraints*. UNODA. 2020;
- b) IATG 07.20 *Surveillance and proof*. UNODA. 2020; and
- c) DSA03.OME part 2 provides for the safe storage and processing of Ordnance, Munitions and Explosives (OME). UK MOD. November 2020.

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UNODA) holds copies of all references¹³ used in this guideline and these can be found at: www.un.org/disarmament/un-safeguard/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 Where copyright permits.

Annex C (informative) Example Ammunition Incident Reporting Form

Ammunition Incident / Accident Reporting Form		
Serial	IATG Form 01.60 / 11.10	
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 <i>(if different from Serial 1)</i>	
2.5	Ammunition Type <i>(including Batch Key Identity, lot or serial number)</i>	
2.6	Fatalities	
2.7	Injuries	
2.8	Weapon Type and serial number	
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	

Annex D (informative) Example Cause and Closure Codes¹⁴

Table D.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.

¹⁴ These example Cause and Closure Codes are also contained as an Annex to IATG 11.10 *Ammunition accidents, reporting and investigation* 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 D.1: Example Cause or Closure Codes

