

A GUIDE TO DEVELOPING NATIONAL STANDARDS FOR AMMUNITION MANAGEMENT



UN SaferGuard ✓
Securing ammunition, protecting lives

ACKNOWLEDGEMENTS

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A guide to developing national standards for ammunition management
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A GUIDE TO DEVELOPING NATIONAL STANDARDS FOR AMMUNITION MANAGEMENT

FOREWORD

National ammunition standards help regulate a State's ammunition and explosives-related processes, operations and activities, procedures and the people involved, thereby enhancing the safety and security of ammunition stocks for all those exposed to its risks. Only with national standards in place will it be possible to provide safe and functional ammunition thus reducing the risk of diversion or an unplanned explosive event.

The International Ammunition Technical Guidelines (IATG) provide an important resource for national authorities to use as part of establishing and implementing national standards. Besides making the process more straightforward, the development of national standards based on the IATG provides coherent, tested and internationally approved methodologies for a State to use in managing risks from their ammunition stockpile, while injecting quality and risk management principles into the systems and organizations involved. The IATG's approach makes a difficult process more manageable for a given State and breaks the process into incremental steps that can be more easily assessed, prioritized, and managed.

An impediment to date in the use of the IATG towards developing national stockpile management standards has been the lack of guidance on how to translate the IATG into national standards. This document is intended to help bridge that gap.

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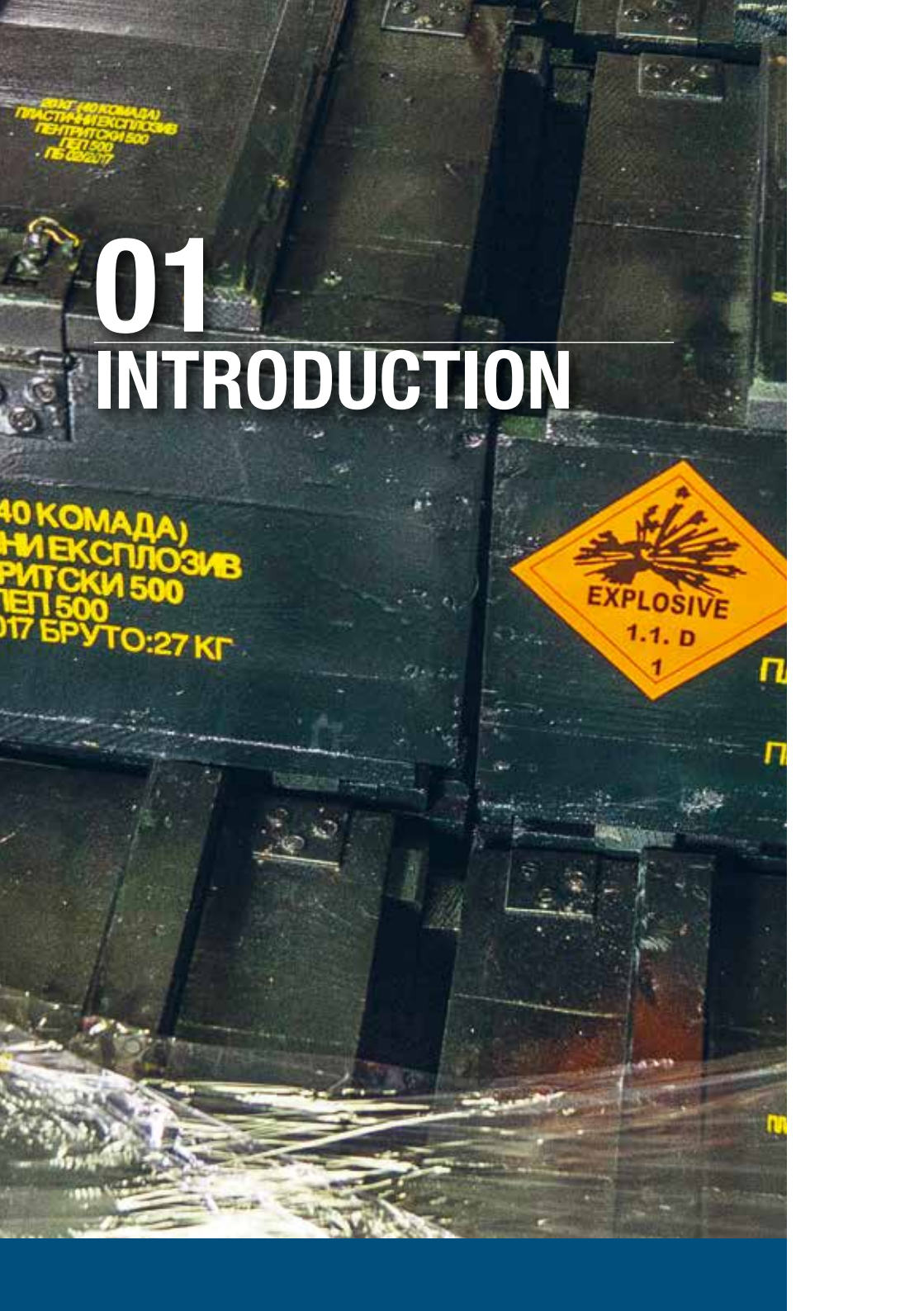
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01

INTRODUCTION

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Figure 1 – Destroying surplus propellant by burning
(Source : Ammunition Technical Trade UK)



1.1 AIM OF THIS GUIDE

The guide aims to assist State authorities in the development of national standards for ammunition management and towards implementing those standards across State institutions. More specifically, it outlines the key considerations and processes involved in the development of national standards, and provides advice for the development of an organizational framework necessary for an effective, coordinated and sustainable national ammunition management system.

Each State is different and will face differing ammunition management challenges. With its full extent of more than 1,300 pages, applying the International Ammunition Technical Guidelines (IATG) may first appear overwhelming. To make the IATG more accessible for users, this guide summarizes each of the technical modules of the IATG and highlights critical issues pertinent to ammunition safety and security, which should be covered by national standards. Not all of the IATG topics may be relevant for a State. Yet there are several universal issues in ammunition stockpile management that will apply in some form to all States. These range from personnel training and competence requirements, ammunition surveillance and inspections, to risk management protocols and security of stocks, amongst others.

As well as conforming to existing national legislation and other relevant norms, national standards should, at a minimum, adhere to the guiding principles of the IATG. They should reflect a State's policies and provide requirements and guidance for ammunition accounting, storage, processing, disposal, security and transport.¹⁾ They should protect those at risk from unintended events such as catastrophic explosions and fires at munitions sites whilst enabling the prevention and mitigation of such events. They should also enhance control over the State's assets and improve security to help minimize the risk of stockpile diversion.

This guide assists those responsible for drafting national regulations, by describing an inclusive and coherent methodology for developing standards, and by providing a simplified approach towards addressing often complex ammunition topics. Beyond the IATG volumes and modules, references are made to other guidance and resources available, such as the IATG Implementation Support Toolkit,²⁾ the UN Recommendations on the Transport of Dangerous Goods Model Regulations,³⁾ and the Ammunition Life-cycle Management Handbook,⁴⁾ which may prove useful in helping develop new or improve existing standards.

1.2 DIFFERENCE BETWEEN THE IATG AND NATIONAL STANDARDS

The IATG are a compilation of voluntary, practical guidelines on the safe and secure management of ammunition. They are meant for States and organizations to use in developing national standards, processes and procedures.⁵⁾

The IATG were developed by the United Nations at the request of the General Assembly and are overseen by the UN SaferGuard Programme. They were developed to be consistent with "good practices" found around the globe, as well as the International Organization for Standardization (ISO) standards and guides. They are also complementary to the International Mine Action Standards (IMAS), Integrated Disarmament, Demobilization and Reintegration Standards (IDDRS) and Modular Small-arms-control Implementation Compendium (MOSAIC), as well as relevant international conventions and treaties.

National standards are issued by a national authority or an organization authorized to act on its behalf. It may be appropriate for the national authority to commence development of national standards by assigning a strategic body and a legal framework to steer the process, and at a minimum, by appointing a standard issuing organization, as described later in this guide. National standards are generally considered legally binding documents within a State.

1.3 STRUCTURED APPROACH TO DEVELOPING NATIONAL STANDARDS

Most industrial sectors have a set of standards to regulate safety, security and efficiency of the work they do and to ensure the quality of the products they produce. The IATG conform to the recommendations and processes contained within the ISO quality management systems (ISO 9001 :2008) and ISO risk management system (ISO guide 51). Adopting the ISO format and language has provided significant advantages to the IATG, including consistency in its layout, use of internationally recognised terminology, and greater acceptance by international, regional and national organizations who are accustomed to the ISO series of standards and guides.

Similarly, in developing its national standards, a national authority may take advantage of the IATG's existing ISO language "shall", "should" and "may" to indicate the level of action required, as well as the quality and risk management systems integrated within the IATG that can be directly implemented.

Prior to publication of the first version of the IATG in 2011, States went their own way in developing national standards, which were often adapted from various regional standards and organizational guidelines. This frequently led to national standards which were fractured and difficult to implement. With the availability of the IATG, a State now has a resource which it can draw from to establish its own, legally binding national standards and protocols.

National standards should not just duplicate relevant sections of the IATG, for a number of reasons. The needs of a State may not warrant the entire scope offered by all of the IATG's 12 thematic volumes and 45 modules, but instead, a State may find that a smaller number of national standards may be sufficient. Therefore, in developing national standards, the aim should be to cover the functions, roles and responsibilities for each core activity, in a manner that is achievable, measurable and legally defensible. Additionally, the IATG provide guidance which should be incorporated into national standards, taking into consideration national needs and processes.

When the national authority chooses to apply the IATG to guide the development of standards for ammunition stockpile management, challenges associated with the implementation of the IATG's requirements can be better anticipated and thus addressed more effectively.

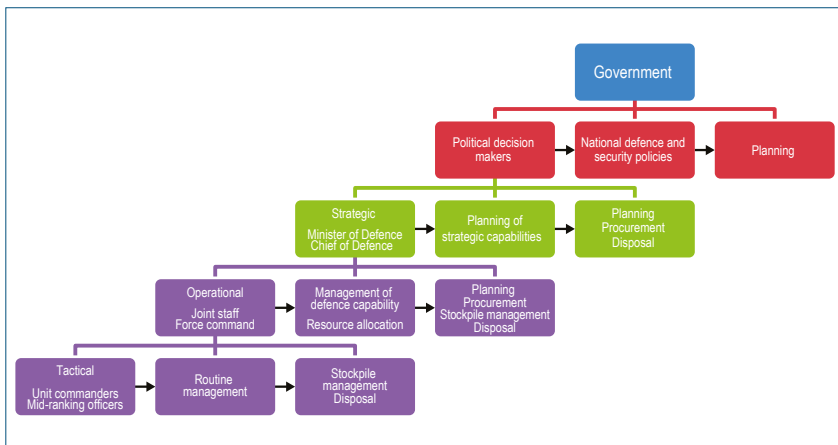
During the first steps in planning national standards, success often depends on the level of participation by relevant government bodies, armed forces and other State key stakeholders. The best national standards come out of those processes that involve all stakeholders, from the authorities at the top to those working at the lowest levels. However, it is important to remember that the development of national standards is a national responsibility, and external entities should only act in an advisory role with final decision-making being made by national authorities.

1.4 SUPPORTIVE NATIONAL POLICY FRAMEWORK AND STEP-BY-STEP APPROACH

Previous experience has shown that the highest levels of success occur if a State addresses the development of standards using a step-by-step approach rather than tackling the entire process all at once. For example, before standards can be developed, a national policy has to be in place that directs the State's approach towards ammunition stockpile management, and that policy could be as simple as "utilize the IATG". Next, competent authorities owning the ammunition stockpile management process should be identified. That could then be followed by the establishment of a national, organizational framework with assigned roles and responsibilities. These organizations would assess national ammunition stockpiles against national and strategic requirements and determine what aspects of the IATG are relevant and should be applied. They should also establish priorities for the application of identified IATG topics and dictate the implementation level, in line with the State resources, capacities and capabilities.

First selecting the topics that are more practically attainable, and those that address known critical safety and security needs, is a better approach than attempting to address all IATG topics at once. It is far better to move forward in this manner, as failing early on with an overly-ambitious set of standards may challenge the system to a point where officials feel discouraged from trying again. The application of the IATG in creating national standards cannot feasibly be accomplished in a short time, but should be viewed as a long-term effort, building on an established framework consisting of national policy, competent authorities and organizational structure. Within this framework, standards are developed and improved gradually and incrementally as the national system matures and is capable of absorbing more.

Figure 2 – Example of a national policy framework, roles and responsibilities



1.5 WHY EFFECTIVE AMMUNITION STOCKPILE MANAGEMENT IS NECESSARY

Stockpile management is an important national responsibility and the most effective mechanism for optimizing safety in storage, and reducing the risk of ammunition diversion through loss, theft, fraud or illicit trade.

Stockpile management is as much about developing appropriate procedures, processes and systems as it is about storage and security infrastructure. Infrastructure is expensive, but significant improvements in safety and security can be made at minimal costs, through system and process improvements. Changes of attitude and the development of an ethos of explosive safety can have a major impact on reducing the current high global level of undesirable explosion events within ammunition storage areas. A similar approach to the security of ammunition stockpiles would make a major contribution to reducing the risk of diversion and onward proliferation.

There are many examples of the consequences of ammunition and explosives that have deteriorated or become damaged due to inadequate attention to storage, handling and movement. The Geneva-based Small Arms Survey has recorded more than 600 unplanned explosions at munitions sites since 1979.⁶⁾ Four different examples of unplanned explosion events are shown below. These could have been prevented or their effects could have been significantly reduced through risk mitigation activities carried out as part of the implementation of national standards for ammunition management.

- On the evening of 27 January 2002, an accidental detonation of a large stock of military high explosives occurred at a storage facility located in the city of Lagos, Nigeria. In addition to the main explosion, many fires and smaller explosions were created by the kick-outs⁷⁾, which created panic that spread to other areas. As people fled the scene, many stumbled into a darkness-concealed canal and drowned. The explosion and its aftermath are believed to have killed at least 1,100 people and displaced over 20,000, with many thousands injured.⁸⁾
- On 11 July 2011, at 5:50 in the morning, an explosion tore through the Evangelos Florakis Naval Base in Cyprus. The cause of this mass explosion was determined to be the auto-ignition of propellant, which was stored incorrectly, in an inappropriate location and exposed to high temperatures, humidity and temperature fluctuations, without having determined the propellant stabilizer level, a very important surveillance requirement for propellant. The immediate consequence was the loss of 13 personnel, with another 62 injured. The dead included the commander of the Navy, the commander of the Naval Base, four other Navy personnel, and six fire fighters who were trying to extinguish the blaze that led to the explosion. The resulting blast destroyed a nearby power plant and damaged buildings at the villages of Mari and Zygi, 1.7 km and 4.5 km away, respectively, from the blast site. Loss of the Vassilikou power station, which provided approximately 50% of the power capacity for Cyprus, resulted in

rolling blackouts lasting two to three hours, for months after. It has been estimated that the cost of this entirely preventable disaster reached 10% of the gross domestic product (GDP) of Cyprus at the time.⁹⁾

- An explosion occurred in the Brak Al-Chaty ammunition storage area in southern Libya on 28 November 2013, killing over 40 people and injuring many others. Three bunkers exploded in the incident, which appeared to have been caused by looters igniting a fire to shine some light on their work. There were clear indications that the diversion from State stockpiles had been ongoing for an extended period of time with many, if not all, of the 20 bunkers emptied of bombs and projectiles.¹⁰⁾ Consequently, illegally trafficked weapons and ammunition from Libya have been traced to at least 12 other States in the region, and beyond.
- The New York Times reported an explosion that occurred on 23 September 2017, at an ammunition depot in the town of Vinnytsya, about 160 miles southwest of Kiev, Ukraine. One of the Ukrainian Army's largest ammunition depots caught fire overnight, setting off gigantic explosions and forcing the evacuation of about 30,000 people. Like a fireworks display, rocket artillery flew out of the depot in all directions, tracing glowing arcs through the night sky. Other ammunition, such as tank rounds, were thrown out of the depot into the surrounding area. The blasts posed a serious danger to air traffic, passing trains and nearby communities. According to the Ukrainian authorities, the depot held about 200,000 tonnes of ammunition, and although it was unclear how much was at risk, the firepower was on clear display. As warehouses exploded, gigantic, apocalyptic fireballs rose high above the site.¹¹⁾

Figure 3— Drone footage of an explosion in ammunition storage area in Balakleya, Ukraine¹²⁾



How stockpile management contributes to achieving the Sustainable Development Goals

The 2030 Agenda for Sustainable Development represents a useful framework to articulate the many potential contributions of ammunition management to broader peace, security and development outcomes. Ammunition stockpile management may be approached in the context of the Sustainable Development Goals (SDGs), as recognized in General Assembly resolution 72/55 “Problems arising from the accumulation of conventional ammunition stockpiles in surplus”¹³ The resolution encourages States to consider ammunition management as an intrinsic part of their actions for achieving relevant SDG targets and urges them to develop national indicators to measure it.



Effective ammunition management mitigates the risk of storage depots accidentally exploding in populated areas. These explosions, when they occur, are humanitarian disasters that lead to death, injury, economic loss, displacement and destruction of infrastructure and private property.



Strengthening the institutional capacities of States to better control arms and ammunition help prevent conflict, violence, terrorism and crime.

SDG 16, dedicated to peace, justice and strong institutions is a natural entry point for national ammunition management. Improving ammunition security and safety is a key measure to curbing illicit arms flows (encapsulated in SDG target 16.4) and preventing unplanned explosions.

Figure 4 – Testing electronic artillery fuzes during surveillance.
(Source: Ammunition Technical Trade UK)



02 OVERVIEW OF THE IATG



2.1 INTRODUCTION

The UN General Assembly requested the development of guidelines for ammunition management in 2008.¹⁴⁾ The IATG were subsequently developed to improve safety and security of ammunition stockpiles, and efficiency in their management. They are based on international “good practice” and accepted explosive science, and provide a common language and a frame of reference for States. Containing an integrated quality management system, the IATG allow for a progressive improvement in ammunition safety and security, in line with the national context and available resources. As such, the IATG encourage authorities to achieve and demonstrate significant risk reductions in ammunition stockpile safety and security.

Designed to assist States in developing their own national standards and standing operating procedures (SOPs), the IATG can be used to inform the development of national standards. Taking into account the diversity of States and their available material, financial and technical resources, the Risk Reduction Process Levels (RRPL) embedded in the IATG offer a system of ascending comprehensiveness in risk management. Accordingly, and regardless of their respective baseline, all States can utilize the IATG as a framework for assessing and improving their ammunition stockpile management processes.

The UN SaferGuard Programme manages the IATG and undertakes a formal review of the IATG on a five-year basis to ensure that the IATG reflect developing ammunition stockpile management norms and practices, and to incorporate changes due to changing international regulations and requirements.

2.2 NATIONAL USE OF THE IATG

Stockpile management in accordance with international good practice is important in ensuring that a national authority fulfills its duty of care and oversees the adequate management of ammunition stockpiles. The IATG provide freely available, commonly accepted, good practice that can be adopted by any State. As such, the IATG can be used to provide the State with detailed technical elements that support policy and legislation. They also form the basis for the drafting of national standards and SOPs for individual ammunition and explosives facilities. The preparation and application of the IATG are shaped by four guiding principles:

- Right of national governments to apply national standards to their national ammunition stockpiles;
- Need to protect those most at risk from undesirable explosion events (e.g. local civilian communities and explosives workers);
- Requirement to build national capacity to develop, maintain and apply appropriate standards for stockpile management; and
- Need to maintain consistency and compliance with other international norms, conventions and agreements.

It is important that national authorities adhere to these guiding principles, and that improvements in stockpile management, where needed, are made in an integrated and graduated manner, as resources become available.

Whereas the IATG provide a range of options and procedures towards effective stockpile management, they also acknowledge that it can be an expensive process. The scarcity of resources and conflicting national priorities for these resources in some States mean that it is neither possible nor desirable to establish a global set of criteria to dictate standards for ammunition management. Responding to such resource and capacity gaps, the IATG are structured as a guidance framework that provides options for a gradual improvement in safety and security within a national risk management process. The IATG do not define a detailed way in which ammunition safety and security requirements are to be achieved by every State: these should be covered in national and local codes of practice.

2.3 OVERVIEW OF THE IATG VOLUMES

The IATG are comprehensive technical documents that are intended for use by suitably qualified and experienced persons, whose competence enables them to interpret, explain and apply the internationally recognized good practice contained in the IATG.

IATG 01.10 (Introduction to Ammunition Technical Guidelines)¹⁵⁾ explains the background, legal standing and framework of the IATG. When defining and drafting policy for managing ammunition and explosives, policy-makers and technical experts can make a good start by considering which areas of ammunition management their national policy will address within this generic framework :

Table 1 – The 12 thematic volumes of the IATG

Series	Generic area
01	Introduction and Principles of Ammunition Management
02	Risk Management
03	Ammunition Accounting
04	Explosive Facilities (Storage) (Field and Temporary Conditions)
05	Explosive Facilities (Storage) (Infrastructure and Equipment)
06	Explosive Facilities (Storage) (Operations)
07	Ammunition Processing
08	Transport of Ammunition
09	Security of Ammunition
10	Ammunition Demilitarization and Destruction
11	Ammunition Accidents, Reporting and Investigation
12	Ammunition Operational Support

2.4 USE OF TECHNICAL LANGUAGE

Since their introduction, there have been requests for the IATG to be simplified for the non-technical user. This continues to be resisted because they are meant to cover the bulk of activities involved in through-life management (TLM) of ammunition. To this end, the IATG must be technically detailed so that State ammunition and explosives practitioners, as well as international assistance providers, can extract relevant technical information in necessary detail, to ensure the safe and secure management of ammunition and explosives in conformity with international good practice. In this vein, oversimplification would introduce the risk of applying unsafe practices.

One of the outcomes of writing and implementing national standards is to give policy-makers and practitioners, at all levels, the tools that they need to deliver safe and secure ammunition management, in terms that all can understand and agree upon. In this way, a glossary of local terms can be created that links to the technical language and the glossary of the IATG¹⁶⁾. In turn, this enables effective communication between different groups involved in national ammunition management. In the realm of the policy writer with responsibility for drafting national standards, there are terms that should be agreed at the outset. These are listed and described in the glossary at the end of this guide.

2.5 AMMUNITION MANAGEMENT IS A NATIONAL RESPONSIBILITY

According to IATG 01.10, stockpile management refers to the procedures and activities on safe and secure accounting, storage, transportation, handling and disposal of conventional ammunition. These are often complex technical areas that, to be safe and secure, require specialist management structures and procedures. The UN General Assembly¹⁷⁾ has recognized the importance of appropriate national ammunition management structures and procedures. These include laws and regulations, training and doctrine, equipment and maintenance, personnel management and finances and infrastructure problems arising from the accumulation of conventional ammunition stockpiles in surplus.

Appropriate national management structures and procedures ensure sustainability in ammunition management. In this regard, the UN General Assembly¹⁸⁾ emphasises the central role of the provision of technical assistance and capacity building to Member States upon their request (A/RES/72/55):

- Encouraging States, as appropriate, to consider ammunition management as an intrinsic part of their actions for achieving relevant targets of the Sustainable Development Goals related to the reduction of illicit arms flows and the prevention of violence through strengthened institutions, and to consider, where relevant, developing national, regional and sub-regional indicators based on this understanding;
- Encouraging States, where relevant, to develop voluntary national action plans on the safe and secure management of conventional ammunition, and acknowledges the utility of information-sharing and the benefit of good practices among States, as appropriate.

In this vein, IATG 01.10 states that the primary responsibility for conventional ammunition stockpile management shall rest with the government of the State holding the ammunition. This responsibility should normally be vested in an authority, which is charged with the regulation, management and coordination of conventional ammunition stockpile management. The national authority shall be responsible for establishing the national and local conditions that enable the effective management of conventional ammunition. It is ultimately responsible for all phases and all facets of the stockpile management processes within its national boundaries, including the development of national standards, SOPs and instructions.

Troop-Contributing Nations (TCNs) to UN peacekeeping operations are further expected to, in addition to adhering to UN policies and procedures, develop SOPs alongside national standards for the sound management of the ammunition stockpiles within their national contingents deployed around the globe, to harness the UN safety requirements and local conditions of the host States.

2.6 FUNCTIONAL AREAS WITHIN CONVENTIONAL AMMUNITION MANAGEMENT

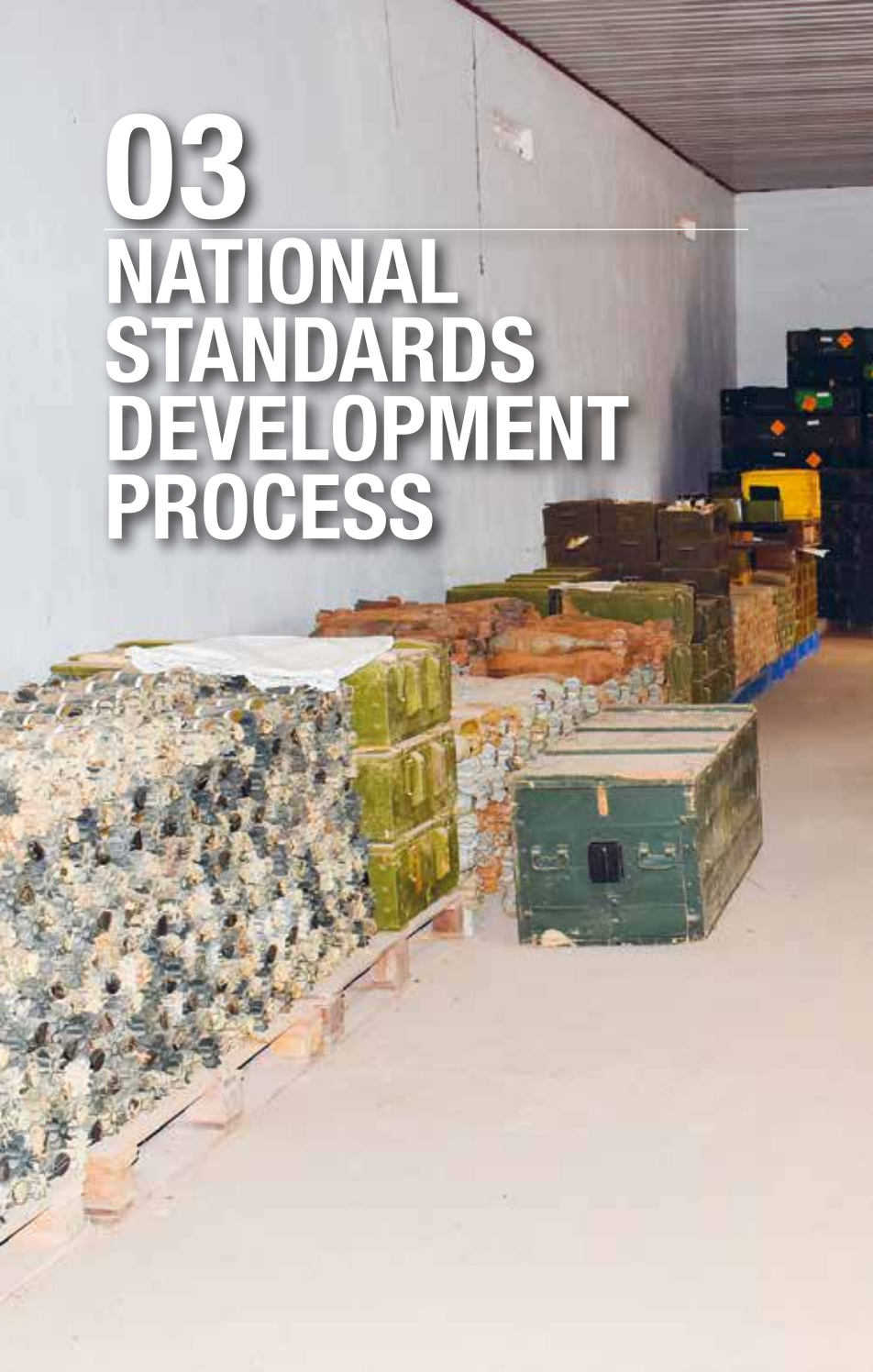
IATG 01.30 (Policy development and advice) ¹⁹⁾ notes that stockpile management is not only about the technical requirements of ensuring the safety and security of ammunition and explosives but also covers areas such as the determination of stockpile size, types of stockpile and the management of ammunition in service. In establishing the scope for national standards, a holistic approach is encouraged. National standards should encompass safety, security and through-life management aspects of ammunition management. The IATG approach this by recognition of six functional areas within conventional ammunition management. For ease of reference, the functional areas and requirements (functions) with corresponding IATG are offered in Table 2 (see IATG 01.30, Table 1).

Table 2 – Functional areas in conventional ammunition stockpile management

Functional Area	Requirements	IATG
Ammunition Management	<ul style="list-style-type: none"> • Inventory Management System and Procedures • Risk Management System and Procedures • Procurement System and Procedures • Hazard Classification System • Accident, Fault and Performance Failure Investigation Capability and Procedures • Ammunition Surveillance and In-Service Proof Capability and Procedures 	<ul style="list-style-type: none"> • IATG 03.10 • IATG 02.10 • N/A • IATG 01.50 • IATG 01.60, 01.70, 11.10 and 11.20 • IATG 07.20
Ammunition Storage	<ul style="list-style-type: none"> • Field and Temporary Storage Procedures and Operations • Depot Storage Procedures and Operations • Safe Depot Storage Infrastructure • Unit Storage Procedures and Operations • Safe Unit Storage Infrastructure 	<ul style="list-style-type: none"> • IATG 04.10 • IATG 06 Series • IATG 05 Series • IATG 06 Series • IATG 12 Series
Ammunition Processing	<ul style="list-style-type: none"> • Ammunition Inspection Capability and Procedures • Ammunition Maintenance Capability and Procedures • Ammunition Repair Capability and Procedures • Ammunition Process Building Infrastructure 	<ul style="list-style-type: none"> • IATG 06 Series and 07.10 • IATG 06 Series and 07.10 • IATG 06 Series • IATG 05 Series
Ammunition Disposal	<ul style="list-style-type: none"> • Identification of Ammunition for Disposal Methodology • Disposal Technology and Infrastructure • Disposal Capability and Procedures 	<ul style="list-style-type: none"> • IATG 03.10 • IATG 10.10 • IATG 10.10
Ammunition Security	<ul style="list-style-type: none"> • Physical Security Infrastructure of Explosive Storage Areas • Security System Capability and Procedures • Vetting System for Staff 	<ul style="list-style-type: none"> • IATG 09.10 • IATG 09.10 • IATG 09.10
Ammunition Transport	<ul style="list-style-type: none"> • Transport Procedures in accordance with International and National Legislation • Intrinsically Safe Vehicles 	<ul style="list-style-type: none"> • IATG 08.10 • N/A

03

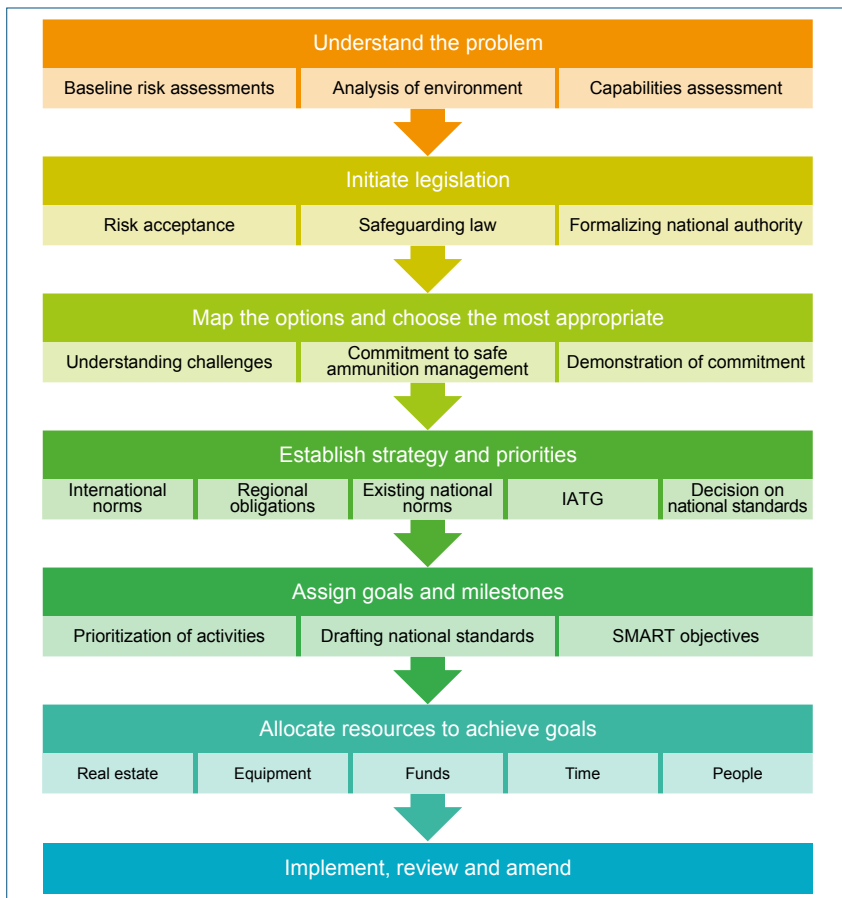
NATIONAL STANDARDS DEVELOPMENT PROCESS



The aim of this chapter is to help understand the scope and content of national standards and walk through the main processes in their development. This is achieved by, as far as possible without being prescriptive, addressing the various issues in the format of *what is the issue, why is it important and how can it be addressed*.

A national standard is a document that is executed by the national authority to comply with the regulatory framework and to control the safety, security, quality and efficiency of the ammunition and explosives sector. It is important that it is written by and for the State by the national authority because national authorities understand the political, cultural, social, economic and technical needs that the legislature must address, better than any external agency could. The proposed outlined process for developing national standards, which belies a great deal of detail to be addressed in each stage, is shown in figure 5 and Annex II.

Figure 5 – Outline process for developing national standards for ammunition management



3.1 UNDERSTAND THE PROBLEM

Effective management of national ammunition stocks is a complex and costly endeavour. The challenges are even greater in conflict-affected States due to lack of resources, infrastructure and trained personnel. Yet, all ammunition management environments can be characterized by some struggle over resources and a degree of pressure to address concerns related to ammunition safety and security. In order to decide what to do first, where it sits in the hierarchy of complex problems, how to set goals and eventually achieve them, a State's legislature and national authority need to understand the scale and scope of the issues pertinent to ammunition and explosives in their State.

Box 1 – Emergence and evolution of ammunition management standards in the United Kingdom

The UK's development of its national standards for explosives and ammunition management dates back to the 19th century. The Explosives Act of 1875 was the first piece of civil legislation to address the control of explosives and was introduced to prevent the diversion of explosives to anarchists and Irish Republican groups. During this period, single service ammunition and explosive regulations, issued under the authority of the Secretary of State for War, covered the control and management of ammunition in magazines, in the hands of army field units, and in Royal Navy shore establishments and vessels.

In 1974, a number of statutory instruments were issued under the primary Health and Safety at Work Act, which covered the control, manufacture and storage of explosives. UK military explosive regulations were later rationalized into a single set of joint service explosive regulations in 2000. As a result of the catastrophic loss of a Nimrod aircraft over Afghanistan in 2006, major changes were made to how the UK assures the safety of all of its defence-related activities. Though ammunition and explosives were not the cause of the aircraft loss, it resulted in the creation of the Defence Ordnance, Munitions and Explosives Safety Regulator.

The principal drivers today for the development of UK national standards and regulations for ammunition control and management come from the UK's interaction with supranational entities such as the United Nations, the European Union and the North Atlantic Treaty Organization.

Author: Bob Seddon. Source: Development and Evolution of National Ammunition Management Standards in the UK. Unpublished background paper. Geneva: Small Arms Survey

Experiences shared by government representatives, the UN, military and international organizations conclude that unplanned explosions and diversion are symptoms of various shortcomings: lack of political awareness, lack of staff capacity, skills and adequate infrastructure, or institutional, governance and oversight issues.²⁰⁾ Whereas "national ownership is a pre-requisite, commitment at the top level of government does, however, not necessarily trickle down to those actually doing

the job on the ground. On occasion, implementing agencies are asked for support, but once in country, cooperation from local storage holders is not guaranteed. Likewise, commitment may be found on the ground whilst lacking at the top level, requiring that it be nurtured at all levels. Effective ammunition management is driven nationally and takes into account country-specific situations.”²¹⁾

Accordingly, national authority and international assistance providers should consider using structured analytical techniques and tools to determine the baseline for safety and security risks to be addressed, the influence of external factors on national ammunition management, and assessment of national capabilities. Below are three exemplary tools for a structured approach to examining potential risks with ammunition:

Risk reduction baseline study

In the IATG, the different tasks and activities necessary for safe, efficient and effective stockpile management are considered to equate to one of three Risk Reduction Process Levels (RRPLs), indicated within each IATG as either LEVEL 1 (basic), LEVEL 2 (intermediate) or LEVEL 3 (advanced), depending on the degree of complexity of each task or activity.

The UN SaferGuard Programme provides an online RRPL checklist tool²²⁾ that can be used to develop a snapshot of the current state of a single ammunition site against the RRPLs described in IATG 01.20. The RRPL checklist is useful for obtaining information about the risks concerning a storage or processing site at any point in time. It can be used to capture the baseline as the national authority sets about improving ammunition safety management and then measuring progress by comparison of new checklists against old ones, as improvement measures are introduced and used.

Using the tool, RRPLs are determined by calculating a weighted score of all the questions answered about an ammunition stockpile site. To achieve a given RRPL, the site’s score must meet or exceed the appropriate score threshold and all *critical* questions for the RRPL must be satisfactorily answered. To make best use of the RRPL checklist tool, as part of the baseline study, the analyst will need to extract and collate information from site reports to identify trends. It should be looking for generic areas and groups of activities where there is consistently good practice as well as those where there is cause for concern.

To determine the status of a State’s ammunition stockpile, all its ammunition stockpile locations would need to be assessed and the individual results compiled into a composite status report. The status report would establish a baseline from which to move forward. The national authority should pay particular attention to those questions that relate to safety-critical activities and, if there is a national trend of not meeting the requirements of these activities, recommend actions to improve the situation. Trends so identified inform the national authority about

general areas of concern and feed into the strategic and operational plans for achieving the national ammunition safety and security goals. Spotting emerging risks that involve ammunition and explosives before they materialize is obviously a life-saving activity but can also prove tremendously helpful in deciding on the priorities i.e. which standards to develop first.

It is proposed that national standards are based on the IATG 01.20 principle that “the basic aim of a conventional ammunition stockpile management organisation should be to make sure that stockpile management processes are maintained at Risk Reduction Process Level 1 as a minimum, which will reduce risk significantly”. Ongoing and gradual improvements should then be made to the stockpile management infrastructure and processes as staff development improves and further resources become available. A national authority should take note that the rate of progress towards overall RRPL 1 and beyond is under their control and that it is quite possible for a site to be at RRPL 2 or RRPL 3 for one activity while not yet being at RRPL 1 for others.

PESTLE analysis

As a national authority acknowledges the presence of a problem involving ammunition and explosive materials, the authority and its partners may seek to identify the underlying causes and contributing factors to the problem. Understanding the problem environment is a pre-requisite for the development of effective and responsive policies, legislation and national standards to tackle it. PESTLE²³⁾ analysis provides one methodology for this. A national authority can use PESTLE to map multiple interlinked factors that may have contributed to the problem and assess the effects of these factors outside the authority’s control on its performance.

PESTLE frames the identified problem with six external factors, to allow a judgement to be made on their importance within the problem. The factors to consider are political, economic, social, technological, legal and environmental, each that may have either a positive (opportunities) or negative (threats) influence on the problem. Refer to Annex III for unpacking PESTLE in the ammunition risk mapping context, pertinent to the development and prioritization of standards.

Figure 6 – External factors that may influence known risks from ammunition stockpiles



Capability lines of development

In most States, ammunition and explosives are a significant defence capability. Ministries of defence make use of capability lines of development to ensure a common approach to the introduction, sustainability of new and existing capabilities, as well as disposal of obsolete capabilities. Ensuring the interoperability of different systems and organizations involved in ammunition stockpile management is at the core of such capability development. The lines of development are also used to analyze the existing capabilities so that areas for improvement can be identified in a State, hence providing valuable advice to its national standards development process.

In this vein, the UN SaferGuard Programme is currently considering a new IATG module addressing “organisational capabilities” to be included in the forthcoming version 3 of the IATG to be released in 2020. Once approved, this module will introduce elements integral to organisational capability development, including processes, functional roles and “capability enabling lines.” It will describe the interaction between these three elements, and explain key processes in the life cycle of ammunition, namely the planning, evaluation, procurement, introduction, utilisation and decommissioning.

National authorities should note that although these capability development frameworks are commonly used by the military, they are equally applicable for a State that is developing complex capabilities. In the United Kingdom, for example, the Ministry of Defence acknowledges eight distinct lines of capability development, namely training, equipment, personnel, information, concepts and doctrine, organization, infrastructure, and logistics. Refer to Annex IV for a description of the UK model of capability lines of development.

3.2 INITIATE LEGISLATION

In establishing national standards, legislation is required to bring them into force. The legislature will need to enact laws that assist the establishment and authorization of the national authority (regulator); the adoption of the relevant IATG as the basis for national standards; and the application of the IATG in national standards and SOPs.

Once appointed, the national authority has a legal responsibility to ensure that the risks that their explosives present to the general public are both tolerable and as low as reasonably practicable (ALARP), should an explosive event occur in storage or during transport. This safeguarding of the public and the personnel involved in ammunition management should be enshrined in legislation. A safeguarding law should prevent the establishment of dwellings within the safeguarded area. Should dwellings nonetheless remain in the safeguarded area, the law should stipulate options to guide political decisions to address the risk:

- The explosive quantity permitted for storage shall be reduced within the facility to a tolerable risk level;
- The increased risk to the civilian population shall be formally accepted by the State and communicated to the residents along with entitlement to a due compensation in the event of an accident;
- The civilian population shall be moved from the safeguarded area;
- The ammunition shall be moved from the safeguarded area to another location.

Refer to Annex V for guidance on the rationale for safeguarding law.

The legislature should make a statement in legislation or regulation that it either adopts the societal and individual risk levels that are suggested in Table 3 of IATG 02.10, or provides nationally accepted tolerable risk levels. The national authority then has a baseline from which it can make reasonable judgements when translating the RRPLs into national standards.

The national authority and legislature need to appreciate that there will always be a degree of risk associated with each RRPL. The overall degree of risk accepted by the State will reduce as more and more of the processes and practices linked to each RRPL are applied. National authorities should note the warnings in IATG 04.10 and 04.20 that quantity distances for field and temporary storage provide short-term solutions; not the same degree of protection as those for permanent facilities given in IATG 02.20.

3.3 MAP THE OPTIONS AND CHOOSE THE MOST APPROPRIATE

Once the challenges pertaining to ammunition stockpiles are understood and reported by the national authority, the legislature will better understand the multi-faceted nature of the challenge and therefore the options and any recommendations made by the national authority.

The legislature and national authority will make a judgement on what activities are necessary to achieve an acceptable and achievable level of ammunition and explosives safety and security for the State. This could take the form of a roadmap and involve a decision published as a governmental statement, edict or decree informing that the State will take the necessary actions to adopt the principles and good practice of the IATG. This, or a formal act of the legislature, will demonstrate the State's commitment to ammunition and explosives safety. Having this formal commitment would give the international community confidence in providing assistance to the national authority to develop national standards and in supporting the necessary enabling projects. Such public commitment to adopt an internationally recognized guidance framework should also prevent well-meaning international assistance providers from delivering equipment, infrastructure or training that is inappropriate at a particular stage of the State's capability development.

3.4 ESTABLISH STRATEGY AND PRIORITIES

An ammunition and explosives safety and security strategy that comes from the heart of government demonstrates to internal agencies that the State's ammunition and explosives stockpile management issues have been given serious consideration. It also indicates that a way to improve the situation has been identified, if not yet in place. Equally important, it demonstrates to external supporters and agencies that the problem is going to be addressed and provides a platform for bids for financial and/or physical assistance.

A good national strategy will explain the issues to be addressed, their relative importance in the contexts of the existing security, economic and political realities, and the State's intent to improve the situation over time.

Box 2 – Timescales

In the immediate aftermath of the US-led coalition military operations in Iraq in 2003, it was estimated that clearance of all explosive remnants of war could take over 50 years. In Ukraine, it is estimated that disposing of all Soviet-era stockpiles at the current pace will require more than 100 years. Meanwhile, the national authorities in Laos and Vietnam have estimated at least 200 years of work to remove all explosive hazards from the wars of the 1960s. In Europe, several States still come across explosive ordnance from World War 2. It seems obvious that an explosives and ammunition safety and security strategy should be able to reduce the hazards and risks to levels that are acceptable to all parties involved and achievable in an acceptable timeframe, with available resources. National authorities and international assistance providers understand that in most cases in recent history, the challenge pertinent to ammunition and explosives is not something that can be solved over a short period of time.

The national authority therefore needs to advise the legislature on a strategy that can achieve reasonable levels of explosives safety and security appropriate for the State. Ideally, the State ambition will align with appropriate Sustainable Development Goals (SDGs) and lean towards internationally accepted norms contained in the IATG. The ammunition and explosives safety and security strategy should also align with relevant security sector reform (SSR) strategies, goals and development programmes that might be in place. Experience suggests that the level of political will and availability of resources will determine the actual timescale for achieving strategic goals in ammunition safety and security but that planners should think in terms of a 20- to 50-year programme, depending on the magnitude of risk and response capabilities at the outset.

Requirements for through-life management of ammunition

To effectively mitigate the risks of unplanned explosions and diversion from stockpiles, ammunition management requires complex systems, which present planning challenges and have significant budgetary implications for governments. A systems-based approach to through-life management of ammunition and a long-term strategy to execute it can help a State to address these challenges and, in particular, to mitigate diversion and the risk of unplanned explosions at munitions sites. A statement that reflects through-life approach to planning, procurement, safe and secure stockpile management and ultimate disposal of ammunition and explosives could be included in the strategy with the details included in associated national standards.

Box 3 – Lessons from Bosnia and Herzegovina (BiH):
developing an ammunition master plan

While the international community substituted expertise for a lack of national capacity in post-conflict BiH up to 2012, it subsequently built government capacity to ensure its ownership of the system for life-cycle management of ammunition (LCMA). Following its establishment in December 2010, the EUFOR Ammunition and Weapon Storage Site Management Mobile Training Team (MTT project) played a key role in this process. Since then, the MTT project has:

- Provided needs-based, tailor-made, modular ammunition management training courses, which the BiH Ministry of Defence (MoD) subsequently integrated into the BiH armed forces structure and curricula;
- Coordinated equipment donations for stockpile management capacity building and training efforts; and
- Provided advice to the BiH MoD and the armed forces for sustainable LCMA, particularly the development of regulations and SOPs for stockpile management, including for ammunition accounting and disposal.

The international community has also encouraged BiH government and armed forces personnel, including the minister of defence and chief of defence, to take a more prominent role in addressing the challenges posed by the vast ammunition stockpiles. As a result of these efforts, high ranking BiH government personnel have taken the lead in related decision-making and planning, including through the development of the Ammunition, Weapons and Explosives Master Plan.

Source: Carapic and Holtom, Small Arms Survey Briefing Paper, 2018

3.5 ASSIGN GOALS AND MILESTONES

Acknowledging that achieving the highest standard of explosives security and safety management can take decades, and that available resources to accelerate this process are limited in any State; a step-by-step approach to achieving the State's desired end-state should be encouraged. If the State's published intent is to apply the IATG as the basis of explosives security and safety regulations, the national authority will need to understand the goals and milestones that are to be achieved and write national standards that enable those goals and required working practices.

The national authority will need to advise on setting the State's goals. Knowing the baseline and desired end-state, the national authority should use, for example, information resulting from the above risk reduction baseline study, PESTLE and capability lines of development analyses, to establish interim goals that will lead to the end-state. To fit these goals into a structured plan, they should contain SMART objectives, i.e. being specific, measurable, achievable, relevant and time-bound. Including SMART objectives for established goals will support their implementation, simplify monitoring and improve arguments for funds and other resources.

To reduce risk significantly, IATG (01.20) encourages ongoing improvements to the stockpile management infrastructure and processes as staff development improves and further resources become available. Let us assume that the State's ammunition and explosives safety management strategy is to achieve RRPL1 as a major milestone. The aim of national RRPL goal-setting should be to:

- Rank the results²⁴⁾ of the national authority's gap analyses according to:
 - How important they are in the overall strategy
 - How feasible they are within existing resources
 - How feasible they are with external assistance
- Determine the order in which the gaps are to be filled, i.e. set the national authority's goals or objectives. The national authority should consider setting these goals in the manner of SMART objectives.
- Put in place a monitoring and auditing regime to measure progress.

Gap analysis identifies and analyses gaps between the optimal resource allocation and the current allocation level to reveal areas that can be improved. If a State, for example, has set an ammunition safety management strategy of achieving RRPL1, the activities that trigger a "RRPL1 Level RED" outcome on the RRPL checklist are gaps in capability that need to be plugged.

3.6 ALLOCATE RESOURCES TO ACHIEVE GOALS

The framework of goals and objectives should support the priorities of work in a national context including which IATG, and in what order, are to be applied in national standards. The priorities are sensitive to the circumstances that prevail in each State context at a given time. There are some generalities however, that come about from the political, economic, cultural and historical factors that affect all States. In general, all States have a duty to ensure the safety of their people i.e. defending them from internal and external threats. Accepting this premise, a State will need security forces and law enforcement that are properly constituted, trained and armed to meet these threats effectively.

The first ammunition- and explosives-related decision to be made by the State is therefore to define the roles, size and structure of its security forces. This in turn will define the weapons required and therefore the ammunition for these weapons. The activities that should take place at early stages in the development and implementation of national standards include at least: disposal of surplus/unsafe stock; movement of ammunition to safe and secure storage or disposal facilities; storage in depots and small units; and management of storage and disposal facilities. Since the aim of national standards is to underpin the State policy about the safety and security of ammunition and explosives, it seems that all of these essential activities are of equal priority and mutually supportive, therefore to be included in the early iterations of national standards.

Resource allocation is made difficult given these priority activities. It is the national authority's responsibility to advise the government, as well as the owners of the available resources, on what needs to be done (informed by the structured analytical process discussed on pp. 25-27), what can be achieved using the existing resources, and what needs to be done using external assistance. Resources for ammunition management cannot be summed up in a guide – each State having different priorities and available funds.

The scale of the problem to be resolved can be understood once the legislature and the national authority consider the resources that are required, against those that are available: real estate, people, equipment, funds and time. The issue of safe and secure management of ammunition cannot be resolved solely by throwing money at it. Resources that a State has in its power are:

- **Funding**

Effective ammunition stockpile management and improvements or enhancements can be expensive. The State will want to use its own funds efficiently and can also call upon assistance from international providers.

- **People**

Suitably qualified and experienced ammunition and explosives specialists are necessary for the efficient, safe and secure management of the ammunition stockpile. Many States have such people in their population, either military or civilian, but experience in conflict-affected States suggests that these individuals can be overlooked in the drive to rehabilitate combatants and rebuild the State. In terms of effective capacity building, the legislature should endeavour to find existing specialists and/or to make use of international assistance opportunities to recruit, train and sustain this expertise within their national authority and ammunition management system.

- **Real estate**

Safe and secure storage, processing, disposal, test and evaluation, and handling of ammunition and explosives require considerable investment in real estate. The national authority needs to ensure that any land occupied has a safeguarded area or "buffer zone," which might be owned by private individuals or government; either way, the national authority must have a good working relationship with the national and/or local authority that is responsible for the land.

- **Equipment**

Ammunition and explosives handling requires both common and special equipment, depending on the explosive article and the process or activity being undertaken. Specialist equipment could be provided by the ammunition manufacturer or specified by the national authority or their process engineer. All equipment can be costly to either purchase or lease and the national authority or procurement organization should always ensure that there is a suitable maintenance contract and package associated with the purchase or lease. All equipment must be maintained correctly to ensure that it is safe to use and store. The national authority

should consider having its own research and development department for designing, manufacturing, testing and approving tools and equipment that will be used in its facilities.

- **Time**

The State should control the arrival and departure times of imports and exports of ammunition and explosives. The national authority should be able to make fairly accurate estimates of the duration of projects to aid planning of major events such as the opening of new facilities, the carrying out of safeguarding routines and special facility inspections. All of these time factors should be accounted for in the State's ammunition and explosives management strategy and the various SMART objectives that come out of the gap analysis discussed earlier.

3.7 DETERMINE TOPICS TO BE COVERED IN NATIONAL STANDARDS

Experience in adopting and applying international standards shows that not every part of the IATG should be included in national standards. Not all of the IATG modules will be relevant to a State context. Some States have existing standards for explosive ordnance disposal (EOD), for example, and corresponding systems for training and regimes. When drafting national standards, selecting the critical and achievable IATG volumes and modules first, in particular in a state with limited resources, is a better approach than attempt to directly adopt a comprehensive set of international standards, or a de facto a copy of the IATG.

Within the national standards chapters that the national authority has selected to draft, it is suggested that the national authority make use of relevant IATG but, more importantly, only those elements from within the IATG that will be used immediately and will support the next one or two stages of the process towards safe and secure management of ammunition.

Is the premise of achieving RRPL 1 reasonable for my country's needs?

Risk Reduction Process Level 1 describes a level of risk that should be tolerable in most societies, acceptable to most governments and achievable given suitable support and resources.

The meaning of RRPL 1 is that:

- Basic safety precautions are in place to reduce the risk of undesirable explosions during ammunition storage, but fatalities and injuries to individuals in local civilian communities may still occur.
- Although some potential causes of such explosions have been addressed (external fires, smoking, mobile phones etc.), others remain (propellant instability, handling, lightning strike).

- Risk of explosion still remains, as routine physical inspection of the ammunition does not occur and the chemical stability of ammunition during storage cannot be determined by analysis.
- Basic security precautions are in place to reduce the risk of theft by external actions.
- Ammunition has been accounted for by quantity, and a basic system of identifying loss or theft is in place.
- A minimal investment of resources has taken place in organizational development, operating procedures and storage infrastructure.

Section 5 of IATG 01.20²⁵⁾ lists the IATG and elements within them that are directly relevant to RRPL1. It is a helpful resource to assist planning in a national context regarding what is urgent, what is important, and how to take steps toward enhanced safety and security in the development and implementation of national standards.

Which IATG modules should be considered and why?

IATG risk reduction measures can be understood to primarily benefit the civilian population in proximity to a stockpile of ammunition, and the personnel involved in managing it. Regardless of the applicable RRPL, one of the best ways to plan and situate storage areas is to put the ammunition a safe distance away (IATG 02.20) from people either by moving the ammunition, or by moving the people. When these requirements cannot be met, a detailed consequence analysis must be carried out to fully understand the effects of not meeting required safe distances. The residual risk must be approved at the right level of authority within the State, and communicated to local population and personnel affected. With a view to immediate safety and security improvements, table 3 lays out all IATG modules and suggests priority considerations for the establishment of national standards and the implementation of specific elements within ammunition management.

Table 3 – Suggested priority considerations on elements within ammunition management

Volume	Module	Priority
01 Introduction and Principles of Ammunition Management	01.10 Guide to the ammunition technical guidelines (IATG)	✓
	01.20 Index of risk reduction process levels	✓
	01.30 Policy development and advice	✓
	01.40 Glossary of terms, definitions and abbreviations	
	01.50 UN explosive hazard classification system and codes	✓
	01.60 Ammunition faults and performance failures	
	01.70 Bans and constraints	
	01.80 Formulae for ammunition management	
	01.90 Ammunition management personnel competences	✓
02 Risk Management	02.10 Introduction to risk management principles and processes	✓
	02.20 Quantity and separation distances	✓
	02.30 Licensing of explosive facilities	✓
	02.40 Safeguarding of explosive facilities	✓
	02.50 Fire safety	✓
03 Ammunition Accounting	03.10 Inventory management	✓
	03.20 Lotting and batching	
	03.30 International transfer of ammunition module	
	03.40 End-Use(r) of internationally transferred ammunition module	
	03.50 Tracing of ammunition	
04 Explosives Facilities: Field and Temporary Conditions	04.10 Field storage	✓
	04.20 Temporary storage	✓
05 Explosives Facilities: Infrastructure and Equipment	05.10 Planning and siting of explosives facilities	✓
	05.20 Types of buildings for explosives facilities	
	05.30 Traverses and barricades	✓
	05.40 Safety standards for electrical installations	✓
	05.50 Vehicles, mechanical handling equipment in explosives facilities	✓
	05.60 Radio frequency hazards	
06 Explosives Facilities: Operations	06.10 Control of explosive facilities	✓
	06.20 Storage space requirements	
	06.30 Storage and handling	✓
	06.40 Ammunition packaging and marking	
	06.50 Specific safety precautions	
	06.60 Works services (construction and repair)	
	06.70 Inspection of explosives facilities	
	06.80 Inspection of ammunition	

Volume	Module	Priority
07 Ammunition Processing	07.10 Safety and risk reduction	✓
	07.20 Surveillance and in-service proof	
08 Transport of Ammunition	08.10 Transport of ammunition	✓
09 Security of Ammunition	09.10 Security principles and systems	
10 Ammunition Demilitarization and Destruction	10.10 Demilitarization and destruction of conventional ammunition	✓
11 Ammunition Accidents, Reporting and Investigation	11.10 Ammunition accidents : reporting and investigation	✓
	11.20 Ammunition accidents : investigation methodology	✓
	11.30 EOD clearance of ammunition storage area explosions	
12 Ammunition Operational Support	12.10 Ammunition on multi-national operations	
	12.20 Small unit ammunition storage	✓

Priority for drafting national standards chapters

Each national authority will have a unique set of priorities that result from its political, economic, security, environmental and social situation at any one time. It follows that the national authority will draft its national standards to meet these national priorities.

There are, however, occasions when a newly formed national authority may have to start with a completely blank slate. One way of prioritizing the order of writing national standards is to base them on the experience of others, basing the framework of national standards on the most common activities in a fairly recognizable order of occurrence. If we look at this from the viewpoint of an item of ammunition, this could look like the following:

- **Inspection**

The item is inspected to determine what it is, if it is suitable for use and whether it is safe to move to a storage or disposal facility. While it is possible to rely on the expertise of international assistance providers, local staff will need to be able to either make their own decisions on these matters or understand the decisions made on their behalf. This will require national standards based on understanding the following IATG :

- IATG 01.50 – UN explosive hazard classification system and codes
- IATG 07.10 – Ammunition Processing : safety and risk reduction

- **Movement**

The item will need to be moved from where it was found, to either a storage facility or a disposal area. The national standards will need an understanding of :

- IATG 01.50 – UN Explosive hazard classification system and codes
- IATG 08.10 – Transport of ammunition

- **Storage**

A commonly observed route to RRPL1 is for storage facilities to progress from field storage, through temporary storage to permanent storage, with small unit storage being a permanent requirement. The national authority will therefore need to draft national standards appropriately, based on an understanding of :

- IATG 01.50 – UN explosive hazard classification system and codes
- IATG 02.20 – Quantity and separation distances
- IATG 02.30 – Licensing of explosive facilities
- IATG 02.50 – Fire safety
- IATG 04.10 – Field storage
- IATG 04.20 – Temporary storage
- IATG 05.10 – Planning and siting of explosive facilities
- IATG 05.30 – Traverses and barricades
- IATG 05.40 – Safety standards for electrical installations
- IATG 05.50 – Vehicles and mechanical handling equipment in explosive facilities
- IATG 06.10 – Control of explosive facilities
- IATG 06.30 – Storage and handling
- IATG 06.50 – Specific safety precautions
- IATG 12.20 – Small unit ammunition storage

- **Disposal**

A State is likely to have a problem with legacy munitions that are no longer of any use and that must be destroyed. The national standards will require a detailed understanding of :

- IATG 10.10 – Demilitarization and destruction of conventional ammunition

- **Through-life management of ammunition and explosives**

Underpinning all of these activities, the national authority will need to be cognisant of the following IATG and draft the relevant national standards when it is appropriate to do so :

- IATG 01.10 – Guide to the IATG
- IATG 01.20 – Index of risk reduction process levels
- IATG 01.30 – Policy development and advice
- IATG 01.90 – Ammunition management personnel competences
- IATG 02.10 – Introduction to risk management principles and processes
- IATG 02.40 – Safeguarding of explosive facilities
- IATG 03.10 – Inventory management
- IATG 11.10 – Ammunition accidents : reporting and investigation
- IATG 11.20 – Ammunition accidents : investigation methodology
- IATG 12.10 – Ammunition on multi-national operations

3.8 NATIONAL STANDARDS FRAMEWORK

Having agreed that the national standards for safety and security of ammunition and explosives will be set out in a logical order, or framework, it makes sense to ensure that they make reference to other legislation or standards by having links to them. This simplifies the national standards, which do not have to be continuously updated when other relevant legislation changes.

Establishing minimum requirements

As the national standards will be a normative and legally binding document, they should reflect local laws and context but also conform to the IATG. Against this background, cutting and pasting from the IATG does not work. Hence the writers assigned with the task of drafting national standards should read each “critical and achievable IATG module”, write down what that IATG module and already existent local regulations say on the topic and create a list of “minimum requirements” for the national standard to-be.

Framework for gradual improvement

Every State must balance its use of resources against competing requirements, and ammunition and explosives safety management is no exception. As such, it is often not possible to achieve all the aims of the safety and security strategy at once but to spread these aims over time in a graduated manner to improve safety and security, thereby reducing risk in the process. What is required is a national framework to define and manage the various elements of the complex systems that are necessary to achieve the State’s goals. This framework must incorporate not only the technical elements but the political and economic needs of the State.

The IATG are a framework for the gradual improvement of ammunition and explosives safety practices, i.e. the technical elements of the graduated response. This is borne out in the way that the tasks and processes necessary for safe, efficient and effective stockpile management are graded against the three RRPLs throughout the IATG. These RRPLs are outlined in IATG 01.20.²⁶⁾

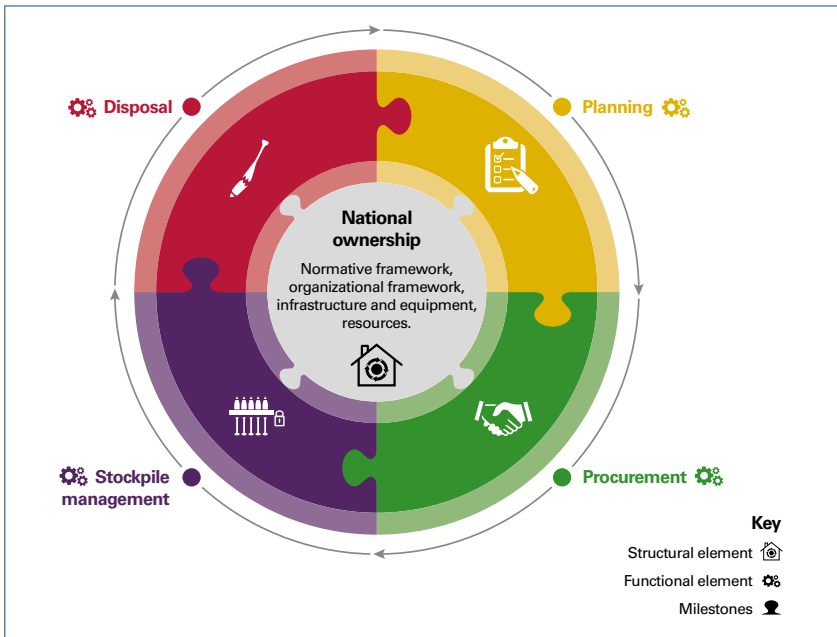
The national authority can identify the State’s technical requirements by conducting an IATG-based RRPL baseline study and advising the legislature on the results, whilst making recommendations about how to plug any gaps effectively and efficiently. When the framework for gradual improvement is in place, the national authority has the role of subsequent audit and progress reporting.

National ownership

The national authority can only go so far without complete national ownership over ammunition and explosives safety and security. Small Arms Survey outlines a model²⁷ for the ammunition life cycle (figure 7) to explain the structural and functional elements of ammunition management :

Figure 7 – Small Arms Survey LCMA Model

- Political – the structural element necessary for effectiveness of the functional elements; and
- Technical – the functional elements necessary for the management of ammunition across its life cycle.



National ownership implies that a State takes full responsibility for through-life management of ammunition, as demonstrated by national authorities' active engagement in the development, implementation and oversight of a system and the provision of adequate financial and other resources to support its implementation. National ownership is a precondition for and is fostered by enabling conditions. This is a normative framework comprising laws, regulations and standing operating procedures to govern the system; an organizational framework for coordination, oversight and implementation of the system; infrastructure and equipment to operationalize the system; and human resources to implement and maintain related processes and activities.

Coherence and consistency in national standards

Assuming that the State issues national standards for ammunition and explosives safety and security as well as regulations for weapons, the two sets of national standards must be coherent, i.e. marked by an orderly, logical and aesthetically consistent relation of parts, and be consistent, i.e. not self-contradictory. It is also important for the national standards to be coherent and consistent with any other safety-related legislation and standards.

Box 4 – United States protective distances criteria adoption

Prior to 1910, there was no federal-level law, standard, or table in the US that specified required safe separation distances from or between explosives storage sites. The development of such criteria resulted from the concerns of the American Railway Association. At that time, there were many instances where explosives storage magazines had been built so close to railroads that they represented a hazard to passengers should an explosion occur at the time a train was passing. A special committee was appointed by the Association of Manufacturers of Powder and High Explosives (founded in 1906) to study the problem. The committee reviewed data from over one hundred notable explosions involving explosive quantities from 200 pounds (91 kg) to 875,000 pounds (396,893 kg). The result of their efforts was the development of an American Table of Distances (ATD, 1910), which gave specific, protective distances to be applied from explosives storage magazines to inhabited buildings, public highways and public railways. In 1913, the Institute of Makers of Explosives adopted the table, and the ATD became the accepted standard in the US.²⁶⁾

Author: Eric J. Deschambault.

Source: Unpublished background paper.

Box 5— Accident leading to American Table of Distances (ATD) adoption by the military and origination of the Department of Defense Explosives Safety Board (DDESB)

An explosives accident on 10 July 1926, from a lightning strike to an above-ground magazine, occurred at Lake Denmark Naval Ammunition Depot, New Jersey (located adjacent to Picatinny Arsenal and 3½ miles from Dover, NJ). The initial explosion event propagated to additional explosives storage sites. This accident destroyed the depot, also causing heavy damage to the adjacent Picatinny Arsenal and the surrounding communities, killing 21 people and injuring 51 others. The monetary loss to the navy alone was \$46 million (\$656 million equivalent in 2018). Injuries occurred out to a distance of three miles and window breakage extended out to 5 miles. This event caused widespread concern and indignation among the public about the practice of building arsenals and storing dangerous explosives near populous communities. In response, the 70th US Congress directed that the Secretaries of War and Navy prepare a report on the subject of ammunition storage conditions. A Joint Board on Ammunition, consisting of four military officers, was assigned “to conduct a survey of points of supplies of ammunition and components thereof for use of the Army and Navy...” In their report, the Board recommended the adoption of the New Jersey explosives law, which had incorporated the ATD as its standard of safety. Ultimately this recommendation was accepted by the US Congress, which also suggested that a permanent board representing the army and navy be established, resulting in the formation of the Joint Army Navy Munitions Board in August 1928. This Board used the ATD as its guide for the application of safe separation distances. The Joint Board eventually evolved into the DoD Explosives Safety Board (DDESB), which exists today and has the responsibility for developing Department of Defense Explosives Safety criteria.²⁹⁾

Author: Eric J. Deschambault.

Source: Unpublished background paper.

Format and numbering of national standards chapters

National standards chapters must be numbered for ease of reference for all users. The numbering system should allow for updates if the State does not re-issue regulations after each change.

The format of national standards should be aligned with the expectations of national legislation but simplified to ensure understanding and ease of use. Clarity is a vital characteristic and this simplification should make the contents clear without compromising the meaning and importance. The set of national standards, and each individual standard, should have a logical structure and use common terminology, presented in plain language unless a technical term is required, in which case a glossary should be provided.

States applying the IATG should consider using the International Organization for Standardization (ISO)³⁰⁾ format that has been used to write the IATG and other international standards and guidelines such as the Modular Small-arms-control International Compendium (MOSAIC),³¹⁾ Integrated Disarmament, Demobilization and Reintegration Standards (IDDRS),³²⁾ and International Mine Action Standards (IMAS).³³⁾ ISO is a worldwide federation of national bodies from over 140 states. Its work results in international agreements, which are published as ISO standards and guides. A list of ISO standards and guides is given in the ISO Catalogue.³⁴⁾

Relationship between legislation, national standards and SOPs

Policy and regulations are enacted by the legislature, forming the overarching framework for the governance of the safety and security of the State's ammunition and explosives sector.

The national authority produces and authorizes the national standards to comply with the national legislation and to effectively deal with the operations of the explosives sector. Subject to the confirmation of the legislature, the standards are amendable by the national authority, which may consult with experts from the State's explosives sector and/or international organizations for advice on what is best for the State's needs and requirements.

Standing operating procedures (SOPs) are the documents that describe how the legislation and national standards will be practically implemented at the local level. SOPs are typically written by relevant technical experts on behalf of the director or commander of a facility. Competent SOPs naturally flow from national standards, which stem from corresponding legislation, however, the adoption of international norms might affect this legislation. Therefore, in writing a national standard, it is necessary to know how to adapt it to the local context, existing political and legal processes and systems to accommodate the upcoming national standards, and how to facilitate their amendment later on.



04

**MANAGEMENT
AND REVIEW
OF NATIONAL
STANDARDS**

M

3-80

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This chapter aims to provide the national authority or individual that is responsible for the creation and upkeep of national standards, with guidance on the day-to-day management and the formal and informal review of these standards in keeping with internationally accepted good practice.

4.1 TRANSLATING THE IATG RISK REDUCTION PROCESS LEVELS INTO NATIONAL STANDARDS

National standards are created and owned by the State, as reflected in the guiding principles of the IATG.³⁵⁾ The IATG are comprehensive in their content but they recognize that States have many competing priorities for their finite resources.

It is widely understood that all States will adopt a risk-based approach to the management of ammunition and explosives stockpiles and the IATG are written so that States or individual ammunition facilities can conduct their activities in a relatively safe manner. Relatively, in this context, means that the State or facility commanders understand the degree of risk that they are willing to accept when implementing national practices and procedures. IATG 02.10³⁶⁾ provides a good introduction to understanding risk management.

4.2 AUDIT AND MONITORING OF PROGRESS TOWARDS NATIONAL RRPL GOALS

Having set out how the State will conduct its ammunition and explosives safety activities in national standards, the national authority will be expected to provide assurance to the legislature (and possibly to international bodies) that the various facilities are operating in compliance with the national standards. The national authority will, in most cases, be responsible to the legislature for national progress in achieving the national ammunition and explosives safety strategy and the achievement of the specified RRPL.

To ensure that processes work, they must be audited, the results assessed, a gap analysis carried out and an improvement action plan created. Carrying out audits and monitoring compliance areas and procedures are essential business functions and must be a regulatory requirement.

The objectives of audit reviews are different from monitoring and auditing : monitoring ensures that policies and procedures are in place and are being followed ; and auditing determines whether the monitoring programme is operating as it should and that policies, procedures and controls adopted are adequate, and their effectiveness is validated in reducing errors and risks.

Monitoring is the programme manager's responsibility. This is the person most familiar with their own operations and they should be charged with identifying

risk areas which are their responsibility, developing appropriate internal controls, policies and procedures, and monitoring them to verify they are being followed. Auditing of these operations needs to be performed by parties independent of these operations. This will ensure objectivity in performing the audit reviews.

Why monitoring and auditing is an important safety process

It can be argued that many of the major unplanned explosions at munitions sites³⁷⁾ are a result of poor compliance with safety procedures and that they might not have occurred if the sites had been subject to rigorous monitoring and audit. It seems to be self-evident that if a stockpile is deteriorating and that this is discovered in an audit of procedures or inspection of the site, then action to reduce or eliminate the risk from the deteriorating stock can be taken.

IATG 06.70³⁸⁾ – Inspection of explosives facilities - explains the rationale behind the requirement for a thorough inspection regime in explosives areas and recommended procedures. It is imperative that all aspects of the explosives licence, and the national authority explosives regulatory regime, are being complied with and that explosives facilities are fit for purpose. Compliance with the terms of the explosives licence should be a mandatory requirement with exceptions approved only by the national authority.

The national standards for monitoring and auditing of ammunition and explosives-related activities should explain the role(s) of the national authority and inspectorate units, their chain of authority and links to the legislature, any links to law enforcement agencies, any cross-governmental responsibilities, and any links to international organizations or groups. The national standards should also include detail of how licences for storage, use, processing, movement and disposal of ammunition and explosives will be submitted, approved, monitored and audited. The national standards will, out of necessity, also remind users of the sanctions available to the legislature and national authority for non-compliance.

4.3 NATIONAL STANDARDS AS PART OF CAPACITY AND CAPABILITY DEVELOPMENT

The acts of drafting, approving, implementing and ensuring compliance with one's own national standards encourages understanding. The States which introduce and/or enact their own national standards are likely to make better use of them than States trying to enact similar national standards from elsewhere, if only because they can say "these are our rules".

Capacity development is the process by which individuals, groups and organizations, institutions and States develop, enhance and organize their systems, resources and knowledge; all reflected in their abilities, individually and collectively, to perform functions, solve problems and achieve objectives.

A national authority demonstrates its understanding of the activities it undertakes through the documents it produces. High-quality, detailed but understandable national standards are important to the users and of great interest to potential international and regional partners.

The Australian Department of Defence defines capability development³⁹⁾ as “the capacity or ability to achieve an operational effect. An operational effect may be defined or described in terms of the nature of the effect and of how, when, where and for how long it is produced.” The operational effect that is delivered in this case is a stockpile of ammunition and explosives that is not only safe and secure but sustainable and ready for use at all times.

4.4 ROLES FOR NATIONAL MANAGEMENT, OPERATING AND AUDITING BODIES

One of the national standards should describe the State’s governance structure for the safe and secure management of ammunition and explosives. No doubt some or all of this will be included in legislation/regulations but the national standards should provide the user with an understanding of how they fit into the structure.

Legislature

In the context of ammunition and explosives safety management, the role of the legislature is to pass laws for the manufacture, storage, processing, movement, testing, use and disposal of ammunition and explosives. The legislature typically:

- Drafts and enacts ammunition and explosives safety and security legislation ;
- Ensures that national standards comply with the legislation before approval for use ;
- Supported by advice from the national authority, publishes the national action plan or ammunition and explosives safety and security strategy based on internationally accepted good practice ;
- Provides the necessary resources to achieve the aims and milestones of the ammunition and explosives safety and security strategy.

The IATG provide technical guidance on how the manufacture, storage, processing, movement, testing, use and disposal of ammunition and explosives is conducted in practice but the laws need to be written such that they include other details such as who can be licenced to handle explosive substances and articles, where and how these licences are issued, and who will enforce the laws and sanctions for those who break the laws. The State might need to acquire land on which to build ammunition and explosives facilities, and to safeguard land surrounding explosives facilities from encroachment by building developments, all of which will require appropriate legislation.

National authority

IATG 01.40 defines the national authority as “the government department(s), organisation(s) or institution(s) charged with the regulation, management, co-ordination and operation of conventional ammunition stockpile management activities”. It is good practice to separate the regulatory body from the operational organization(s) as can be seen from the following sections. The national authority:

- Drafts and implements national standards;
- Advises the legislature on the scope and scale of the ammunition and explosives issues to be addressed;
- Advises the legislature on which internationally accepted good practices are in the best interest of the State and the resources necessary to achieve the aims of the national action plan or ammunition and explosives safety and security strategy;
- Audits the operating bodies, be they government or civil entities, to provide assurance to the legislature of the degree of compliance with the national standards, to identify gaps and advise on short- to medium-term goals to fill any gaps.

Regulatory body

The primary goal for a regulatory body is to protect the public, such as providing and enforcing adequate standards for health and safety in an organization. Unlike professional organizations, which require regulating, a regulatory body is created on the basis of a legal mandate or legislation. These regulatory bodies are funded by levies taken from their professions and have their own staff and premises. Examples of explosives regulatory bodies are the U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) and Department of Defense Explosives Safety Board (DDESB), and the UK’s Health and Safety Executive (HSE) and Defence Safety Authority (DSA).

Operational organization

Some States appoint one or more department(s) of State to be the only organization that can manage the safe and secure handling and use of ammunition and explosives. Others allow commercial organizations to do this. Whichever model or self-designed construct is used, the role of an operational ammunition and explosives organization is to conduct all its activities within the law.

The government and/or civil ammunition and explosives operators such as depots, disposal and demilitarization facilities, manufacturers, companies and quarries:

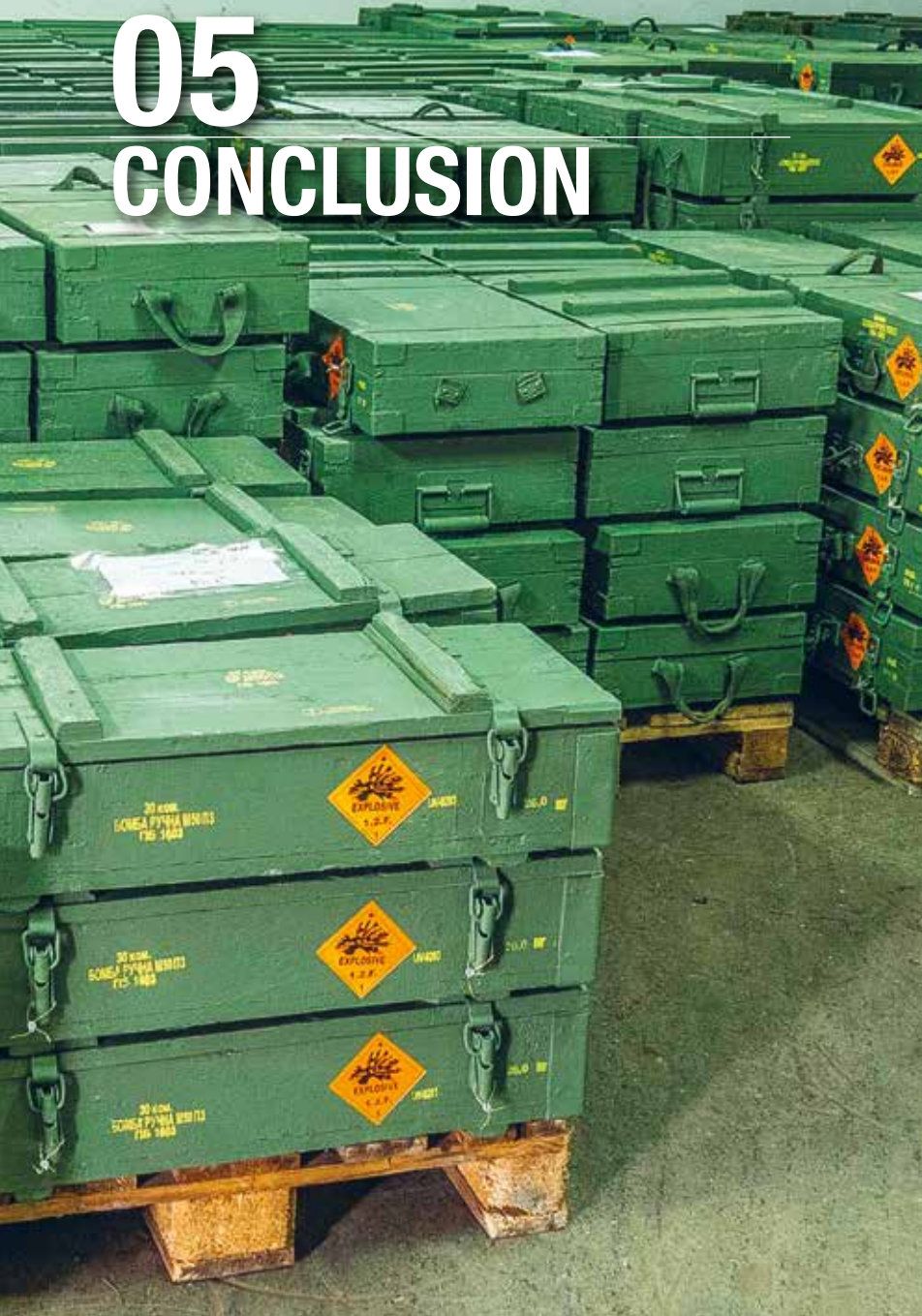
- Draft and implement standing operating procedures (SOPs) that direct their staff and guide their work in conformity to the national standards;
- Conduct their activities and maintain records as required by the national standards;
- Provide reports to the national authority and prepare to be audited as required.

Auditing organization

As the regulator, the national authority is expected to have an organization within its structure that carries out audits of ammunition and explosives facilities. The role of this “inspectorate” is captured in the description of an ammunition inspector in IATG 01.90⁴⁰⁾ to “...audit the policy and technical instructions for all aspects of the stockpile management of ammunition and explosive substances and articles.” This will involve inspectors visiting facilities, observing all the activities that are undertaken there, completing an RRPL checklist, making note of all good and poor practices, reporting on his/her findings to the national authority and taking appropriate actions.

In States with large security forces, it is not uncommon for the operational organization(s) to have its own auditing body or individuals with an audit function on the staff of explosives facilities. Their role is to provide the commander of a facility or the head of the operational organization with assurance that they are compliant with all relevant regulations. This explosives safety representative is usually an experienced ammunition manager or ammunition inspector who is not employed in the day-to-day activities of the facility and who reports directly to the head/commander.

05 CONCLUSION



By developing its own set of standards, a national authority will gain greater understanding of all aspects of ammunition management. The application of good practice from the IATG and other relevant guidance to national standards will enhance the knowledge of the authors of these standards. This local understanding and knowledge are essential in the capacity development of the State's ability to manage its own ammunition in the long-term.

As described in Chapter 3, States should not attempt to achieve risk reduction to RRPL 3 immediately. Instead, an assessment of the current situation should be completed and then a risk assessment carried out. The national standards should reflect the outcome of these assessments and describe a realistic approach to the safe and secure management of ammunition with the assets available currently and in the future, with a natural progression through RRPL 1 and RRPL 2.

To be effective, the national standards will need to take into account the current state of ammunition and available resources. Competent implementation of adequate national standards will enable a State to attain the goal of safe and secure management of ammunition. This guide and the IATG will assist the national authority in achieving this goal.

The national authority responsible for management of the national ammunition and explosives stockpile is best placed to deliver national standards. It will have the relevant competencies to be able to adapt the IATG to national requirements. The national action plan or strategy will specify if the State will adopt the IATG as its basis for compliance with international norms.

The IATG and other international norms recognize the absolute right of States to legislate for the safety and security of their people. Only at the national level can the scope and scale of ammunition and explosives safety and security issues be addressed. For it is at this level that the State-specific political, economic, cultural, educational, security and structural issues of the management of military and civil explosives stockpiles can be identified.

National standards will embrace not only the technical aspects of stockpile management but also the legal framework within which authorization to manufacture, acquire, keep, process, use and dispose of ammunition and explosives is managed, along with the range of sanctions for non-compliance.

The establishment of effective and well-coordinated national standards is a concrete signal that ammunition management is nationally owned.

GLOSSARY OF TERMS AND DESCRIPTIONS

National authority	The government department(s), organisation(s) or institution(s) charged with the regulation, management, coordination and operation of ammunition stockpile management activities.	IATG 01.40
National standard	A documented agreement containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics to ensure that materials, products, processes and services are fit for their purpose. A national standard therefore brings together the technical, legislative and regulatory requirements of the State into a set of nationally accepted norms that are available to, understood by, and achievable (within accepted boundaries) by all those affected.	IATG 01.40
Standing operating procedure (SOP)	Instructions that define the preferred or currently established method of conducting an operational task or activity, noting that their purpose is to promote recognisable and measurable degrees of discipline, uniformity, consistency and commonality within an organisation, with the aim of improving operational effectiveness and safety. SOPs should reflect local requirements and circumstances.	IATG 01.40
Risk	Combination of the probability of occurrence of harm and the severity of that harm.	IATG 01.40
Risk analysis	Systematic use of available information to identify hazards and to estimate the risk.	IATG 01.40
Risk assessment	The overall process comprising a risk analysis and a risk evaluation. The objective evaluation of risk in a manner in which assumptions and uncertainties are clearly considered and presented.	IATG 01.40
Risk management	The complete risk-based decision-making process.	IATG 01.40
Risk reduction	Actions taken to lessen the probability, negative consequences or both, associated with a particular risk.	IATG 01.40

Risk reduction process level 1	Basic safety precautions are in place to reduce the risk of undesirable explosive events during ammunition storage, but fatalities and injuries to individuals in local civilian communities may still occur.	IATG 01.40
Risk reduction process level 2	Safety precautions, in the form of appropriate separation and quantity distances, have been implemented to reduce the risk of fatalities and injuries to individuals within local communities to a tolerable level.	IATG 01.40
Risk reduction process level 3	A safe, secure, effective and efficient conventional ammunition stockpile management system is in place that is fully in line with international best practices.	IATG 01.40

ATTACHMENTS



ANNEX I : BRIEF SUMMARIES OF IATG MODULES

This table briefly summarizes the 45 modules in the 12 thematic IATG volumes, to assist the development of national standards.⁴¹⁾

Table 4 – Brief summaries of IATG modules to assist the development of national standards

IATG Volume 01 – Introduction and Principles of Ammunition Management	
<p>Module 01.10 Guide to the International Ammunition Technical Guidelines (IATG)</p>	<p>This module introduces the six activity groups that encompass conventional ammunition stockpile management and identifies four guiding principles of the IATG :</p> <ul style="list-style-type: none"> • the right of national governments to apply national standards to their national stockpile; • the need to protect those most at risk from unintended explosive events ; • the requirement to build a national capacity to develop, maintain and apply appropriate standards for stockpile management ; and • the need to maintain consistency and compliance with other international norms, conventions and agreements. <p>By applying the IATG risk management process in line with their capabilities and resources, States and other users are expected to secure immediate reductions in ammunition-related risk. More broadly, use of the IATG is designed to ensure consistency with international guidelines and compliance with relevant international regulations, conventions and treaties.</p>
<p>Module 01.20 Index of risk reduction process levels (RRPL) within IATG</p>	<p>The RRPLs lie at the heart of the IATG risk management process. Each required task and activity is assigned to one of three possible levels. As the level number increases, the risks decrease accordingly. Under RRPL 1, basic stockpile safety and security precautions are in place and a minimal investment of resources is required. The risk of unplanned explosions at munitions site (UEMS) remains, as does the concomitant likelihood of fatalities and injuries. RRPL 2 is an improvement on RRPL 1 and requires medium-level investment. The risk of UEMS remains, but the likelihood of fatalities and injuries is reduced due to the use of basic separation distances. RRPL 3 requires the greatest investment. The result is a relatively safe, secure and efficient stockpile that is consistent with international best practice. States that adopt the IATG risk management structure are able to develop, manage and monitor their own efforts towards achieving self-assigned RRPL goals. Using the tables presented in this module, a State can design its own comprehensive plan for achieving IATG compliance.</p>
<p>Module 01.30 Policy development and advice</p>	<p>A comprehensive national ammunition management programme that ensures the safe and secure storage of ammunition requires top-level support for State policies that specify requirements for the system. Before policies can be established, policy developers and decision makers must gain an understanding of the overarching philosophy and principles of safe, effective, and efficient ammunition storage, as well as the associated challenges. International agreements may have an impact on national policy and direction, and stockpile management.</p> <p>This module is designed to assist States as they develop strategic ammunition management policy and requirements. It outlines important functional areas that need to be addressed by policy-makers and relevant organizations at all levels of national planning and operational activities. Efficient stockpile management ensures the best “value for money” from ammunition. Stockpile management is an effective mechanism for reducing security risks associated with loss, theft, leakage and proliferation.</p>

IATG Volume 01 – Introduction and Principles of Ammunition Management

Module 01.40

Glossary of terms, definitions and abbreviations

The IATG draw on a variety of international sources. To ensure a common understanding and consistency in interpretation and application, this module defines all key terms that are used in the IATG modules. In addition, it explains the top-down approach that was taken by the IATG drafting team in developing the IATG terms and definitions.

Module 01.50

UN explosive hazard classification system and codes

The development of appropriate ammunition safety requirements calls for an understanding of the risks associated with each individual ammunition item. In general, a technical authority in the State where the ammunition is produced assigns an item's dangerous goods classification, using prescribed UN testing and assessment protocols. The classification identifies the item's hazard class, division, and storage compatibility code, all of which are necessary for shipping and storage purposes. With rare exceptions, purchased and shipped ammunition should be classified in accordance with the UN protocols described in this module. For storage purposes and to ensure the proper application of quantity distances, a relevant technical authority may need to assign ammunition to a storage subdivision and to further classify its predominant hazardous effects. Since the IATG risk management process and its safety requirements are based on UN hazard classifications, it is important for users to have a basic understanding of what these are, how they are derived, and how they should be applied.

This module introduces and explains the UN system and related codes, identifies the tests that are performed to determine an appropriate hazard classification, and discusses the mixing of ammunition with different compatibility groups. It also covers the assignment of an appropriate storage subdivision when relevant. National authorities can ensure the proper application of IATG requirements once they have integrated the UN hazard classification system into their through-life management processes.

Module 01.60

Ammunition faults and performance failures

Despite efforts to promote stockpile safety, UEMS may still occur. Most of these events are preventable, however, and their impact can be reduced significantly if preventive LCMA safety measures are undertaken.

This module outlines what steps to take in the case of ammunition faults or performance failures. It explains the importance and benefits of reporting such problems, investigating them thoroughly, and taking prompt corrective action to prevent them from reoccurring.

The ability to manage ammunition faults and performance failures is an important part of ensuring the safety and security of a national stockpile. This module advises authorities on how to develop a national process for reporting, investigating, correcting and managing these failures.

IATG Volume 01 – Introduction and Principles of Ammunition Management

Module 01.70 Bans and constraints	<p>States should never permit the storage or use of ammunition that is dangerous or unsafe. Similarly, they should not use ammunition that does not meet minimum performance requirements or is in short supply.</p> <p>This module provides guidance on the establishment of a formal system of bans and constraints. It also covers their application to ammunition use, storage, handling, transportation and disposal. It explains why bans and constraints might be used, how to manage them, and how to make sure all relevant parties are aware of their existence and abide by them. The ability to manage ammunition bans and constraints is an important part of the through-life management of ammunition. This module helps authorities to develop a national process for establishing, implementing and managing them.</p>
Module 01.80 Formulae for ammunition management	<p>Module 01.50 explains the UN hazard classification system and codes in the context of IATG risk management and safety requirements. It helps users to understand the hazardous effects of ammunition and explosives, as well as how to protect against them.</p> <p>The type and extent of hazardous effects associated with UEMS is related to the kind and quantity of ammunition and explosives involved in an incident, as well as the location in which it occurs. Proper risk management calls for a solid understanding of all possible hazards.</p> <p>This module is designed for technical officials who require an understanding of the effects and consequences of explosives and who need to undertake risk assessments, which are an RRPL 1 requirement. Risk assessments help to identify the potential impact of an unexpected event on surrounding areas and personnel. When minimum IATG separation distances cannot be met, risk assessments and risk analyses are also RRPL 2 and RRPL 3 requirements (see Module 2.20). By understanding hazardous effects, technical experts will be better able to advise decision makers on available options for reducing, preventing and even eliminating risk.</p>
Module 01.90 Ammunition management personnel competences	<p>To assure the safety and security of a State's ammunition stockpile, personnel charged with handling and managing ammunition must be properly trained and demonstrate minimum competency levels. As there are no international standards on the skill sets required for proper ammunition and risk management, this module provides an overview of the required basic competencies. It is focused on RRPL 2 and RRPL 3 of the IATG requirements.</p> <p>The module describes three areas that are associated with personnel competencies: behavioural traits, technical skills, and the achievement of targets and objectives. It also identifies seven generic categories of ammunition-related personnel and explains how to assess an individual's competency to perform assigned tasks. For each of the generic personnel categories, detailed annexes identify roles and responsibilities, competencies and IATG tasks for which personnel must be able to demonstrate proficiency. Ensuring that personnel are properly trained and competent is an important part of Through Life Management. This module assists authorities in developing a national training and competency programme for personnel involved in ammunition-related tasks and their management.</p>

Module 02.10

Introduction to risk management principles and processes

Based on their resources and capacities, States take various approaches to risk management, ranging from basic to extremely complex. For those with limited resources, capacity and capabilities, even simple risk management techniques and tools can help to identify risks related to UEMS so that decision makers clearly understand the risks they are accepting and the consequences of their decisions.

Implementation of a robust, effective and integrated risk management process for achieving an “acceptable” risk level for ammunition-related activities should be a fundamental part of a State’s through-life management process.

This module discusses the concept, principles, activities, and techniques pertaining to risk management of ammunition storage, as well as available IATG tools (provided by SaferGuard) to support risk management efforts. Adherence to IATG requirements calls for the implementation of many components of an integrated risk management system. Although this module is primarily focused on risks to the local civilian population, it provides information that can be used to address risks involving all functional areas of ammunition stockpile management. The module describes straightforward risk assessment techniques that can be used in a wide range of circumstances. It also provides references for more complex risk assessment and analysis.

Module 02.20

Quantity and separation distances

The use of separation distance - that is, quantity distance as detailed in this module - is the most effective way to protect people and structures from the impact of UEMS, which can produce weapon fragments, thermal radiation and structural debris. Under ideal circumstances, a safe separation distance is determined and applied. In practice, this step is often skipped due to a lack of resources or capacity; in such cases, authorities make do with a distance that ensures an “acceptable” level of risk.

This module underscores the importance and value of complying with IATG requirements in determining minimum quantity distances from potential explosion sites. It provides pre-determined distances that are based on the exposed site, ammunition type and quantity, and storage sites - in the open air or within a structure.

Module 02.30

Licensing of explosives facilities

This module addresses licensing of explosives facilities. It identifies issuing authorities, the various types of licences, the minimum content of such licences, and related management and oversight responsibilities to ensure that licensing requirements are met. The explosives allowance specified in a licence should be based on the results of a risk assessment or analysis and associated risk management decisions (see Module 02.10), by use of the quantity distance tables (see Module 02.20), and/or an approved site plan (see Module 05.10). The guidance provided in this module can assist authorities in developing a national licensing system for ammunition facilities and their management.

The safety distances and the net explosive quantity described in Module 02.20 are recorded on an explosive limit licence (ELL) for each explosive storehouse or facility.

Module 02.40 Safeguarding of explosives facilities

A guiding IATG principle is that national authorities have a responsibility to protect those most at risk from UEMS (see Module 01.10). One of the most effective ways of protecting the public from such an event is by using the quantity distances provided in Module 02.20.

All too often, these quantity distances extend beyond the boundaries of ammunition sites, including into areas that are not under the control of national authorities, such as private property. The process for managing, protecting, and restricting the use of such land is called “safeguarding”. In the absence of a system for safeguarding land located within designated boundaries, the public can be at risk. Such cases contravene approved quantity distances or decisions on an “acceptable” level of risk from explosives facilities (Module 02.10). A lack of safeguarding can have a significant impact on public safety as well as a State’s ammunition capabilities and its stockpile.

This module discusses the concept of safeguarding and provides an approach for establishing, implementing and managing a safeguarding system. Authorities can use this guidance to develop policy and requirements for safeguarding land surrounding ammunition stockpiles.

Module 02.50 Fire safety

Fire presents a significant threat to ammunition stockpiles and is probably the most common cause of UEMS. In view of the inherent risks associated with ammunition, fire presents an immediate and high risk to life and property surrounding a stockpile.

For this reason, an aggressive and comprehensive fire prevention programme is essential to minimize the risk of fires in or near ammunition storage facilities. In addition, trained personnel, response processes and equipment for fighting fires must be in place and readily available. Once a fire gets out of control and ammunition begins to react, the evacuation of all personnel to a safe distance is generally required.

This module addresses the elements of a good fire safety and prevention programme for explosives facilities. It also outlines the basic principles underpinning firefighting in such facilities and provides guidance on firefighting equipment, systems and procedures. It is not intended to help design firefighting systems or responses, as these must be assessed on a case-by-case basis.

IATG Volume 03 – Ammunition Accounting

Module 03.10 Inventory management

Ammunition has a shelf life that is finite and controlled by a number of internal and external factors. Unmanaged and unmonitored ammunition can be stolen, damaged or misused and can deteriorate to a point where it reacts in an unintended manner. To protect such a valuable commodity and provide a safe and secure environment, a State must be able to account for – and effectively manage – its ammunition as part of an inventory management system. This module details the basic elements of such a system and how to incorporate it into an ammunition management programme. Failure to provide basic inventory management is almost a guarantee that ammunition will fail to function as designed, will become unsafe, or will be diverted.

An inventory management process can help a State to meet the IATG guiding principles by ensuring that only ammunition that is serviceable and safe to use is issued and thus protect the civilian population from hazards associated with unsafe ammunition (see Module 01.10). An effective inventory management system allows a state to identify inventory issues – including inaccuracy, loss, theft and unsafe ammunition in the national stockpile – and is an essential part of through-life management.

Module 03.20 Lotting and batching

Tracking lot and batch numbers on ammunition as part of the inventory management process supports a State's efforts towards efficient ammunition management. Lotting and batching distinguishes like stockpile items that were manufactured at the same time using the same or similar materials and processes, meaning that they are generally expected to have the same performance capacity and properties throughout their lifetime.

This module introduces the concept of lotting and batching, describes when lot and batch numbers should be used, how they are assigned, and what information can be derived from a lot or batch number. It also addresses the importance of knowing and tracking ammunition locations by lot and batch numbers. A primary benefit of recording and tracking such information, as well as ammunition locations (by lot and batch), is the ability to identify and locate unsafe or suspect ammunition so that appropriate action can be taken to manage risk (see Module 01.70).

Accounting for lotting and batching information as part of the national ammunition inventory management system is important for proper stockpile accounting and through-life management. These processes improve a State's ability to keep ammunition safe and secure.

Module 03.30

International transfer of ammunition module

This module provides guidance on the development and implementation of effective national controls over international ammunition transfers, including the import, export, transit, transshipment and brokering of ammunition. It also addresses issues related to the transfer of man-portable air defence systems (MANPADS), the enforcement of controls, international cooperation and assistance, and public and parliamentary transparency. This module is of particular relevance to States that are significant exporters or importers of ammunition but that have little involvement in other aspects of the international arms trade. The module may also be of interest to legislators, ammunition manufacturers, non-governmental organizations (NGOs), and other stakeholders working to improve controls.

The module focuses on assisting government personnel, UN officials, and staff from other international and regional organizations that are developing and implementing ammunition transfer controls. It covers the development and strengthening of national controls to help prevent transfers that fuel armed conflict, abuses of human rights or violations of international humanitarian law, or risk being excessive or destabilizing to the recipient country. It also offers advice concerning the development of effective national measures to prosecute individuals who breach ammunition transfer norms.

Module 03.40

End-user and end-use of internationally transferred ammunition module

This module provides guidance for the development and implementation of effective national controls over the end-users and end-uses of internationally transferred ammunition, specifically in order to prevent and combat its diversion from the legal market into the illicit sphere. Other aspects of the international transfer of ammunition are covered in Module 03.30.

This module covers legislative and other processes that can be used to control the end-users and end-uses, including the assessment of diversion risks at the licensing stage; the establishment and use of end-use documentation; the authentication and verification of end-use documentation; and post-delivery monitoring of transferred ammunition. It also addresses enforcement mechanisms and international cooperation and assistance. The primary targets of this module are national authorities responsible for devising and implementing ammunition transfer controls. This module is also relevant to legislators, ammunition manufacturers, NGOs and other stakeholders working to improve controls. National controls of end-users and end-uses are part of a comprehensive system that encompasses all aspects of ammunition transfer. The basic characteristics of such a system are: legislation or a regulatory framework; procedures for the assessment of diversion risks at the licensing stage; end-user authentication; verification measures before, during, and after the transfer; and enforcement mechanisms.

Module 03.50

Tracing of ammunition

This module aims to build national capacity for the tracing of ammunition in order to identify and disrupt sources of illicit trade linked to armed conflict and criminal activity. Illicit ammunition - which tends to enter the illicit sphere following legal manufacture - fuels conflict and crime. Ammunition components are commonly used to produce improvised explosive devices. Tracing is used to determine the point at which ammunition was diverted or became illicit. It involves the systematic tracking of items from the point of manufacture or import, through the supply chain, to the last legal owner. Lotting and batching help to ensure that ammunition is traceable (see Module 03.20).

This module covers areas such as the introduction of national points of contact, the establishment of a national tracing system, domestic and international tracing operations, responses to international tracing requests, and international cooperation and assistance, including the roles of INTERPOL, the UN, regional organizations and NGOs.

IATG Volume 04 – Explosives Facilities (Storage) (Field and Temporary Conditions)

Module 04.10 Field storage

During military operations, there is often a need to store ammunition in the field (“open storage”) if proper storage facilities are unavailable at deployment locations. Ammunition in open storage can be kept safely, effectively and efficiently as long as certain safety challenges are resolved.

This module addresses open storage of ammunition for periods of up to one year in support of military operations, describes the challenges associated with such “short-term” storage, and details specific requirements for managing and monitoring the ammunition. Open storage is associated with significant safety concerns, including the deteriorating effect of exposure to wind, water, sun, heat, humidity, sand and dust, as well as the possibility that the service life of ammunition may be significantly reduced by exposure. A surveillance and in-service test programme is required to ensure that ammunition performance and safety are not compromised during, or as a result of, short-term open storage (see Module 07.20). This module assumes that deployment activities will end within one year and that ammunition deemed safe for transport will be returned to its originating State. Module 04.20 provides guidance for deployments that exceed one year and involve long-term open storage of ammunition.

Module 04.20 Temporary storage

Long-term open storage may be required for up to five years if appropriate depot storage infrastructure is not available, or if available infrastructure cannot offer the necessary protection from the elements. This module assumes that the situation that led to the need for long-term open storage will be eliminated or resolved within five years, either because appropriate new infrastructure will become available or because the ammunition will have been used, relocated or demilitarized. Even under long-term open storage, it is possible for ammunition to be stored safely, effectively and efficiently, as long as significant safety and security challenges are resolved.

This module describes these challenges and details specific requirements for managing and monitoring ammunition in this environment. Concerns regarding safety and reliability are further amplified for long-term open storage due to the increased exposure time. An effective surveillance and in-service test programme is the only way to ensure that ammunition performance and safety are not compromised during, or as a result of, long-term open storage (see Module 07.20).

IATG Volume 05 – Explosives Facilities (Storage) (Infrastructure and Equipment)

Module 05.10 Planning and siting of explosives facilities	<p>UEMS can have extremely dangerous effects on the surrounding area. Authorities must consider these potential effects as early as possible in the planning and design of an explosives facility of any size or capacity. They also need to factor them into their assessments of protection needs around these facilities, such as in relation to the public, roads, buildings or other storage facilities.</p> <p>Every existing or planned explosives facility must be carefully considered and evaluated to ensure that minimum quantity distances are applied (see Module 02.20). Whenever these cannot be applied, appropriate risk assessment and risk acceptance steps must be taken (see Module 02.10). These actions can be accomplished through the establishment of a formal national process to assess, site, and approve all existing and planned explosives facilities. The primary purpose of this process is to verify that each established and planned ammunition storage location meets IATG requirements in addition to providing minimum protection levels within quantity distances (see Module 02.20).</p> <p>This module details general requirements and procedures for planning, siting and approving planned and existing explosives facilities and for managing construction within quantity distances of these facilities.</p>
Module 05.20 Types of buildings for explosives facilities	<p>Many different types of buildings are used for the storage and handling of ammunition, but - from a safety or risk perspective - not all are appropriate for the ammunition-related activities conducted in them. The consequences of using unsuitable buildings can be serious. When planning the construction of a new explosives facility, decision makers should consider a number of different building types and aspects of building construction.</p> <p>This module details the general requirements for the design of explosives facilities. It discusses the effects of unplanned events, the hazards they introduce, the concept of explosives propagation (that is, a detonation reaction in which one ammunition stack causes the immediate detonation reaction of an adjacent stack), and the importance of protecting against the detonation of an adjacent stack in order to limit the size of any unplanned event. The module provides guidance on the types of buildings to be used as explosives facilities; possible scenarios and effects resulting from unplanned events and how different types of buildings respond to such events; design considerations; and the optimization of explosives facility design with quantity distances. Explosives facilities are a hazard to personnel, the public, surrounding facilities and other exposed locations. Appropriate building design, construction and siting are of crucial importance in the application of IATG quantity distances, as detailed in Module 02.20.</p>
Module 05.30 Traverses and barricades	<p>A properly constructed barricade around an explosives facility is an extremely effective mitigation technique for intercepting low-angle fragments and debris resulting from an unplanned explosion. It is important to properly assess the placement of barricades so that they are constructed where they provide the most beneficial protection and are most cost-effective.</p> <p>This module addresses the issues of barricade selection, design, construction and siting, and only applies to barricades used in permanent explosive storage facilities. Temporary barricades used as part of open storage are addressed in Modules 04.10 and 04.20.</p>

Module 05.40
Safety standards
for electrical
installations

The control of electrical and lightning-related hazards in explosives facilities is important because of the potential for transient electrical signals and surges, arcing, static discharge and lightning strikes, as well as associated fires. Control measures for these hazards can vary significantly, depending on the ammunition-related operations being performed and the facility involved. Some measures may be very simple while others may require complex, integrated systems that must be collectively considered as part of the design of the building's electrical, grounding, bonding and lightning protection systems, as well as their installation and maintenance. A primary technique for managing electrical risks within an explosives facility is categorizing the facility by electrical hazard codes and zones. Such categories further define the levels of protection that are required to prevent an unplanned event.

This module helps users to understand the electrical hazard categorization process, as well as the protection systems that may be required to manage various electrical threats. It also details the requirements and standards for these systems, including testing, to demonstrate system effectiveness.

Module 05.50
Vehicles and
mechanical
handling
equipment (MHE)
in explosives
facilities

In the context of ammunition-related operations, unsuitable vehicles and mechanical handling equipment can present a fire or explosion risk. Vehicles and equipment, as well as ancillary items, should comply with the facility's or area's assigned electrical hazard categorization codes and zones (see Module 05.40).

This module addresses a broad range of vehicles and MHE that might be used in ammunition-related operations and provides corresponding risk reduction measures. It also reviews requirements for a management and control process for vehicle equipment design, modification, selection, approval, labeling, use, maintenance and testing – to ensure the process is appropriate for all intended uses and that it is kept current with applicable standards. Compliance with this module ensures that vehicles and MHE used to support ammunition-related operations are appropriate and safe for their intended use and environment, thereby reducing risk.

Module 05.60
Radio frequency
hazards

Technological advances have resulted in the increased use of communications equipment operating on a host of different radio frequencies, as well as power outputs such as data loggers, mobile phones, pagers, two-way radios (hand-held, permanent, or vehicle-mounted) and high-power transmitters. This equipment generates electromagnetic radiation energy; if improperly used in the proximity of susceptible ammunition, the energy from an inadvertent transmission may cause an unplanned event or the degradation of an electronic system. The energy can also lead to arcing or sparking, both of which are potential fire hazards. These threats point to the need to consider, control and manage the use of electronic communications equipment in the proximity of ammunition throughout the through-life management process.

This module explains why electromagnetic radiation energy is a hazard that needs to be addressed as part of ammunition management, and details basic precautions that can be taken. It provides guidance on the requirements for developing a technical national authority and statutory regulations, in addition to establishing an assessment and approval process for the use of electronic communications equipment and transmitters. Compliance with this module addresses a critical safety issue and helps prevent UEMS related to uncontrolled electromagnetic radiation energy.

IATG Volume 06 – Explosives Facilities (Storage) (Operations)

Module 06.10 Control of explosives facilities	<p>The safe and efficient management of explosives facilities or operations - with their myriad hazards - entails the consideration of areas such as personnel training and qualifications, security and access controls, fire protection, real estate management and site planning, electronic equipment for communications, facilities and licensing. From a safety and security perspective, managers, supervisors and ammunition-related personnel should prioritize the management and control of activities associated with the above areas.</p> <p>This module introduces the basic principles for managing explosives operations. It lists the elements of a good control and management programme, identifying what is important about each and providing the requirements for the routine control of ammunition-related activities. The module covers some technical issues including radio-frequency energy produced by transmitters, MHE, and electrical installations. It cites references to other modules that have been developed to help manage these areas.</p>
Module 06.20 Storage space requirements	<p>Both ammunition and storage facilities are expensive and should be managed not only to maximize storage facility use, but also to place as much ammunition as possible in the protective spaces of storage facilities. As Modules 04.10 and 04.20 indicate, covered storage is preferable to open storage for the protection of ammunition from the potentially damaging effects of environmental and other exposure.</p> <p>This module helps users to plan for and optimize ammunition storage, thereby ensuring maximum cost efficiency and effective storage planning. It encourages the full use of available units of space in covered storage to reduce the need for open storage. Explosives limits must not be exceeded in any storage facility. This module provides guidance on storage space planning, taking into consideration the allowable explosives limits of storage facilities. This module is designed to help users align their storage facility space requirements more closely with their available stockpile needs, towards safer and more effective storage of ammunition.</p>
Module 06.30 Storage and handling	<p>Improper storage and handling of ammunition increases the potential for damage, which may negatively impact its reliability and safety, or lead to UEMS. Damaged ammunition has to be either repaired or destroyed and then replaced, which may result in significant financial cost. The protection of ammunition from such damage is one of the controls discussed in Module 06.10.</p> <p>This module provides an overview of general practical considerations and requirements for the safe storage and handling of ammunition in facilities and for inter-facility transportation. It references related modules, all of which provide additional guidance and requirements for important aspects of safe ammunition storage, processing and transport.</p>

Module 06.40 Ammunition packaging and marking

The correct packaging of ammunition – which is designed and tested to demonstrate that it provides the required protection throughout its service life – is a key safety measure. Packaging is also designed to assist the processes of ammunition movement, storage and handling. The removal of ammunition from its approved packaging exposes it to damage and other potential hazards, such as environmental effects, insects, dirt and electromagnetic energy, which can have a serious impact on its safety and reliability. For this reason, ammunition should always be kept in its approved packaging until needed. In addition, taking ammunition out of UN-approved shipping packaging can affect its hazard classification. Changes in classification must be accounted for as part of the management of explosives facilities (see Module 06.10). The UN hazard classification system is detailed in Module 01.50.

Proper markings, labels and seals on ammunition and packaging communicate critical safety and security information, allowing for proper storage, handling and transport of ammunition. Some are required by the UN hazard classification system, while others support management and control processes in facilities, as discussed in this module and Module 06.10. This module provides general, practical information and basic requirements related to ammunition packaging and its markings, with the aim of raising user awareness of the many considerations involved.

Module 06.50 Specific safety precautions (storage and operations)

The chemicals that are used to manufacture ammunition are generally hazardous. They are toxic to humans, posing health risks through inhalation, ingestion and absorption through both the skin and the eyes. Some ammunition items require additional safety considerations because they present unique risks. These must be considered and incorporated into management and control processes in explosives facilities (see Module 06.10).

The purpose of this module is to highlight additional safety precautions, basic requirements, and mitigation factors for ammunition in general, as well as for unique ammunition items and component materials, such as:

- ammunition filled with dangerous substances, such as white or red phosphorus, which, if cracked or damaged, can leak and upon contact with air spontaneously ignite;
- phosphide-filled ammunition, which is activated by water and, if cracked or damaged, can interact with water in any state and produce toxic and flammable phosphine gas;
- finely divided powdered metals (in bulk and in ammunition), which can generate hydrogen gas upon contact with water and form an explosive hydrogen/air mixture;
- ammunition or components recovered through explosive ordnance disposal (EOD), such as unexploded ordnance;
- ammunition for museums, souvenirs, displays and training aids, or surplus products and salvageable leftover materials from manufacturing, demilitarization or other similar processes.

Module 06.60

Works services
(construction and
repair)

Contract personnel working in an area where explosives are stored, processed or transported must be properly managed and monitored for their own safety and the safety of others. To minimize risks and ensure compliance with the necessary requirements, management and control measures must be implemented for any work involving – or carried out in the proximity of – an explosives facility. The measures are to be applied regardless of the scope of the work - be it major, minor or routine – and irrespective of who is carrying it out (see Module 06.10).

This module describes the key roles and major responsibilities associated with explosives safety with respect to contractors, a visiting workforce, and explosives area support workers. It provides procedures and safety requirements for the control and management of such personnel, as well as the approval, monitoring and management of work involving – or carried out in the proximity of – explosives facilities.

Module 06.70

Inspection of
explosives
facilities

An important element of managing explosives facilities is the carrying out of inspections by the establishment responsible for the facilities as well as by national authorities with oversight responsibilities. The absence of an inspection process or programme to address inspection faults can lead to unplanned explosions. For this reason, it is critical that national authorities require their explosives establishments to document and track periodic inspections of explosives facilities, inspection faults and the status of fault corrections and repairs. In addition, national authorities should monitor these establishments' processes and provide oversight to ensure compliance with the IATG and their own national processes.

This module explains the importance of having both a comprehensive inspection process and an aggressive fault correction system in place. It underscores the potential ramifications of being deficient in these areas. It also describes a recommended procedure for conducting inspections of explosives facilities, recommends timeframes for periodic inspections, provides a sample logbook that identifies areas in the explosives facility that should be inspected, and provides a sample format for recording inspections and faults. Users should adapt these as necessary for each of their explosives facilities. Lastly, this module addresses national authorities' oversight responsibilities and provides a checklist format for them to use when inspecting their explosives establishments.

Module 06.80

Inspection of
ammunition

Inspection of ammunition is necessary to ensure its safety, reliability and performance. The level of inspection and complexity of the effort depends on the reason for the inspection. Some are basic external inspections of ammunition or its packaging, while others – such as surveillance breakdown of ammunition and the collection of propellant or explosives samples (see Module 07.20) – are significantly more complex and require additional resources, training and preparation time.

This module presents general information on ammunition safety and common inspection points. It provides guidance for the conduct of a basic risk assessment prior to any explosives processing operation (see Module 02.10); outlines three types of ammunition inspections – routine, technical and safe to move – and offers advice on physical inspections, including for 25 generic types of ammunition.

The module is also designed to help users assign status codes and other markings to indicate the status of inspected ammunition : serviceable, unavailable or banned.

Module 07.10

Safety and risk reduction (ammunition processing operations)

Any operation involving ammunition potentially increases the risk of UEMS. Explosions can be initiated by a multitude of external stimuli, and a minor event can quickly escalate into a major one. As a result, full consideration must be given to every explosives processing operation, regardless of the level of complexity involved, so as to assess all potential risks.

It is difficult to control and manage risks and develop a risk reduction strategy for an explosives operation if potential risks are unknown. For this reason, this module starts with general guidance on the carrying out of a risk assessment (see Module 02.10). Users are then systematically guided on how to translate findings into safety measures, namely through the establishment and implementation of user-developed "safe systems of work". Such systems, guided by risk assessment results in conjunction with guidance and requirements from this module, should also address other areas that are part of the control and management of explosives facilities (see Module 06.10). In addition, the module provides guidance on general safety aspects of ammunition and explosives processing.

Module 07.20

Surveillance and in-service proof

Since ammunition deteriorates over time, it has a finite serviceable life. Surveillance and in-service proofs are used to monitor its condition and gauge any safety deterioration or performance degradation; these processes also fulfill the ammunition inspection requirements provided in Module 06.80. An accurate appraisal of an ammunition item's state and remaining lifespan is important to ensure both safety and cost-effectiveness. Such a determination ensures the most advantageous return on what can be a heavy investment.

This module explains both the rationale for, as well as the importance of, surveillance and in-service proof processes. In providing guidance and requirements that national authorities can use to develop their own processes, it serves to address areas such as national regulation, responsibilities, requirements for effective programmes, and the establishment and implementation of relevant processes, including the collection of baseline data, sample selection, scheduling and documentation. Also included is strong advice related to propellants, some of which can spontaneously ignite upon depletion of their stabilizer content below minimum levels. This depletion process is unstoppable and irreversible and has resulted in many catastrophic UEMS. Once stabilizer content is depleted, the only safe solution is immediate isolation and disposal of the ammunition. With advance warning through a surveillance programme, such ammunition could possibly be used in training before it becomes unsafe to handle or store, which would allow an owner to optimize its use.

IATG Volume 08 – Transport of Ammunition

Module 08.10 Transport of ammunition	<p>International agreements and regulations govern the transport of dangerous goods, including ammunition. Without them, and given that national transportation regulations vary greatly across States, the international movement of dangerous goods would be severely impeded, if not impossible. These international regulations rely on the UN hazard classification system, which is almost universally accepted by States and which provides a common platform for safe transport (see Module 01.50). All other international transport agreements and regulations build on the UN system.</p> <p>This module explains how the UN system is used by organizations responsible for developing international regulations for the safe transport of ammunition and explosives by truck, rail, air and sea. It discusses each of these modes of transport and the international regulations and requirements that govern them.</p> <p>The ammunition-related regulations on the transport of dangerous goods in these international agreements apply only if a national authority has adopted them for internal use. States that adopt them benefit from a harmonized and safe system for classifying and transporting ammunition. The quantity distances in Module 02.20 are based on the UN hazard classification system, an IATG RRPL 3 requirement.</p>
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IATG Volume 09 – Security of Ammunition

Module 09.10 Security principles and systems	<p>The physical security of ammunition stockpiles is an essential part of through-life management as it reduces the risk of loss, theft, leakage and proliferation (collectively referred to as “diversion”) as well as acts of malfeasance, such as sabotage. Physical security is especially important in regions of instability and post-conflict environments, where basic security steps can have a very large impact in terms of preventing diversion. When compared to the value of an ammunition stockpile, the financial costs associated with taking security precautions are minimal. Security costs should not be viewed simply as an expense; they should be balanced against the potential costs associated with poor security leading to UEMS. Effective and efficient physical security of a State’s ammunition stockpile is consistent with IATG guiding principles (see Module 01.10). States are advised to adopt an active, rather than reactive, approach to accounting for and securing their ammunition (see Module 03.10).</p> <p>This module is designed to help improve physical security standards for ammunition stockpiles. It establishes guiding principles for physical security, details the various elements of physical security, provides guidance and requirements for implementing these elements, defines the necessary procedures, and introduces technical security systems in support of the through-life management of ammunition.</p>
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IATG Volume 10 – Ammunition Demilitarization and Destruction

Module 10.10 Demilitarization and destruction of conventional ammunition

A number of IATG modules note that certain stockpile management activities can generate unsafe, damaged or excess ammunition-related materials that may need to be demilitarized or destroyed. In addition, certain international treaties, agreements and instruments refer to or require the destruction of ammunition. States that intend to destroy ammunition can avail themselves of various techniques, ranging from relatively simple open burning and detonation, to highly sophisticated industrial demilitarization processes. Each of these processes requires expert knowledge and carries a unique set of risks. States are advised to carry out comprehensive planning to be able to select the most appropriate and efficient process and to execute it safely.

This module provides general guidance on and introduces a technical methodology for the safe planning and execution of ammunition demilitarization and destruction activities in support of through-life management. It does not provide a template for demilitarization and destruction as there are many different factors to consider; instead, it focuses on core activities that are common to most destruction processes.

IATG Volume 11 – Ammunition Accidents, Reporting and Investigation

Module 11.10 Ammunition accidents : reporting and investigation

Reporting and investigating ammunition accidents are fundamental, preventive safety measures. All accidents should be immediately reported and properly investigated so that appropriate action can be taken. Delays in reporting and responding, or the failure to conduct a proper investigation, may perpetuate a dangerous situation and increase the likelihood of an accident.

This module introduces the overall rationale behind accident reporting and investigation. It presents a classification system for accidents and provides guidance on actions that can be taken when an accident occurs; accident reporting procedures; and the related responsibilities of the established investigation authority and assigned technical investigator. National authorities that wish to develop requirements for accident reporting and investigation can use this module as well as Module 11.20, which covers a specific methodology for conducting an accident investigation.

Module 11.20 Ammunition accidents : investigation methodology

Reporting and investigating ammunition accidents is important to ensure that causes are identified and appropriate actions taken to prevent a reoccurrence or UEMS. Conducting an investigation is never a simple matter. Accidents are not usually the result of a single failure, but rather result from a series of progressive and sequential events or failures that together eventually cause an accident. Determining the causes of an accident requires the application of a systematic and deliberate approach using a proven and agreed-upon methodology.

This module introduces and describes the basic elements of an accident investigation and provides a methodology for conducting one. It includes topics such as gaining assistance from other agencies and technical experts, gathering evidence and interviewing witnesses. It provides a checklist that helps to guide and track investigation activities. In addition, it includes lists of generic questions, divided by major topics - such as ammunition, personnel qualifications, and procedures - that can be used by an investigator.

IATG Volume 11 – Ammunition Accidents, Reporting and Investigation

Module 11.30 Ammunition storage area explosions : EOD clearance

Based on the number of UEMS that occur each year around the world, it is highly likely that some IATG users will need to oversee post-event explosive ordnance disposal clearance. As these situations are extremely dangerous, cleanup is best left to experienced and qualified organizations. An understanding of the consequences of UEMS and of the particulars of post-UEMS cleanups can underscore the need to maintain safe and secure ammunition stockpiles.

This module explains the extreme danger associated with post-event situations, during which ammunition and explosives - in a variety of hazardous conditions - may be scattered over large areas. It details the potential consequences of such an event on the surrounding people and areas, as well as the hazards that have to be addressed. It provides basic clearance principles and guidance on the development of a clearance methodology and the clearance operation itself. An example of an EOD clearance order is provided as an annex to this module.

IATG Volume 12 – Ammunition Operational Support

Module 12.10 Ammunition on multi-national operations

This module provides guidance on the storage, handling, and use of ammunition and explosives for personnel deployed in multi-national operations. It provides basic planning guidance for selecting appropriate locations for the safe storage of ammunition from troop-contributing nations, details key force level explosives safety and risk management roles and responsibilities, and identifies the required competencies for a multi-national force explosives safety officer. It establishes the minimum safety requirements for unit personnel and the public; specifically, it features a table that refers to appropriate IATG modules and paragraphs, to meet RRPL 1 stockpile management requirements, at a minimum. A force's goal should be to strive for higher RRPLs to reduce risk.

The guidance in this module encourages all troop-contributing nations to certify that ammunition deployed in support of multi-national operations is "safe to deploy" and is subject to surveillance and in-service proof programmes that are fully compliant with Module 07.20.

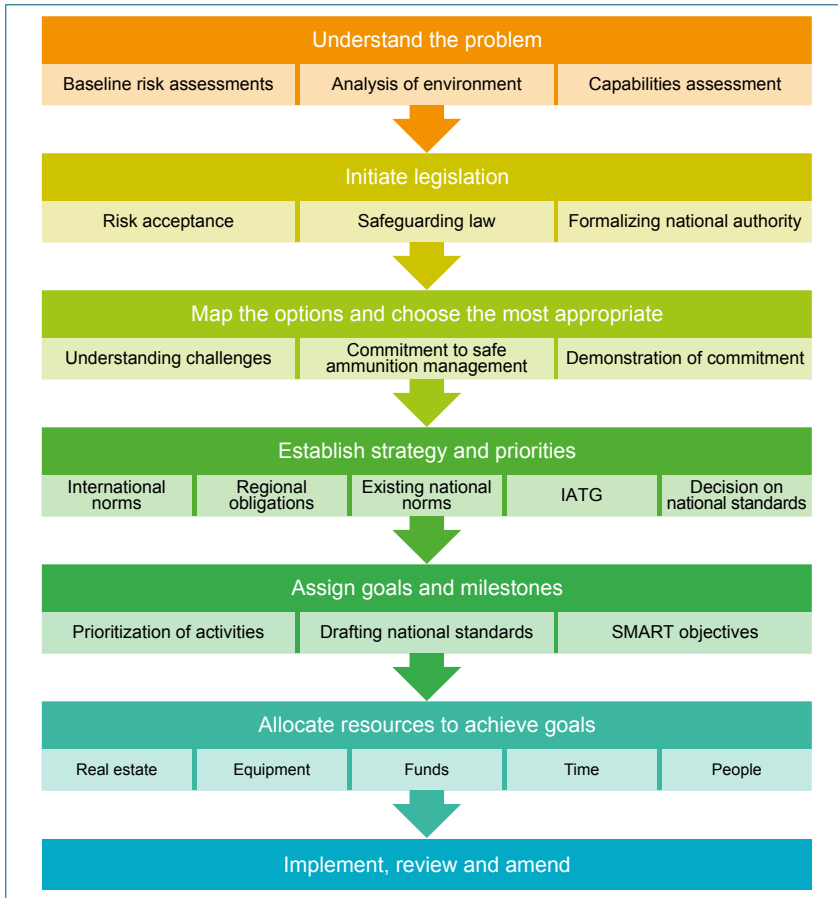
Module 12.20 Small unit ammunition storage

Small unit organizations such as police or isolated military units - many of which operate in heavily populated urban areas - handle ammunition on an almost daily basis although they may not have received the necessary training to do so. Such a lack of training has led to deaths and injuries in a number of catastrophic UEMS.

This module provides guidance for individuals in small units who are responsible for ammunition handling, storage and management. Since many basic safe handling and storage requirements in the IATG are also directly applicable to small units, this module provides a requirements checklist that points to appropriate IATG modules and paragraphs to meet RRPL 1 stockpile management requirements, as a minimum. As compliance may be difficult to achieve, this module offers advice on the use of a risk management approach (see Module 02.10) and the importance of communicating risks to all potentially affected parties, especially when compliance with the IATG cannot be achieved. Wherever possible, small units should apply quantity distances (see Module 02.20).

Small units may accumulate large amounts of ammunition whose safety status is unknown, including as part of criminal investigations. This module includes warnings and guidance on isolating or disposing of such dangerous materials as quickly as possible, in accordance with the governing national legal framework or protocol.

ANNEX II : PROCESS FOR PRODUCING NATIONAL STANDARDS



ANNEX III : PESTLE FACTORS TO CONSIDER IN NATIONAL AMMUNITION RISK MAPPING

Various external factors may positively influence ammunition risks, thus creating opportunities ; or negatively, thus posing a threat⁴². The PESTLE factors to consider are political, economic, socio-ethical, technological, legal and environmental :

Political factors include government regulations and legal issues such as : political situation, political stability, State interference, market regulations, trade agreements, tariffs or restrictions, tax policy and taxes, employment laws, environmental regulations, lobbying and clarity of law. They define both formal and informal rules that a State must abide by, so they can create advantages and opportunities for both the State and organizations. The analyst should have the freedom to explore and present the positive and negative effects of political factors so that the national authority can consider all possible outcomes, to develop appropriate policy and strategy.

Economic factors such as gross domestic product (GDP), economic growth, interest rates, exchange rates, inflation rate, tax policy and level of unemployment all affect the State's purchasing power and cost of capital. National interest rates and fiscal policy are set around economic conditions, which then influence the purchasing power of government and commerce as well as the structure of their expenditure. The analyst will take these and any other economic factors into account to inform the strategy.

Social forces influence our attitudes, interests and opinions, creating our behaviour and ultimately what is expected or acceptable within a society, e.g. societal and individual risks to life. In this context, societal factors can include : structure of population, birth rates, accident rates, increase of global population, level of education, cultural diversity and standards and norms. Ethical factors involve duties, morality, integrity, behaviour, what is good and bad for the State, organizations, employees and society as a whole. Ultimately, the analyst uses socio-ethical factors to inform the strategy on how the government and the society at large view the impact of diversion of ammunition and accidental explosions at munitions sites.

Technological advances can change the way in which governments and organizations operate. Technological factors such as R&D activity, automation, technological incentives, or the rate of technological change, can remove or place barriers for the successful strategy outcome. They can also enhance productivity levels and sway outsourcing decisions, which might include the development of home-grown expertise and the reduction of reliance on support from international assistance providers. Understanding the existing and potential capacity for technological development can inform the development of an ammunition and explosives safety and security strategy that is achievable and sustainable. In many States, technological progress has created a society which expects instant results, which can be a cause of friction between the affected State and well-intentioned international assistance

providers, if the affected State is not at the same level of technological development and integration. New technologies can increase the rate at which information is exchanged between stakeholders. A faster exchange of information can benefit governments and organizations as they are able to react more quickly to changes. The analyst should consider the absorptive capacity for innovation of the State and of society, to inform the strategy about if and when the State could and should introduce new technologies.

Legal factors are a subset of the above-mentioned political factors, which involve all regulatory and law determinants that can negatively or positively affect results of internal and external stakeholder actions and the decisions of government. The analyst must identify and consider these factors, such as international, regional and national legal restraints, regulations and guidance, independently for every activity relating to ammunition and explosives. These are factors which deal with legal complications. The analyst will need to check on new and pending legal requirements to ensure compliance.

Environmental factors include environmental protection legislation, pollution, waste management and disposal, clean air and water, wind, energy saving technologies and attitudes towards ecology in society. The environmental factors assess what kind of impact an activity is having, or might have, on the environment. The impact can either be negative or positive and the analyst should consider both in order to inform policy-makers so that they make choices relevant to their own State's situation and aspirations.



ANNEX IV : CAPABILITY LINES OF DEVELOPMENT

The UK Ministry of Defence manages eight capability lines of development in its acquisition framework. Interoperability should be considered as an overarching theme that encompasses all lines of development. It implies the ability for an armed force and its branches of service, civilian contractors, service providers and relevant national authorities and ministries to work together in a compatible manner whilst performing very different roles and tasks. Interoperability extends to the interaction between services, defence capabilities, other government departments and the civil aspects of interoperability, including compatibility with civil legislation and standards. The capability lines of development⁴³⁾ are briefly characterized below :

- **Training.** The provision of the means to practise, develop and validate, within constraints, the practical application of a common military doctrine to deliver a military capability.
- **Equipment.** The provision of military platforms, systems and weapons (expendable and non-expendable, including updates to legacy systems) needed to outfit or equip an individual, group or organization.
- **Personnel.** The timely provision of sufficient, capable and motivated personnel to deliver defence outputs, now and in the future.
- **Information.** The provision of a coherent development of data, information and knowledge requirements for capabilities and all processes designed to gather and handle data, information and knowledge. Data is defined as raw facts, without inherent meaning, used by humans and systems. Information is defined as data placed in context. Knowledge is information applied to a particular situation.
- **Concepts and doctrine.** A concept refers to capabilities to be used to accomplish an activity in the future. Doctrine is an expression of the principles by which the military guide their actions and is a codification of how activity is conducted today.
- **Organisation.** Relates to the operational and non-operational organisational relationships of people. It typically includes military forces, line ministries and civilian organisations as well as the structure of defence contractors providing support.
- **Infrastructure.** The acquisition, development, management and disposal of all fixed, permanent buildings and structures, land, utilities and facility management services in support of defence capabilities. It includes estate development and structures that support all personnel.
- **Logistics.** The science of planning that takes care of the forces' movement and maintenance. It encompasses activities in the design and development, acquisition, storage, transport, distribution, maintenance, evacuation and disposition of material; transport of personnel; acquisition, construction, maintenance, operation and disposition of facilities; and furnishing of services, including medical and health service support.

ANNEX V: IATG RATIONALE FOR A NATIONAL SAFEGUARDING LAW

One of the most efficient means of protecting the public from the effects of an explosive event is by using separation distances,⁴⁴⁾ which ensure that the general population and their properties are always at a tolerably safe distance from the explosives during storage and handling. These separation distances frequently extend beyond the boundary of the explosives facility. Past experience has shown that without a system of safeguarding the land outside the facility boundary, the civilian population may build dwellings or commercial installations thereby negating the effective separation distance. If this occurs there are only two options available to the ammunition storage facility:

- 1) The explosive quantity permitted for storage shall be reduced within the facility; or
- 2) The increased risk to the civilian population shall be formally accepted, even if it is above the tolerable risk level.

Either option is undesirable.

The alternative options of:

- 1) Moving the civilian population from the area; or
- 2) Moving the ammunition storage area;

are national, political decisions. Therefore, to ensure that explosives facilities are not compromised by civil encroachment of private or public land development within the explosion danger area of the facility, a system of safeguarding should be established and incorporated within the laws of the State. To achieve this, a formal system of safeguarding⁴⁵⁾ that permits the ammunition storage organization to influence what activities are permitted within the explosion danger area, should be developed and implemented.

Local authorities have to be made aware of the status of an ammunition storage area and are to ensure that the national authority is notified should any building or development work begin in the area marked on a safeguarding map. This map should be produced by the national authority and distributed to local authorities whose area of responsibility is affected by the storage area. This map should have marked on it:

- The inhabited building distance (IBD), marked with a yellow line, indicating the area where no inhabited buildings should be developed;
- The vulnerable building distance (VBD), marked with a purple line, indicating the area where no vulnerable buildings (churches, schools, curtain wall structures, vital structures, etc.) should be developed;
- The area owned by the explosives facility, marked in red.

ANNEX VI: AVAILABLE ASSISTANCE

The latest iteration of the General Assembly resolution “Problems arising from the accumulation of stockpiles of ammunition in surplus”; A/RES/72/55:

- Recognizes the urgency of addressing the security and safety risks emanating from ineffective stockpile management around the world;
- Recognizes the importance of appropriate national ammunition management structures and procedures, including laws and regulations, training and doctrine, equipment and maintenance, personnel management, and finances and infrastructure in order to ensure sustainability in ammunition management;
- Encourages States in a position to do so to assist interested States within a bilateral framework or through international or regional organizations, including through activities conducted under the umbrella of the SaferGuard knowledge resource management programme, on a voluntary and transparent basis, in elaborating and implementing programmes to eliminate surplus stockpiles or to improve stockpile management.

States seeking assistance for the development of a national normative framework for ammunition management have many options available, some of which are outlined below.

International

UN SaferGuard Programme

Under the Quick-response Mechanism, the UN SaferGuard Programme arranges for ammunition management assistance, including technical assessments, training for personnel, technical and policy support and/or clearance activities, in accordance with the IATG.⁴⁶⁾

States wishing to engage the UN SaferGuard Programme should contact UNODA at: conventionalarms-unoda@un.org

United Nations Mine Action Service (UNMAS)

UNMAS operates under UN legislative mandates from both the General Assembly and the Security Council. UNMAS is an integral component of UN peace operations and special political missions. UNMAS responds to specific requests from affected Member States, the UN Secretary-General or designated officials to assist in storage, inspection, transportation and stockpile destruction of ammunition.

Contact: unmasgeneva@un.org

United Nations Institute for Disarmament Research (UNIDIR)

Under the Conventional Weapons Programme, UNIDIR conducts weapons and ammunition management research and projects to enhance the capacity of national policymakers and relevant security authorities, tasked with leading or supporting the design and strengthening of a national framework related to the governance and management of weapons and ammunition. More specifically, UNIDIR endeavours to support States and UN partners in their efforts to establish accountable and transparent weapons and ammunition management policies and plans, and to help monitor and assess progress.

States wishing to contact UNIDIR may reach them at: unidir@un.org

Government to government

Many States are willing to provide assistance through their department for foreign affairs or possibly through a specific department for international development. This assistance might be for either humanitarian, historical relationship or commercial/trade purposes. Such assistance can take the form of training, education, technical or legal advice and support, infrastructure projects, trade treaties, etc.

Multinational Small Arms and Ammunition Group (MSAG)

The Multinational Small Arms and Ammunition Group (MSAG)⁴⁷⁾ is an informal grouping of similar-minded States seeking to exchange best practices, build capacity on physical security and stockpile management (PSSM), and promote knowledge transfer with regard to SALW and conventional ammunition, including the provision of advice and support in the field of disposal and destruction of SALW and conventional ammunition.

States seeking assistance from MSAG should use the instructions in the publicly available MSAG handbook.⁴⁸⁾

Bilateral

Governments may have bilateral partnerships which often extend to arrangements for knowledge and technology transfer that can be applied to the safe and secure management of ammunition and explosives.

During and in the immediate aftermath of conflict, military assistance is most often in the form of "equip and train", i.e. the assisting State will provide equipment to the requesting State as well as training with the equipment for its designed purpose. In well-developed bilateral relationships, it is often possible for the affected State to receive more advanced training and education. This type of training and education can be in the form of advanced courses of instruction held in the assisting State's training or academic establishments. Some States also offer opportunities for short

or long-term attachments in technical units, which provide the “learner” from the assisted State with the chance to learn new skills in a practical setting. States may also wish to share technical expertise, advice and support.

Regional collaboration

There are many relevant inter-governmental and regional organizations which may offer ammunition management assistance,⁴⁹⁾ including the United Nations Regional Centres for Peace and Disarmament (UNLIREC, UNREC and UNRCPD),⁵⁰⁾ African Union (AU), Association of South East Asian Nations (ASEAN), Organization of American States (OAS), European Union (EU) and Organization for Security and Cooperation in Europe (OSCE).

Box 6 – Ammunition management cooperative approach – NATO and United States

Though the US Department of Defense has its own weapons development, research facilities and explosives safety programmes, because of its close relationship with NATO, US ammunition life cycle safety is addressed cooperatively within NATO Allied Committee (AC) 326, also known as the Ammunition Safety Group, and its three subgroups. This process and the subject matter material have expanded and evolved since the early 1960s and continues to this day, towards addressing life-cycle aspects: design, manufacture, suitability for service, hazard classification and packaging, surveillance, storage, transportation, and disposal. These activities are not carried out because of a particular accident has occurred, but to help pool ideas, experience and resources, assess accident and test information, and enhance capabilities towards the development of “best practice” in common standards and procedural guidance on munitions and explosives safety. These activities foster interoperability in NATO-led operations, promote the potential for interchangeability of ammunition, and establish a basis for coordinated procurement of munitions and explosives. These, in turn, have been integrated into US and other NATO nations’ requirements documents and are the basis for much of the content found in the IATG.

Author: Eric J. Deschambault.

Source: Unpublished background paper.

International and non-governmental organisations

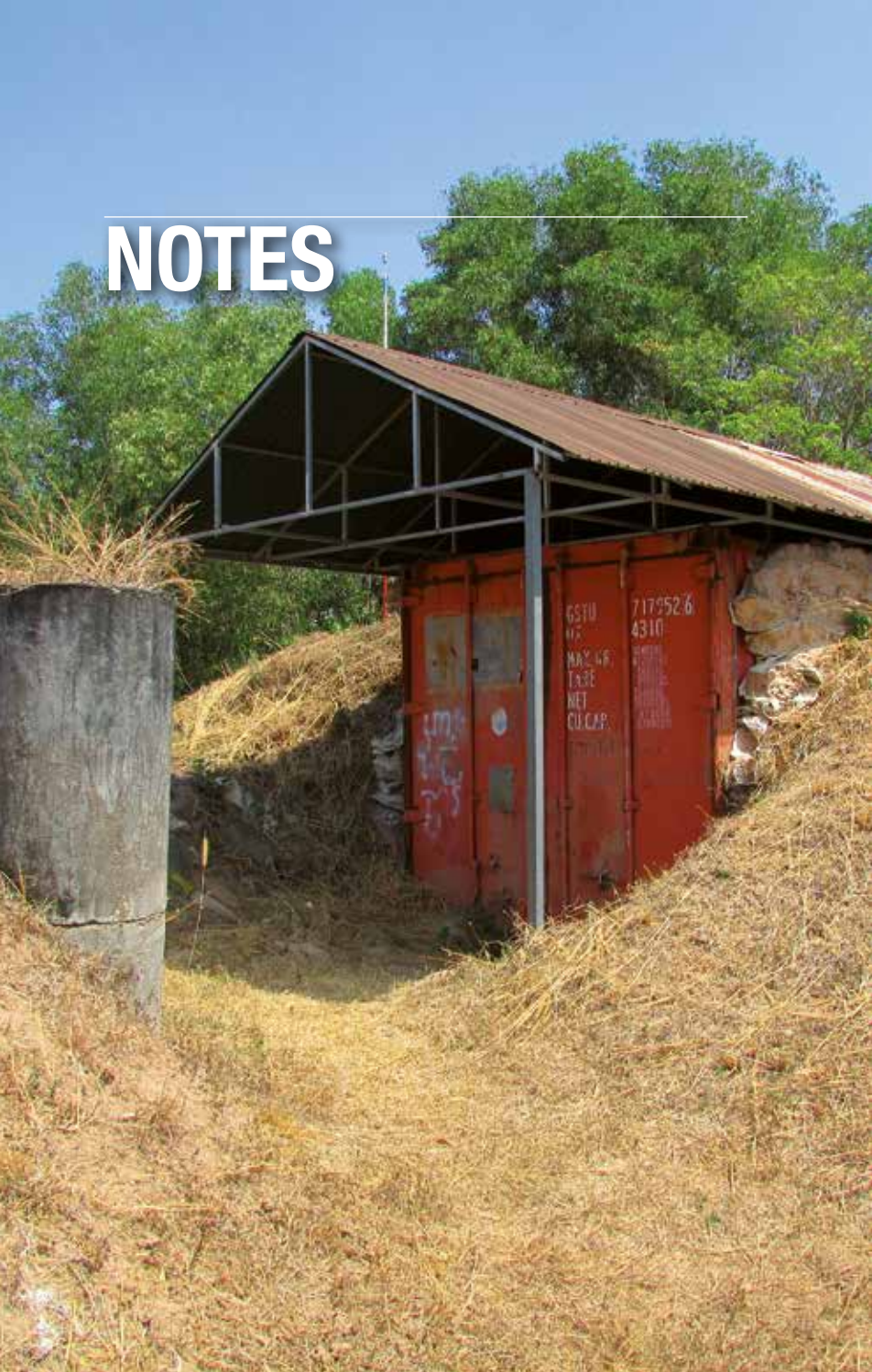
States may be aware of international (IO) and non-governmental organizations (NGO) that can offer assistance in specific areas of expertise. There are several IOs and NGOs offering expert services that are relevant to the safe and secure management of ammunition and explosives. They come from defence and civil backgrounds and possess expertise and experience that they can bring to the table. Because of this diversity, States wishing to engage such experts should consider the organization's knowledge and practical experience specifically with the IATG, as opposed to knowledge on a single State's regulation.

In the context of safe and secure management of ammunition and explosives, the most obvious IOs and NGOs are those working in the fields of explosive ordnance disposal (EOD), PSSM, and weapons and ammunition management. These are the IOs and NGOs that a State may do well engaging with in the early years of implementing its ammunition and explosives safety and security strategy.

As the strategy develops and the affected State becomes more resourceful, its own capabilities should take over the running of many or all of the facilities and activities. IOs and NGOs may then continue to provide expertise and advice on complex tasks such as long-term procurement strategy and planning, the sustainable demilitarization of surplus stocks, environmental testing and in-service surveillance of stocks of ammunition and explosives.

There is no single clearing house or list of IOs and NGOs but States wishing to engage could seek impartial advice, for example, from the UN SaferGuard Programme⁵¹⁾ or the Ammunition Management Advisory Team (AMAT).⁵²⁾

NOTES



- 1) See IATG 01.30, Table 1 : Functional areas of conventional stockpile management
- 2) www.un.org/disarmament/ammunition
- 3) www.unece.org/?id=3598
- 4) www.smallarmssurvey.org/fileadmin/docs/Q-Handbooks/HB-05-LCMA/SAS-HB05-LCMA.pdf
- 5) www.s3.amazonaws.com/unoda-web/wp-content/uploads/2016/11/IATG-01.10-Guide-to-IATG-V.2.pdf
- 6) www.smallarmssurvey.org/weapons-and-markets/stockpiles/unplanned-explosions-at-munitions-sites.html
- 7) Kick-out is a common term for ammunition items expelled from the explosion site.
- 8) Small Arms Survey Unplanned Explosions at Munitions Sites (UEMS) database
- 9) Ibid
- 10) UNSMIL Libya. See www.unsmil.unmissions.org/un-experts-assist-aftermath-brak-al-chati-ammunition-explosion
- 11) NYTimes. See www.nytimes.com/2017/09/27/world/europe/ukraine-ammunition-depot-explosion.html
- 12) Video is available at www.youtube.com/ewestnews1000
- 13) UNGA (2017), Problems arising from the accumulation of conventional ammunition stockpiles in surplus, UN Doc. A/RES/72/55, available at www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/72/55.
- 14) Resolution 63/61. Adopted 2 December 2008. A/RES/63/61 of 12 January 2009
- 15) www.un.org/disarmament/un-safeguard/guide-lines/
- 16) IATG 01.40 www.s3.amazonaws.com/unoda-web/wp-content/uploads/2016/11/IATG-01.40-Glossary-and-Definitions-V.2.pdf
- 17) www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/72/55
- 18) UNGA Resolution 72/55 “Problems arising from the accumulation of conventional ammunition stockpiles in surplus”, 4 Dec 2017
- 19) www.s3.amazonaws.com/unoda-web/wp-content/uploads/2017/05/IATG-01.30-Policy-Development-and-Advice-V.2.pdf
- 20) Swiss Federal Department of Foreign Affairs and Swiss Department of Defence, Civil Protection and Sports (2015), Consultative Meeting on the Safe and Secure Management of Conventional Ammunition, Geneva (16-17 November 2015). Chair’s Summary; Swiss Federal Department of Foreign Affairs and Swiss Department of Defence, Civil Protection and Sports (2016), International Workshop on the Safe and Secure Management of Ammunition, Geneva (8-9 December 2016). Chair’s Summary.
- 21) GICHD, February 2018. The State of Play in Safe and Secure Management of Ammunition, p. 24
- 22) www.un.org/disarmament/ammunition
- 23) A PESTLE analysis is an acronym for a tool used to identify the external forces and factors facing an organisation. The letters stand for Political, Economic, Social, Technological, Legal and Environmental.
- 24) Concerning risk reduction, external factors and existing capabilities
- 25) www.s3.amazonaws.com/unoda-web/wp-content/uploads/2016/11/IATG-01.20-Index-of-Risk-Process-Levels-V.2.pdf
- 26) www.s3.amazonaws.com/unoda-web/wp-content/uploads/2016/11/IATG-01.20-Index-of-Risk-Process-Levels-V.2.pdf

- 27) Life-cycle management of ammunition (LCMA) handbook (2018), Geneva : Small Arms Survey
- 28) Reference : DDESB, Technical Paper 15 Approved Protective Construction, version 3. May 2010, Alexandria, VA
- 29) Ibid
- 30) www.iso.org/home.html
- 31) www.smallarmsstandards.org/isacs/
- 32) www.unddr.org/iddrs
- 33) www.mineactionstandards.org
- 34) See www.iso.org/standards-catalogue/browse-by-ics.html
- 35) IATG 01.10, Section 6 - www.un.org/disarmament/un-safeguard/guide-lines/
- 36) 02.10 - Introduction to risk management principles and processes - www.un.org/disarmament/un-safeguard/guide-lines/
- 37) www.smallarmssurvey.org/?uems
- 38) www.un.org/disarmament/un-safeguard/guide-lines/
- 39) www.defence.gov.au/publications/DefenceCapabilityDevelopmentHandbook2012.pdf
- 40) www.s3.amazonaws.com/unoda-web/wp-content/uploads/2016/11/IATG-01.90-Personnel-Competences-V.2-rev.pdf
- 41) The table is adapted from Annex 1 of 'A Practical Guide to Life-cycle Management of Ammunition' published by the Small Arms Survey.
- 42) See, for example Chartered Institute for Personnel and Development UK, www.cipd.co.uk/knowledge/strategy/organisational-development/pestle-analysis-factsheet
- 43) www.trak-community.org/index.php/wiki/Defence_Line_of_Development
- 44) IATG 02.20 Quantity and separation distances
- 45) IATG 02.40 Safeguarding of explosive facilities
- 46) www.s3.amazonaws.com/unoda-web/documents/factsheets/Ammunition-Fact-Sheet.pdf
- 47) www.msag.es/
- 48) www.msag.es/images/general/menuimagenes/handbook/2013_MSAG%20HANDBOOK%20as%20of%2006.2013.pdf
- 49) www.en.wikipedia.org/wiki/List_of_intergovernmental_organizations
- 50) www.un.org/disarmament/disarmsec/regional-centers
- 51) www.un.org/disarmament/un-safeguard/
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