

# 4

## **Conventional Ammunition Tracing**

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### **Overview**

Tracing is a set of diverse methods used to identify ammunition, its origins, and patterns of transfer. It is a prerequisite for successful ammunition management and a crucial means of identifying diversion and the illicit trade in all munitions.

Tracing is contingent on being able to identify specific production runs, batches, lots, and other collections of ammunition, and to ascertain where they have come from. It therefore shares many similarities with ammunition accounting procedures (CHAPTER 5), but its application is usually retrospective and applied to illicitly circulating arms and ammunition—notably diverted munitions (CHAPTER 15).

This chapter sketches a number of modes of ammunition tracing, ranging from identifying stocks via systematic and accurate markings to methodologies that can be applied where ammunition is poorly marked or bears no markings at all. It concludes that ammunition tracing is in its infancy, but offers considerable hope for identifying and alleviating illicit arms proliferation.

### **Modes of tracing**

There are two modes of ammunition tracing: direct identification using marks on the ammunition in question and indirect identification by a process of elimination. As Table 4.1 illustrates, the degree to which each method is employed is contingent on the degree of specificity in the way ammunition is marked.

Table 4.1

**Ammunition tracing methods for investigating cases of diversion**

Tracing components	Explanation
<b>Marked ammunition</b>	
Manufacturer codes	Tracing ammunition to a particular manufacturer through unique factory codes
Dates of production	Identifying the age of ammunition through date stamps: older stocks may have passed through numerous hands; younger stocks are 'closer' to the point of diversion
Batch/lot numbers	Tracing ammunition to particular units or facilities by the batch/lot number of munitions on consignment notes
<b>Unmarked ammunition</b>	
Metallurgical analysis of components	Testing for trace elements that can be used to determine the manufacturer of metals*
Chemical analysis of primer, propellant, and explosives	Testing for the chemical footprint
Manufacturing processes	Analysis of extrusion marks specific to the blank and die used
Inference	Establishing the primary users of specific types of ammunition and investigating whether they are the source of diversion

\* Questionable in some cases; see Randich et al. (2002).

**Direct tracing**

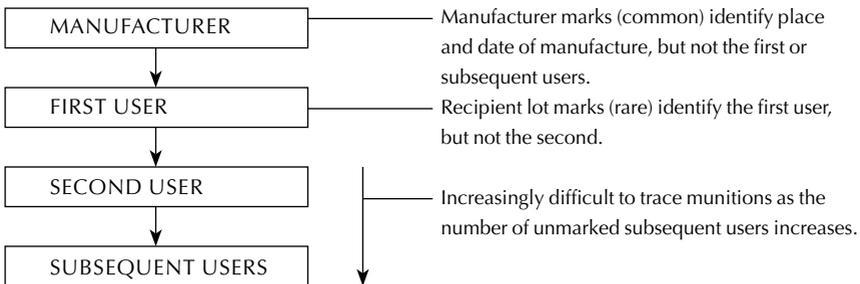
Direct tracing entails analysis of ammunition markings to establish its source. Most conventional ammunition is marked at the point of manufacture (CHAPTER 3).<sup>1</sup> These marks relay basic information required for the effective management, safe storage, and efficient use of ammunition. They can also be used to trace ammunition back to the particular manufacturer and production period. Markings that identify the individual production run of the ammunition (lot or batch markings) may identify the recipient of that lot or batch of ammunition, if adequate records are kept.

For example, in 2002, non-state actors fired two man-portable air defence system missiles at an Israeli airliner in Mombasa, Kenya (CHAPTER 12). The

manufacturer and date marks on the missile tubes and gripstocks found at the scene enabled investigators to trace their origin to factories in the Russian Federation and Bulgaria (Bevan, 2004, p. 88).

This form of tracing can be particularly useful in establishing diversion from a manufacturer or from first recipients of weapons and ammunition (CHAPTER 15). However, the utility of direct tracing is significantly reduced when munitions have changed hands numerous times since manufacture (see Figure 4.1). This is particularly so when states retransfer weapons and ammunition (e.g. surplus ammunition). In the Mombasa case, it proved very difficult to ascertain the intermediate links in the supply chain between the first user (Yemen) and the subsequent illicit users of the weapons in Mombasa (UNSC, 2003). With the exception of ammunition that is lot-marked according to recipient (CHAPTER 16), factory marks cannot usually identify the subsequent users of the ammunition (see Figure 4.1).

Figure 4.1  
**The chain of ammunition transfers and deteriorating tracing possibilities**



## Indirect tracing

In the vast majority of cases, tracing ammunition requires more than analysis of marks. As Figure 4.1 illustrates, in the absence of recipient-identifying lot marks, or for second and subsequent users, it becomes impossible to attribute ammunition to particular users by markings alone. Under these conditions, tracing becomes more a process of eliminating where the

ammunition in question *did not* come from, rather than establishing where it originated.

Like all commodities, basic patterns of ammunition demand and supply lead different users to adopt particular types of ammunition. National stockpiles therefore vary considerably, and there are key differences in the ammunition used by different security forces. This means that an item of ammunition found on the illicit market can have a relatively restricted set of potential sources. The case of small arms ammunition is a good example.

There are in excess of 70 small arms ammunition manufacturing countries in the world, each producing ammunition over a range of years (Anders and Weidacher, 2006, p. 48). The result is an extremely large number of cartridges in circulation that, while they may be of the same calibre, display a wide range of combinations of different manufacturer, date, and calibre marks (CHAPTER 3). Although each round of ammunition is far from unique—a given factory may produce hundreds of thousands of identically marked cartridges in a year—sheer diversity of manufacturers and years of production make each more easily identifiable. Trade barriers, defence agreements, domestic production for domestic consumption, and varying calibres in service mean that ammunition found on the illicit market is more likely to come from some state armed forces than from others.

Ammunition marks are never a definitive means of tracing. Even a lot-marked cartridge may have been transferred several times after having been diverted from its intended military or police unit. But marking, in conjunction with in-depth analysis of ammunition procurement and deployment patterns, does indicate where to *begin* looking for the sources of illicit proliferation.

## Complementary methods

Tracing by marks alone can only indicate an ultimate or penultimate source (i.e. manufacturer or military unit, respectively). It cannot substantiate any intermediate sources that may have been involved in transfer to the illicit market (see Figure 4.1). A number of methods need to be applied to make tracing more precise and to better establish these intermediate linkages if they are to be addressed. These include:

1. studies of defence acquisitions (defining what types of ammunition circulate in which states and how they are marked);
2. parallel, comparative studies of illicit ammunition types and markings (e.g. ammunition retrieved post-conflict or following crime);
3. field-based assessments of illicit markets, the regional demand for weapons, and existing patterns of trade in all commodities; and
4. analysis of broader politico-economic factors that may induce diversion from legal to illicit markets (notably in the security sector, but also elsewhere).

Bevan and Dreyfus (2007, pp. 289–315) provide an illustration of how these very different methods should triangulate with one another to build up an accurate picture of illicit proliferation. Their studies employ a combination of analyses, including ammunition collection and records of markings; key informant interviews; press reviews; the findings of formal investigations; and assessments of regional security dynamics, in order to highlight diversion in two countries.<sup>2</sup> The studies provide clear evidence of the dangers of diversion, but also of the critical role tracing can play in identifying its sources. Tracing can therefore provide the first step in dealing with the problem of diversion.

## Progress to date

There is no single method for tracing ammunition, and, given the many different means through which ammunition reaches the illicit market, there is unlikely to be one. However, accurate marking—particularly lot marking—facilitates all tracing endeavours, and national governments could greatly improve the practice.

At present, there are considerable variations in the degree to which states mark ammunition. Most major conventional munitions are well marked (CHAPTER 3). The same is not true for small calibre ammunition, which, paradoxically, is far easier to divert (CHAPTER 16). Around 10 per cent of illicitly circulating small arms ammunition in parts of East Africa, for instance, is completely unmarked, which makes tracing a complicated process and one that is heavily dependent on expansive qualitative research (Bevan and Dreyfus, 2007, p. 293).

To date, very few countries apply lot marks to ammunition that specify the security force units that use it. Moreover, few countries seem set to adopt the practice—one that could significantly reduce the resources spent on tracing illicit ammunition. Ammunition marking—particularly of small arms cartridges—continues to receive minimal international attention. The 2004–05 UN Open-ended Working Group on Tracing Illicit Small Arms and Light Weapons, for instance, notably failed to address the issue of marking small arms ammunition (McDonald, 2006, pp. 102–3).

If there is no substantive improvement in marking practices, there is a strong case to be made for increased transparency in existing marking procedures (many states refuse to make public information on their ammunition and manufacturers' marks) and in the types of ammunition that comprise national stockpiles. Increased transparency would greatly aid existing tracing methodologies by allowing researchers and monitoring organizations—including state armed forces and UN sanctions inspectors—to cross-check potential sources of diverted ammunition more effectively.

## Conclusion

Ammunition tracing is an important tool for identifying sources of ammunition on the illicit market. While there is no single, agreed-upon method of tracing, initial studies suggest that tracing is a process that should draw on a number of triangulating approaches and not simply involve analysis of ammunition marks.

That said, comprehensive marking—particularly lot marking of small arms ammunition—would greatly facilitate tracing. Lot marking, in conjunction with improved accounting, offers states a means to detect diversion from national stockpiles and subsequently address security failings. In states where monitoring and oversight of personnel are often ineffective, lot marking could prove a valuable 'second source' of oversight.

There is currently growing international interest in ammunition tracing. A number of organizations, including the Small Arms Survey, are in the process of refining existing methods and piloting new approaches. There is also, however, a clear need for greater transparency on the part of states and security forces. Marking—and knowledge of marking practices—greatly facilitates ammunition tracing. At present, too few states make such information public. ■

## Notes

- 1 Ammunition may also be re-marked if repair or modification changes the nature of the ammunition in question.
- 2 Uganda and Brazil.

## Further reading

- Anders, Holger. 2006. 'Following the Lethal Trail: Identifying Sources of Illicit Ammunition.' In Stéphanie Pézard and Holger Anders, eds. *Targeting Ammunition: A Primer*. Geneva: Small Arms Survey, pp. 207–27.
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