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## Rogue Rocketeers

### Artillery Rockets and Armed Groups

*By Matt Schroeder*



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## List of abbreviations and acronyms

ATT	Arms Trade Treaty
DIO	Defence Industries Organization
EOD	Explosive ordnance disposal
GPS	Global positioning system
HE	High explosive
HEAT	High explosive anti-tank
HEI	High-explosive incendiary
IRAM	Improvised rocket-assisted munition
IED	Improvised explosive device
MANPADS	Man-portable air defence system
MOD	Ministry of Defence
RPG	rocket-propelled grenade (launcher)
UAV	Unmanned aerial vehicle
UNROCA	UN Register of Conventional Arms
USD	United States dollar



## About the author

Matt Schroeder is a senior researcher at the Small Arms Survey and the former director of the Arms Sales Monitoring Project at the Federation of American Scientists. Since 2002 he has researched and written on the arms trade, arms export controls, and the illicit proliferation of small arms and light weapons. He is the author of numerous publications, including *The MANPADS Threat and International Efforts to Address It: Ten Years after Mombasa* and *The Small Arms Trade*. He has written for *Arms Control Today*, *Defense News*, *Defense Technology International*, *Disarmament Forum*, *Foreign Policy*, *Jane's Intelligence Review*, and the *Small Arms Survey Yearbook*. He graduated from Wittenberg University with a Bachelor's degree in history and received a Master's degree in international security policy from Columbia University's School of International and Public Affairs.

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# Introduction

For decades, armed groups around the world have converted rockets intended for use with large, vehicle-mounted launchers into improvised light weapons. Indiscriminate and lethal, these weapons have killed and injured thousands of people in Afghanistan, Iraq, and elsewhere. Yet, despite the demonstrated threat posed by artillery rockets, they have received significantly less attention from policy-makers than conventional small arms and light weapons. The following Working Paper attempts to improve understanding of artillery rockets, their use as improvised light weapons by armed groups, and the threat that these weapons pose to military and civilian targets.

The main findings from this Working Paper include the following:

- Use of artillery rockets by armed groups is widespread. Groups in at least 12 countries have produced, acquired, and/or used artillery rockets against military and civilian targets in recent years.
- Armed groups in Iraq have acquired hundreds of Iranian artillery rockets. The Small Arms Survey has also documented the acquisition of Iranian rockets by armed groups in several other locations, including Afghanistan, Gaza, and Syria.
- Many of the key provisions of the Arms Trade Treaty (2013) do not explicitly apply to artillery rockets commonly used by armed groups.

The report is divided into four sections. The first section presents key terms and definitions. The second section provides an overview of the types and models, battlefield roles, and manufacturers of artillery rockets. The third section assesses the threat posed by poorly secured and illicit artillery rockets, including usage by armed groups in Afghanistan and Iraq. The publication concludes with a brief assessment of the Arms Trade Treaty as a tool for controlling the transfer of artillery rockets. 

# Terms and definitions

For the purposes of this report, the term ‘artillery rockets’ is used to refer to the following:

- factory-built ground-to-ground rockets and crew-portable variants of their launchers;
- improvised ground-to-ground rockets and launchers; and
- other rockets that are used—or converted for use—as direct- and indirect-fire, land-attack weapons by armed groups, including some air-to-ground rockets.

In keeping with Small Arms Survey practices, only those rockets or rocket systems that have a combined weight of less than 400 kg (882 lbs)<sup>1</sup> and are three metres long or less are considered ‘light weapons’. This definition captures several types of rockets and many of the craft-produced launchers used by armed groups, but it excludes most factory-built launchers, which can weigh several tonnes.

Some armed groups, including groups in the countries assessed below, have acquired and used larger rockets,<sup>2</sup> but data on seized arms caches suggest that smaller calibre models are most common. Thus, the main focus of this brief is on those rockets that fit the above definition of ‘light weapons’. Other types of light weapons, including rocket-propelled grenades, infantry rockets, and portable missiles, are not covered in this report.<sup>3</sup>

This Working Paper uses the Survey’s definition of ‘armed groups’, which refers to ‘armed organizations that challenge the state’s monopoly of legitimate coercive force. They include a variety of actors, including opposition and insurgent movements, pro-government militias, and community-based vigilante groups’ (Small Arms Survey, n.d.). 📄

## Types, manufacturers, and importers of artillery rockets

Artillery rockets vary significantly in size, range, roles, and technological sophistication. Some are truly man-portable, measuring a metre or less in length and weighing as little as 5 kg (Ness and Williams, 2011, pp. 779, 785). Other rockets can only be transported by vehicles and are launched from dedicated platforms. For example, the 9M55K rocket for the Soviet-designed Smerch Multiple Rocket System is 7.6 m long and weighs 800 kg (Ness and Williams, 2011, p. 810). Few armed groups acquire and use rockets of this size. The capabilities of artillery rockets are equally varied. The Ultra-short Range version of a naval rocket produced by the Italian firm Simmel Difesa has a maximum range of just 600 m (Ness and Williams, 2011, p. 784), whereas the GPS-guided Block 1A rocket fired from the US Army's Tactical Missile System can place a 227 kg warhead on targets located as far away as 300 km (Lockheed Martin Corporation, 2011; US Army, 2014).

Like mortars and other indirect-fire weapons, artillery rockets perform many different roles on the battlefield. Most are equipped with warheads designed for use against enemy personnel, structures, or vehicles. When fired in volleys, these weapons can quickly cover large areas with shrapnel, anti-personnel fletchettes, anti-vehicle shaped charges, or mines. Other rockets are designed to illuminate or mark potential targets, create smoke screens, or ignite fires. In recent years, weapons manufacturers have also developed rockets that play niche roles on the battlefield, including the deployment of electronic jammers, which disrupt radio communications, and chaff, which is used to thwart missile attacks and confuse enemy radar (Ness and Williams, 2011, pp. 782–87).

The technological sophistication of artillery rockets ranges from unguided variants of systems first developed in the 1940s to guided rockets that deliver smart (self-targeting) sub-munitions (Ness and Williams, 2011, pp. 787, 815). Some manufacturers of older systems offer upgrades for launchers and

advanced rockets for use with these systems. An example of the latter is the Russian company Splyav, which manufactures modern variants of the BM-21 Grad-series rockets, the first generation of which was fielded in the early 1960s. In recent years, producers of Grad-series rockets have introduced several enhanced-performance rockets, including models with extended ranges and smart sub-munitions (Ness and Williams, 2011, pp. 787–88; Splyav, n.d.).

Current and recent manufacturers of artillery rockets include companies in the following countries: Argentina, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, China, Croatia, the Czech Republic, Egypt, India, Iran, Iraq, Italy, North Korea, Norway, Pakistan, Poland, Romania, Russia, Spain, Serbia, Slovakia, South Africa, South Korea, Sudan, Taiwan, Turkey, and the United States.<sup>4</sup> Dozens of additional countries have imported multiple-launch rocket systems and other launchers that fire artillery rockets. According to the Institute for International and Strategic Studies, multiple-launch rocket systems are in the inventories of nearly 100 countries in every region of the world (IISS, 2010). Many of these systems fire the types of rockets commonly used by armed groups.

## Artillery rockets and armed groups: a brief overview

As noted above, artillery rockets have been in the arsenals of armed groups for decades. The Vietcong used Chinese 107 mm, Soviet 122 mm, and Soviet 140 mm rockets against a wide array of military and civilian targets. As revealed in captured training documents, the primary targets for 107 mm rockets were ‘objectives having a large area, usually 400 x 400 m, such as enemy strongholds, airfields, storage points or towns’. Artillery rockets were also used against civilian targets, including bridges, ports, and urban areas (US MACV, 1969, p. 12).

A declassified report on the US military’s efforts to defend the Da Nang Air Base illustrates the threat posed by artillery rockets, particularly early in the conflict. Rockets are described as ‘[t]he enemy’s most effective weapon’ against the base, which was subject to repeated attacks by Vietcong rocket units. In the twelve-month period from February 1967 to February 1968, the guerrillas launched 297 rockets at the base, killing 57 people and wounding 488.

Damage from these attacks was estimated at USD 110 million, or an average of USD 370,000 per rocket (Thorndale, 1969, p. 13).

In the 1980s, Afghan rebels fired hundreds of 107 mm and 122 mm rockets at Soviet and Afghan government military compounds, killing dozens of troops, disrupting transport routes, and destroying aircraft, ammunition, fuel, and other supplies worth millions of dollars. Rockets were used in some of the most costly rebel attacks of the war. In August 1986, a barrage of Chinese-made 107 mm rockets triggered a chain reaction of explosions that razed the massive Afghan Army weapons depot near Kabul. The depot, which was one of the largest in Afghanistan at the time, reportedly held 40,000 tonnes of weapons and ammunition (Bearden and Risen, 2003, pp. 221–22; Renfrew, 1986). Two years later, a similar rocket attack destroyed the Soviet base in Kalagay. The explosions caused by the rockets killed at least 100 soldiers and destroyed eight helicopters (Biers, 1988). Media reports described the attack as ‘... probably the worst single loss suffered by Soviet forces in Afghanistan’ (Bone, 1988).

Recent examples include—but are not limited to—the acquisition and use of artillery rockets by armed groups in Afghanistan, Egypt, Gaza, Iraq, Jordan, Lebanon, Libya, Mali, Pakistan, Sri Lanka, Sudan, and Syria.<sup>5</sup>

## Employment of artillery rockets by armed groups in Afghanistan and Iraq

Among the most prodigious non-state consumers of artillery rockets in recent years are armed groups in Afghanistan and Iraq, which use the rockets as

- indirect-fire weapons for attacking bases, airports, and other large, stationary targets;
- direct-fire weapons for attacking personnel, ground vehicles, and aircraft; and
- components for improvised explosive devices (IEDs).<sup>6</sup>

This section provides an overview of the types, capabilities, and sources of artillery rockets and launchers used by armed groups in Afghanistan and Iraq. It is based on an assessment of dozens of government reports

on weapons seizures and rocket attacks, many of which were released in response to Freedom of Information requests from the Small Arms Survey. The reports reveal the extent to which artillery rockets have proliferated in Afghanistan and Iraq, and the ability of armed groups to employ these and other weapons in innovative and often unanticipated ways.

## Types of artillery rockets employed by armed groups in Afghanistan and Iraq

Data compiled by Small Arms Survey on arms caches captured by Afghan, Iraqi, and US authorities include references to a wide array of rockets and launchers.<sup>7</sup> Rockets seized from armed groups range from 57 mm air-to-ground rockets designed for use on aircraft to 240 mm Falagh-1 rockets capable of delivering a 50 kg warhead to targets 10 km away (DIO, n.d.). The rockets most commonly found in the caches were 57 mm, 107 mm, and 122 mm calibre models, most of which were of Chinese, Iranian, and Russian (or Soviet) origin. In Iraq, 57 mm rockets were seized at a higher rate than 107 mm and 122 mm rockets, but none of these calibres accounted for more than 40 per cent of the rockets identified by type or calibre. In Afghanistan, the vast majority appear to be 107 mm rockets; more than 1,200 rockets of this calibre are identified among the seized weapons studied, as opposed to just eighty-nine 122 mm rockets and fifteen 57 mm rockets.<sup>8</sup>

Most of the 57 mm rockets seized in Afghanistan and Iraq appear to be variants of the Soviet-designed S-5 series of air-to-ground munitions. First produced in the 1950s, the S-5 was designed for use with rocket pods mounted on aircraft. They are the smallest of the three most frequently encountered rockets, measuring approximately one metre in length and weighing around 4 kg (US JCAT, 2011, p. 53). By comparison, most shoulder-fired anti-aircraft missiles—which are specifically designed to be carried and used by dismounted infantry—are nearly twice as long and three times as heavy. S-5 series rockets are fitted with a variety of warheads, including HE (high explosive) fragmentation, HEAT (high explosive anti-tank), chaff, fletchettes, and illumination (Friedman, 1997, pp. 262–63). According to the US Army,



most of the rockets used by armed groups in Iraq had HE fragmentation warheads (NGIC 2004a, pp. 4–24). While the maximum range against ground targets is two kilometres, the US Army estimates that the practical range of the rockets is 100–400 m, depending on whether a sighting device is used (DCSINT, n.d.).

Armed groups in Afghanistan and Iraq found several uses for S-5 rockets. They launched them from improvised artillery tubes (indirect fire),<sup>9</sup> converted them into IEDs,<sup>10</sup> and fired them from improvised (direct-fire) man-portable launchers. The man-portable systems, which are often referred to as improvised rocket-propelled grenades, usually consisted of one to four barrels attached to wooden or metal handles, and a push-button ignition switch attached to a nine-volt battery. To improve accuracy, some launchers were equipped with an iron post or the optical sight of an RPG-7 rocket-propelled grenade launcher (DCSINT, n.d.; NGIC, 2004b). Photographs of launchers seized in Iraq suggest that most were shoulder-fired (see Images 1a–c).



Images 1a, 1b, and 1c: Shoulder-fired S-5 rocket launchers

© DCSINT

Armed groups experimented with other configurations of 57 mm rocket launchers, the most novel of which is a four-barrelled system recovered in Fallujah. The launch tubes, which at first glance appear to be mounted on the operator's head, are attached to a rectangular metal frame that rests on the shoulders of the operator. The rockets are launched via initiator switches built into two handgrips protruding from the front of the metal frame (see Image 2). A plexiglass blast shield protects the operator from heat and ash emitted by the rockets, which 'degrade[s] firer accuracy' (NGIC, 2004b; DC-SINT, n.d.). Unwieldy and potentially perilous to operate, it is unlikely that this particular design was widely used in Iraq. Nonetheless, the launcher reveals a tendency by armed groups to fully utilize the weapons, ammunition, and other matériel available to them, often in innovative ways.



Image 2: Four-barrel S-5 rocket launcher seized in Iraq © DCSINT

Use of S-5 series rockets as improvised rocket-propelled grenades is not unique to Iraq. According to the US Army, armed groups in the Caucasus region fielded the first successful shoulder-fired S-5 launchers, which are described as a 'welded design with good durability' (DCSINT, n.d.). Anti-government forces in Libya also constructed shoulder-fired launchers for S-5 rockets, including from launch tubes for SA-7 man-portable air defence systems (Chivers, 2011d; Image 3).



Image 3: MANPADS launch tube, converted for use as an improvised rocket launcher in Libya, 2011

© orac22, 2011

Armed groups in Afghanistan and Iraq have also acquired and used hundreds of 107 mm rockets, mainly Chinese-designed Type 63-series rockets and foreign variants.<sup>11</sup> The Type 63 rocket was developed in the 1950s by Chinese arms producers, primarily for use with truck- and trailer-mounted 12-tube launchers (Foss, 2011, p. 1050). Only two versions of the original Type 63 rocket were produced: a high-explosive version and an incendiary version. Since then, Chinese manufacturers have fielded an HE fragmentation round, a cargo round, and a round that deploys an electronic jammer (Ness and Williams, 2011, p. 785). Reports on rocket attacks in Afghanistan include at least one reference to the use of a white phosphorus round against a US military vehicle (Estrada, 2012). Type 63-series rockets and foreign variants weigh approximately 18–19 kg and are approximately one metre long. They have a maximum range of between 7,800 and 11,000 m, depending on the make, model, and version. Warheads for Type 63-series rockets, which weigh between 6 and 8 kg, are significantly larger than most of the other light weapons used by armed groups (Ness and Williams, 2011, pp. 785–86).

In addition to the towed and truck-mounted 12-tube launchers mentioned above, arms producers in China have fielded a single-barrel, tripod-mounted launcher, the Type 85. Additional single- and multi-barrelled launchers have been developed by other countries (Foss, 2011, pp. 1050–51, 1072). Type 63

rockets can also be fired without a launcher, a characteristic that makes them ‘uniquely suited for guerrilla warfare’, observes former Navy EOD Officer John Ismay (Ismay, 2013). Deploying the rocket without a launcher reduces the size and weight of the weapon, making it easier to conceal and transport, but also reducing the rocket’s accuracy (Ness and Williams, 2011, p. 785). The loss of precision is often of little consequence when the target is a town or large military base and the purpose of the attack is to terrorize or disrupt operations.

Artillery rockets of 122 mm are also popular among armed groups in Iraq and, to a lesser extent, Afghanistan. The best-known and most widely proliferated 122 mm artillery rockets are Grad-series models, which were first fielded in the early 1960s. Grad-series rockets are significantly larger than 107 mm rockets, weighing between 45 and 77.5 kg and measuring between 1.9 and 3.3 m in length (Ness and Williams, 2011, pp. 787–90; Splav, n.d.). Consequently, many models are more difficult to conceal, transport, and surreptitiously launch than other artillery rockets used by armed groups.

The widespread use of Grad-series rockets by armed groups despite their size is explained, in part, by their long range and large payload. The 9M22U version, which is identified in accounts of weapons seized in Iraq, has an 18.4 kg warhead—more than twice the size of the warhead carried by Type 63-II 107 mm rockets. The lethal radius of 9M22U is 28 m compared with just 12.5 m for the Type 63-II, and the 9M22U rocket’s maximum range of more than 20 km is more than twice the range of the Type 63-II rocket (Ness and Williams, 2011, pp. 785, 787). Recent improvements to the Grad series have increased their range and lethality. Enhanced-range 9M522 rockets can deliver a larger (25 kg) HE fragmentation warhead to targets located up to 37 km away (Ness and Williams, 2011, p. 787–88; Splav, n.d.).

Armed groups in Afghanistan and Iraq have acquired several other types and calibres of artillery rocket, including 240 mm rockets and improvised rocket-assisted munitions (IRAMs). While rare in comparison with their 107 mm and 122 mm counterparts, 240 mm rockets are occasionally used by—or seized from—Iraqi armed groups. Reports of 240 mm rockets in Iraq include the seizure of four rockets and rail launchers from an insurgent safe house in 2007 (25<sup>th</sup> Infantry Division, 2007b), and the recovery of nine recently manufactured rockets from a cache in the Samra Jungle a year later (CJTF

Troy, 2008; Image 18). In 2008, coalition forces fired Hellfire missiles at insurgents setting up a 240 mm rocket for an attack in Baghdad. The US military later posted a video of the engagement online (MND-B, 2008j; Images 4a–c).<sup>12</sup>



Images 4a, 4b, and 4c: Images of aerial weapons team engaging armed group rocket team, Sadr City District, Iraq, 2008

© MND-B, 2008

During the period studied, most 107 mm and 122 mm rockets were employed as indirect-fire weapons, and were fired from a wide variety of launchers. While some were factory-built, such as a Type 85 launcher recovered in Afghanistan in 2011, most were made by local craftsmen. Craft-produced launchers range from crude wooden rails that require little skill to construct, to elaborate multi-tube systems incorporated into the chassis of trucks and other vehicles. Many of the launchers seized in Iraq were the types commonly referred to as ‘rocket rails’: simple improvised launchers usually consisting of a v-shaped or rectangular metal rail fastened to a wooden or metal frame. Tubes are occasionally used instead of—or in conjunction with—rails. Rocket rails vary significantly in size and design. Some are small and portable—easily transported by a single individual. Others are large, semi-fixed platforms with welded frames that appear to be difficult to disassemble and transport (see Images 5a–5b).

Armed groups also use these rockets as components for IEDs<sup>13</sup> and improvised rocket-assisted munitions (IRAMs). IRAMs, which are often referred to as ‘flying IEDs’, are improvised rockets in which the warhead of a conventional (factory-built) artillery rocket is replaced with a metal canister (e.g. oxygen or acetylene tank) that is filled with explosives. The canisters are larger than conventional warheads and can hold more explosives. Photographs of IRAMs recovered in Iraq reveal that at least some were constructed from 107 mm rockets of Iranian origin (Roggio, 2008).<sup>14</sup> IRAMs are fired from fixed and vehicle-mounted launchers, including cargo trucks rigged with multiple launchers (Roggio, 2008; Ismay, 2012). Usage of IRAMs in Iraq was reportedly limited to a small number of Iranian-backed Shia groups, with Kata’ib Hizballah accounting for most IRAM attacks (Ismay, 2012).<sup>15</sup>



© Sgt. Frank Vaughn/DVIDS, 2009



Images 5a and 5b:  
Rocket rails seized  
in Iraq, 2009

© Courtesy photo/DVIDS, 2009

Accounts of seized rocket launchers also shed light on the components used in their construction, the origins of these components, and the methods used to smuggle them into Iraq. In August 2009, Iraqi authorities raided a warehouse in northern Maysan province that had been converted into a factory for assembling rocket launchers. Inside the warehouse they found eight complete rail launchers for 107 mm, 122 mm, and 240 mm rockets, along with various components, including more than 1,700 car jacks. The jacks are used to adjust the angle of the launch rail (US CENTCOM, 2011b).<sup>16</sup> Images of other launchers seized in Iraq suggest that the use of car jacks in this capacity was widespread in Iraq,<sup>17</sup> and reports from Afghanistan reveal similar use of jacks by armed groups in that country (Chivers, 2011c; Australian War Memorial, n.d.; Images 6a–6b).



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Images 6a and 6b: **Improvised launchers** recovered in Afghanistan (c. 2005) and Iraq (2007)



© Ben Hutto/DVIDS, 2007

Items recovered from the warehouse in Maysan also provide clues to the origin of launcher components and the means by which they were smuggled into Iraq. According to a US military spokesman, ‘much of the equipment potentially was smuggled in fruit boxes across Iraq[’s] south-eastern border’ (Caggins, 2009). Photographs of the jacks confirm that many were packed in cardboard boxes for bananas (see Images 7a–7b).



Images 7a and 7b: Car jacks seized from an improvised rocket-launcher factory in Maysan, Iraq, 2009

© US CENTCOM

A US military report on the rocket-launcher factory indicates that the jacks were made in Iran (US CENTCOM, 2011b). Assessing this claim is difficult because labels on the jacks are not visible in the redacted version of the report obtained by the Survey. However, packing materials in the fruit boxes feature a company logo similar to the one found on a car jack used in



© US CENTCOM



© Sgt. Ben Brody/DVIDS, 2008

Images 8a, 8b, and 8c: Car jacks used in the construction of improvised rocket launchers, Iraq, 2008–09



the construction of a rocket launcher that was recovered in early 2008 (see Images 8a–c). The words ‘made in Iran’ are printed on the label (Brody, 2008).

While reports from Afghanistan and Iraq suggest that free-standing rocket rails and shoulder-fired launchers were most frequently used, Iraqi groups also converted a variety of civilian vehicles into stealthy, mobile launch platforms. In 2008, US troops seized a van used to fire 57 mm rockets. Inside US soldiers reportedly found improvised launch tubes, three Russian S5M rockets, and a ‘timer initiated device’. The insurgents had installed a sliding window in the van that ‘allowed the rockets to be fired from the vehicle without having to open the doors’. Rockets had already been fired from the van, as evidenced by ‘scorch marks on the interior’, according to a US military report on the seizure (US CENTCOM, 2011a). US and Iraqi forces have also seized a motorcycle, a cargo truck, and an ice-cream truck rigged to fire artillery rockets of various calibres (Goemaere, 2005; Roggio, 2008; Mohammed, 2009).

What explains the widespread use of artillery rockets in Afghanistan and Iraq? One likely reason is the availability of the rockets, thousands of which were looted from Iraqi government arms caches after the fall of the Baathist regime in 2003. Accounts of caches seized early in the war reveal the extent of this proliferation. While tracking insurgents through the streets of Baghdad in October 2003, US troops found two trucks containing nearly 1,550 rockets, at least 800 of which were 57 mm in calibre.<sup>18</sup> A month later, members of Task Force Iron Horse—one of several US military units operating in Iraq—seized more than four hundred and fifty 57 mm rockets in a single day (Banusiewicz, 2003). Coalition and Iraqi forces continued to seize large caches of 57 mm, 107 mm, and 122 mm rockets over the next five years.<sup>19</sup> In 2008, for example, authorities seized two hundred and sixty-nine 122 mm rockets from a cache near Abu Ghuraib.<sup>20</sup>

Comparably large stockpiles of rockets have also been recovered from armed groups in Afghanistan. Among the largest are a cache containing three hundred 107 mm rockets seized near the town of Kelat in 2003, and another containing 800 rockets of the same calibre recovered in 2008 (Federal News Service, 2003; US ARCENT, 2011). These seizures are in addition to dozens of smaller but still substantial rocket caches recovered by coalition forces since 2002.

Artillery rockets also have certain performance advantages over other light weapons. When used as improvised rocket-propelled grenades, 'air-to-surface rocket velocities are at least a factor greater than that of an RPG', according to a US military report. The greater velocity 'provides a flatter trajectory, decreased time-of-flight to a target, greater standoff capability, and a simplified aiming solution' (NGIC, 2004b, p. 1). Similarly, artillery rockets have advantages over conventional light weapons when used in an indirect-fire role. A comparison with 120 mm mortar systems, which are the largest indirect-fire weapons categorized as 'light weapons' and are closest to artillery rockets in terms of range and explosive payload, illustrates these advantages. Grad-series rockets have explosive payloads that are twice as large as most 120 mm mortars. Furthermore, the rocket can deliver the larger warhead to targets located 20,000 m away—more than twice the range of most 120 mm mortars.

The ranges of Type 63-style rockets are comparable to 120 mm mortars while their warheads are slightly smaller. Their main advantage over 120 mm mortars is their portability. Because the rockets do not require a conventional launcher, they are significantly lighter and less bulky than 120 mm mortar systems. As noted above, Type 63-style rockets weigh just 18 kg and are less than one metre long. Use of an improvised rocket rail increases the size and weight of the weapon, but often only marginally, depending on the launcher. In contrast, 120 mm mortar systems often weigh 200 kg or more.

Avoiding counter-battery fire<sup>21</sup> through time-delayed launch is another key advantage of Type 63-style rockets. Since the rockets are electronically initiated, their launch can be delayed by the use of a simple battery-powered clock.<sup>22</sup> US troops can respond in minutes to a rocket attack but, if the rocket is connected to a timer, the insurgents are long gone by the time the launcher is located (Wasserbly, 2009). ■

## Sources of artillery rockets: Iran's growing footprint

Armed groups in Afghanistan and Iraq acquire artillery rockets from both domestic and foreign sources. Before it was overthrown in 2003, the Baathist regime in Iraq stockpiled tens of thousands of 122 mm artillery rockets (Lederer, 2003) and was a known producer of 107 mm rockets. Many were looted from government depots in 2003 and subsequently acquired by armed groups (IHS Jane's, 2005a; 2006b). Whether the looted rockets account for the majority of insurgent stocks during the period studied is difficult to determine, however. Generating even a rough ratio of rockets sourced domestically<sup>23</sup> to those smuggled into the country is currently impossible given the limitations of publicly available data.<sup>24</sup>

The one sub-category of seized artillery rockets on which detailed data is available are those identified as Iranian.<sup>25</sup> The type of Iranian rocket most frequently identified is the Fadjr-1, a 107 mm rocket that is similar to the widely exported Chinese Type 63 model (Ness and Williams, 2011, p. 785). The large numbers of seized Fadjr-1s, many of which were recently manufactured, highlight the extent to which Iranian munitions have proliferated among armed groups, and the speed with which these weapons enter the black market.

An undated brochure published by the Iranian Defense Industries Organization describes the Fadjr-1 as a 107 mm spin-stabilized rocket 'designed and produced to destroy [the] enemy's offensive forces and hidden forces in trenches'<sup>26</sup> The rocket is 838 mm long, weighs 18 kg, and has a maximum range of more than 8 km. It is marketed for use with single- and dual- round tripod-mounted launchers, 12-round towed and vehicle-mounted launchers, and a 12-round naval system (Foss, 2011, p. 1072).

During Operation Iraqi Freedom, coalition forces seized hundreds of 107 mm rockets from arms caches, many of which were identified as Iranian.<sup>27</sup> Accounts of weapons recovered by US and Iraqi authorities include

references to more than 400 Iranian 107 mm rockets. Of the 127 rockets for which photographs or video footage are available, more than half are nearly identical in appearance: tan with black rings around the base and centre. The markings on the rockets are in the same font, are approximately the same size, are located in the same place on the rocket casing, and include the same information: the calibre, lot number, date, and weight. Several of the remaining rockets are nearly identical except that they are green instead of tan. Data on these rockets is summarized in Table 1.

**Table 1: 107 mm rockets identified as Iranian and recovered in Iraq, July 2007–May 2009**

Seizure date	Location*	Description*	Manufacture date	Quantity
12.07.07	Besmaya Range Complex	Iranian 107 mm rockets	At least some 2006	35
23.10.07	Forward Operating Base Hammer	107 mm rocket 'manufactured in Iran'	2006	1
26.10.07	Al Hillah	Iranian 107 mm rockets	2006 (4 rockets), 1995 (23 rockets)	27
27.10.07	Outside of Patrol Base Assassin	Iranian 107 mm rockets	2005	4
4.12.07	Iraq (unspecified)	107 mm Iranian rockets	2006	14
12.01.08	Baghdad area	107 mm Iranian rocket (HASEB)	*	1
15.01.08	Baghdad area	Iranian 107 mm rockets	*	10
29.01.08	Central region	107 mm Iranian rocket	*	1
29.01.08	Central region	Iranian 107 mm rocket	*	1
13.02.08	Unspecified	107 mm Iranian-made rocket	*	1
15.02.08	Baghdad area	107 mm Iranian rocket	*	1

**Table 1: 107 mm rockets identified as Iranian and recovered in Iraq, July 2007–May 2009**

Seizure date	Location*	Description*	Manufacture date	Quantity
16.02.08	Baghdad area	107 mm rockets (Iranian, model unknown)	*	36
19.02.08	Baghdad area	107 mm Iranian rocket	*	1
19.02.08	Central region	Iranian 107 mm rocket	*	10
23.02.08	Central region	Iranian 107 mm HASEB rockets	*	2
27.02.08	Central region	Iranian 107 mm rocket	2006	1
08.03.08	Central region	107 mm Iranian rockets	*	4
18.03.08	Central region	Iranian 107 mm rockets	*	7
18.03.08	Baghdad area	107 mm rockets Iranian	*	29
22.03.08	Central region	Iranian 107 mm rocket	*	15
26.03.08	Central region	Iranian rocket 107 mm	*	1
29–30.03.08	Al Qasim and Hashmiyah	107 mm rockets	2006 (at least 2 rockets)	3 <sup>a</sup>
02.04.08	Central region	Iranian rockets 107 mm HE model unknown	*	3
02.04.08	Al Qasim	Katusha 107 mm rockets and stands <sup>b</sup>	*	45
05.04.08	Baghdad area	Iranian 107 mm rocket	*	4
12.04.08	Central region	Iranian 107 mm rockets	*	2
14.04.08	West Rashid	107 mm rockets	2006 (at least 2 rockets)	4 <sup>c</sup>

**Table 1: 107 mm rockets identified as Iranian and recovered in Iraq, July 2007–May 2009**

Seizure date	Location*	Description*	Manufacture date	Quantity
17.04.08	Central region	107 mm Iranian HASEB	*	2
20.04.08	Baghdad area	107 mm Iranian HE rocket	*	1
22.04.08	Baghdad, Rashid district	107 mm Iranian rockets	*	4
28.04.08	Baghdad area	Iranian 107 mm rockets	*	7
30.04.08	Central region	Iranian rocket 107 mm HE HASEB-1	*	1
01.05.08	Baghdad area	107 mm rocket	*	1
02.05.08	Warij	Brand-new 107 mm rocket	2007	1
05.05.08	South-east region	Iranian 107 mm rocket	*	3
07.05.08	Baghdad area	Iranian rocket, 107 mm, ground-to-ground, HE, HASEB	*	2
11.05.08	Central region	107 mm Iranian HESAB rocket	*	2
18.05.08	Baghdad area	107 mm Iranian rocket	*	1
19.05.08	Baghdad, West Rashid	107 mm Iranian rockets	*	3
24.05.08	Baghdad, Rashid	Iranian 107 mm rocket	*	1
23.05.08	Baghdad area	107 mm rockets	*	5
09.07.08	Baghdad	107 mm rockets	*	2
15.07.08	Baghdad, Rashid district	Iranian-manufactured 107 mm rockets	*	45
29.07.08	Baghdad, East Rashid	Iranian-manufactured 107 mm rockets	*	8

04.08.08	Baghdad, Sadr City	107 mm Iranian rockets	2008	28
04.08.08	North of Baghdad	Iranian-made 107 mm rockets	*	2
18.09.08	Sadr City	Iranian HASAB rocket	*	14
28.10.08	Sadr City	107 mm rockets	*	At least 7
29.12.08	Adhamiyah	107 mm HE rocket	2006	1
16.05.09	Baghdad	Rocket	*	At least 1
13.06.09	Nasiriyah	Rocket	*	At least 5

Note: \* As identified by the source.

- a There were two additional 107 mm rockets the provenance of which is unclear.
- b The US military noted that '[t]he rockets are believed to have been manufactured in Iran' (3rd ID Public Affairs, 2008b).
- c Five additional rockets were seized. The rockets were green with markings that were different from the Iranian rockets.

Source: Small Arms Survey (2014)

In 2009, Afghan authorities seized 107 mm rockets from Taliban members that were similar in appearance to those found in Iraq. The Associated Press published a photograph of the distinctive tan-coloured rockets, at least one of which has markings with the same font style, size, colour, and placement as those seen on the rockets seized from Iraqi armed groups (see Image 13e).



Image 9: Artillery rockets recovered in Iraq, 2007

© Courtesy photo/DVIDS, 2007

The US government has repeatedly identified Iran as the source of the rockets and other weapons, citing—among other evidence—interviews with detainees, interdiction of weapons shipments, and Iranian markings on weapons recovered from caches (US MNF-I, 2007). Most officials are careful not to draw a direct link between the weapons and the Iranian leadership, however. In response to queries about the origins of a recently intercepted shipment of Iranian weapons, US Army General Dan McNeill offered the following clarification: ‘[w]e didn’t say that we could prove they were coming from the Iranian government’, but ‘I do not believe [the shipment] could have originated and come here without the knowledge of the Iranian military’ (Anderson, 2007).

Iranian government officials have denied these accusations, dismissing them as ‘ridiculous and repeated lies of the Americans [aimed] at justifying their own errors’ (Ghasemilee, 2011). When asked about the origins of weapons, the officials have neither confirmed nor denied that the weapons were made in Iran.<sup>28</sup>

While data limitations preclude a definitive assessment of the Iranian government’s role in delivering the weapons, there is mounting evidence that many of the seized 107 mm rockets are indeed Iranian, and that armed groups have acquired large quantities of these rockets. An undated brochure published by the Defense Industries Organization (DIO), an Iranian arms manufacturer, includes photos of a 107 mm rocket identified as the ‘FADJR-1’ that is very similar in appearance to those seized in Afghanistan and Iraq, the only notable differences being the colour and the direction of the markings. A weapons identification guide published by the British Ministry of Defence in 2010 also identifies rockets that are similar in appearance as Iranian. The entry on the ‘FADJR-1’ includes a photograph of a tan-coloured rocket that is nearly identical to the rockets seized in Afghanistan and Iraq (UK MOD, 2010, p. 39; Images 10 and 11).

The Iranian government itself inadvertently corroborated claims about the provenance of these weapons after a shipment containing similar rockets was seized in Nigeria in 2010. The Nigerian government reported the seized shipment to the UN Security Council, indicating that it consisted of ‘13 containers of cargo originating from Iran which were suspected of containing






<b>Name:</b>	<b>Type-63, FADJR-I</b>
<b>Country of Origin:</b>	China, Iran
<b>Calibre:</b>	107mm
<b>Range:</b>	8.5 - 10km
<b>Rocket Weight:</b>	18.84kg
<b>Remarks:</b>	[REDACTED]
Chinese Type 63-11	
Iranian Fadjr I	
	

Image 10: Description of the Fadjr-1 rocket in UK MOD weapons identification guide

© UK MOD

www.diomil.it
FADJR 1 ROCKET
107 mm SPIN STABILIZED

**General Specifications:**

107 mm Fadjr 1 rocket has been designed and produced to destroy enemy's offensive forces and hidden forces in trenches. It can also be used to target artillery batteries fires and destroy platoons of tanks, armored vehicles and technical equipments. This rocket is capable to strike ground equipment, command posts and ordnance depots.

**Technical Specifications:**

Maximum range in sea level	8.3 km
Fragmentation radius	100 m
Maximum speed	375 m/s
Average time of the motor operation	0.6 s
Rocket length	838 mm
Rocket caliber	107 mm
Rocket weight	18 kg
Warhead weight	7.9 kg
Quantity per box	Two rounds
Type of warhead	High explosive
Type of propellant	Double base
Warehousing	15 years



Image 11: Description of the Fadjr 1 rocket in a Defence Industry Organization brochure

© DIO

materials prohibited under Security Council resolution 1747 (2007)' (Ogwu, 2011, p. 3). Photos of the interdicted shipment reveal the presence of tan-colored 107 mm rockets similar in appearance to those seized in Afghanistan and Iraq. In early 2011, Iran's ambassador to Nigeria confirmed that the weapons were from Iran. According to the ambassador, the shipment was one of three consignments of weapons delivered pursuant to an arms sales agreement between Iran and Gambia.<sup>29</sup>

Fadjr-1 rockets have been spotted in—or seized en route to—several other current and recent conflict zones. In 2009, the Israeli navy seized a massive shipment of weapons from the MV *Francop*, an Antiguan-flagged merchant ship reportedly bound for Beirut. The ship, which was 160 km off the coast of Israel when it was stopped, contained 500 tonnes of weapons, including 2,124 'Haseb' (Fadjr-1) artillery rockets. According to the Israeli government, the weapons were intended for Lebanese Hezbollah (Israel MFA, 2009a; 2009b). The 107 mm rockets found on the *Francop* were similar to the rockets recovered in Afghanistan, Iraq, and Nigeria except for a red band around the centre and their weight, which was 1.25 kg heavier than the rockets seized in other countries. The red band may indicate that the rockets were high-explosive incendiary (HEI) rounds.

In 2012, the Associated Press published a photograph of what appears to be remnants of a Fadjr-1 that hit southern Israel in October. The rocket was one of 60 mortars and rockets fired from Gaza that morning. Markings on the rocket fragment, which are consistent with the tan-coloured 107 mm rockets found elsewhere, indicate that it was manufactured in 2008 (see Image 13d). That year, similar rockets began to appear in Syria. A video posted on YouTube in October 2012 features what appears to be an unexploded IRAM made from a 107 mm rocket and markings on the rocket indicate that it was manufactured in 2010 (Aldoumany, 2012). While the font of the markings is different from that of Fadjr-1 rockets found elsewhere, the placement and content of the markings are similar. Additional images of IRAMs constructed from tan-coloured 107 mm rockets were acquired by analyst Eliot Higgins, who posted them on his website in 2013. The colour and markings are consistent with Fadjr-1 rockets seen elsewhere (Higgins, 2013).



Images 12a and 12b: Unexploded 107 mm rocket found in Syria, 2013

© Aqraba Coordination Damascus, 2013



© Spc. Ben Hutto/DVIDS, 2007



© Fridoon Pouyaa/Associated Press, 2009



© Israel MFA



© Pius Utomi Ekpei/AFP/Getty Image



© Ariel Schalit/Associated Press, 2012



© Brown Moses, 2013

Images 13a–f: Iranian 107 mm rockets recovered in various countries, 2007–2013

A month later, a video of an unexploded 107 mm rocket found in an alley was posted on YouTube. The markings, which are in the same font as the markings on the IRAM found in October 2012, indicate that the rocket was manufactured in 2012 (Aqraba Coordination Damascus, 2013; Images 12a–b).

Other types of artillery rockets found in Afghanistan and Iraq that were reportedly sourced from Iran include 122 mm rockets,<sup>30</sup> 240 mm Falagh-1 rockets,<sup>31</sup> and various IRAMs.<sup>32</sup> Among the best-documented of these seizures is a cache of nine 240 mm rockets recovered by coalition forces in September 2008. A summary of the cache obtained under the US Freedom of Information Act includes numerous photographs of the rockets, all of which have manufacture dates of 2006 or 2007 (see Image 14). According to the documents, the US military concluded that, '[d]ue to the shallow depth of holes' in which the rockets were found, 'the area was for short term storage and transit for further distribution' (CJTF Troy, 2008).



Image 14: Rockets seized in Iraq that were identified as Iranian Falaq-1, 2008

© US Central Command

These seizures highlight the prevalence of Iranian-made weapons among armed groups in the Middle East and elsewhere. In addition to rockets, coalition forces serving in Iraq in 2008 and 2009 recovered hundreds of other Iranian light weapons and rounds of light weapons ammunition, including hand grenades, mortar rounds, and rocket-propelled grenades, along with hundreds of pounds of C-4 explosives and thousands of rounds of small arms ammunition (US CENTCOM, 2011a; Schroeder and King, 2012). Proliferation of Iranian-made weapons extends beyond Iran's neighbours. Field research recently conducted by Conflict Armament Research yielded evidence of Iranian

arms and ammunition in the possession of non-state entities in Côte d'Ivoire, Kenya, Niger, South Sudan, Sudan, and Uganda. These entities include 'foreign-backed insurgents, rebel forces, Islamist-oriented armed groups and warring civilian communities' (Conflict Armament Research, 2012, pp. 20, 37). Markings on the small calibre ammunition catalogued by researchers indicate that most rounds were manufactured in the past decade. In at least two cases, the weapons and ammunition were supplied in contravention of UN arms embargoes (Conflict Armament Research, 2012, pp. 18, 21).

Despite this research, the Iranian government's role in most of the above-mentioned transfers remains unclear. Publicly available documentation of the weapons is often limited to a few photographs and a brief description of the cache from which they were recovered. In only a few cases is documentation linking the weapons directly to Iranian shippers or suppliers made available to the public. A rare example is the arms shipment recovered from the Francop (Israel MFA, 2009a; 2009b). Even in this case, the extent and nature of the Iranian government's involvement in the shipment is unclear.

Nonetheless, the large quantity of seized rockets, tightly clustered lot numbers, and recent manufacture dates point to systematic exploitation of Iranian weapons stocks by armed groups in Iraq and their suppliers. As noted above, more than four hundred 107 mm Iranian rockets were identified in summaries of arms caches seized in Iraq in 2007–09. Of the rockets for which the lot number or manufacture date were available, most were manufactured in 2006 or 2007, and many had the same lot numbers (see Table 1).

It is highly unlikely that so many rockets could be diverted from government stockpiles over so short a time period without the knowledge of depot managers. Whether the managers were following orders or pursuing their own agendas is difficult to discern. Given the type and quantity of recovered weapons, it is likely that arms shipments to Iraq received at least tacit approval from Iranian military authorities. If, however, depot managers were not simply executing orders, the large-scale diversion of rockets and other weapons is indicative of a systemic failure in the Iranian military's physical security and stockpile management practices. Either way, the Iranian government is culpable for the acquisition and use of these weapons by armed groups in Iraq and elsewhere. 🇮🇷

## Use of artillery rockets by armed groups in Iraq and Afghanistan

Armed groups in Afghanistan and Iraq have used artillery rockets against a wide array of targets. Iraqi insurgents armed with 57 mm rockets have ‘claim[ed] hits against aircraft, vehicles and personnel’ (DCSINT, n.d.). Other targets of artillery rockets include military bases and airfields,<sup>33</sup> hotels (Xinhua, 2003), international organizations (AFP, 2005), and the civilian infrastructure (CJTF-82, 2007; AP, 2004). In 2012, an Afghan armed group hit the C-17 aircraft used by the Chairman of the US Joint Chiefs of Staff with a rocket (Kurtz, 2012; Taylor, 2011).<sup>34</sup> There are also numerous accounts of rockets landing in residential areas, damaging houses, mosques, and schools, and killing and injuring civilians (MND-B, 2008c; 3<sup>rd</sup> ID Public Affairs, 2008a). Some were errant or poorly aimed rockets fired at military bases.<sup>35</sup> In other cases, armed groups appear to have deliberately targeted civilians.<sup>36</sup>

Rocket teams in Afghanistan and Iraq have demonstrated various levels of sophistication. For inexperienced or careless teams, rocket attacks can be more perilous to them than to their targets. In the battle for Sadr City, US troops used sensors to detect launching rockets, locate the launch team, and ‘watch the rail’ (i.e. monitor movement of the launcher). When the launch teams left the attack sites to resupply or liaise with commanders, US forces would strike, destroying supply points and command locations, and killing the rocket teams and higher level operatives (Johnson, Markel, and Shannon, 2011, p. 16). In both Afghanistan and Iraq, many of the ill-fated rocket teams were spotted with unmanned aerial vehicles (UAVs), which tracked their movements and either fired a missile at them (if the UAV was armed) or handed off the target to an aerial weapons team.<sup>37</sup> Members of armed groups were also killed and injured by their own rockets. Shortly after an attack with a 107 mm rocket in 2008, US soldiers observed ‘militants aiding two cohorts who appeared to be



Image 15: Insurgents firing artillery rockets in Iraq, 2007

© Sgt. Natalie Loucks/DVIDS, 2007

severely injured from a round that apparently exploded while they attempted to launch a third rocket' (MND-B, 2008i). Accidental explosions of artillery rockets also pose a threat to civilians. In 2008, a rocket loaded into a truck-mounted IRAM launcher detonated prematurely, hurling four of the remaining rockets hundreds of metres. The rockets killed two insurgents and 16 civilians, injured 29 civilians, and damaged 15 buildings (Roggio, 2008).

Other groups proved more adept at avoiding detection and counter-battery fire. Tactics adopted by these groups include altering the location and time of the attacks, simultaneously firing rockets of different calibres from multiple locations, and using a variety of launchers and launch platforms, including civilian vehicles (Knights, 2011).<sup>38</sup> As noted above, some groups also rig rockets with timers to delay their launch, allowing the attackers to escape before the arrival of counter-battery fire. Some rocket teams conduct extensive reconnaissance of intended targets and use modern technology to improve targeting. In May 2005, coalition forces in Iraq captured a group of 22 insurgents believed to be responsible for a series of rocket attacks. In their

possession were, among other items, a 122 mm rocket and launcher and a global-positioning system. In an account of the operation, US soldiers noted that '[the militants'] global-positioning system had the grids to our motor pool, mess hall, and a bunch of other key locations' (Drumsta, 2005).

Data and anecdotal accounts of rocket attacks underscore the frequency and intensity of this activity in certain parts of Afghanistan and Iraq. In 2004, LSA Anaconda—a military base in Iraq—was 'subjected to daily mortar and rocket attacks', according to the US military (Burton, 2004). Attacks with artillery rockets were also a regular occurrence in some parts of Afghanistan. An example is Forward Operating Base Salerno, which received the nickname 'Rocket City' because of the numerous rocket and mortar attacks endured by its occupants (Bloker, 2013). Urban areas like Baghdad were also regularly subjected to rocket attacks. According to the Olive Group, armed groups fired 1,100 rockets into Baghdad in a single three-month period from March to May 2008 (Knights, 2011).

A US military account of the attacks that occurred on 29 April 2008 provides a snapshot of insurgent use of rockets and its cost. The first rockets hit eastern Baghdad at 2 pm, killing two Iraqis, damaging shops, and destroying four vehicles. Two hours later, three more 107 mm rockets were fired, damaging a house in eastern Baghdad and injuring one of its inhabitants. Fifteen minutes after the second attack, a 122 mm rocket fired into central Baghdad killed another Iraqi citizen (MND-B, 2008f). In total, damage inflicted by rockets that afternoon alone included three civilian deaths, injuries suffered by another civilian, the destruction of at least four vehicles, and damage to several commercial and residential buildings.

Despite the large number of rocket attacks, casualty data compiled by the US military suggests that artillery rockets account for a comparatively small percentage of deaths and injuries suffered by US troops abroad. Of the 52,798 casualties inflicted on US troops serving in Iraq and Afghanistan from 2001 through May 2012, only seven per cent (3,767 casualties) are attributed to artillery, rockets, and mortars. The data does not permit further disaggregation and therefore the precise number of casualties caused by rockets is not known. However, given the pervasive use of mortars by armed groups in both countries, it is likely that rockets account for significantly fewer



**Table 2: US military personnel killed or wounded during Operation Enduring Freedom and Operation Iraqi Freedom, 7 October 2001 to 7 May 2012**

Casualty reason	Operation Enduring Freedom: hostile deaths	Operation Enduring Freedom: hostile wounded	Operation Iraqi Freedom: hostile deaths	Operation Iraqi Freedom: hostile wounded	Total
Artillery/mortar/rocket	26	830	211	2,700	3,767
Explosive device	851	9,813	2,195	21,581	34,440
Grenade	1	*	*	70	71
Gunshot	387	2,368	670	2,425	5,850
Nuclear, chemical, or biological agents	*	*	*	21	21
Other weaponry	*	*	*	4	4
Rocket-propelled grenade	51	1,155	53	773	2,032
Not reported/unknown/miscellaneous	156	1,630	207	3,997	5,990
Other	64	62	143	354	623

Notes: The table only includes data on ‘hostile casualties’. The US Defense Manpower Data Center defines a hostile casualty as ‘a person who is the victim of a terrorist activity or who becomes a casualty “in action.” “In action” characterizes the casualty as having been the direct result of hostile action, sustained in combat or relating thereto, or sustained going to or returning from a combat mission provided that the occurrence was directly related to hostile action. Included are persons killed or wounded mistakenly or accidentally by friendly fire directed at a hostile force or what is thought to be a hostile force.’<sup>39</sup>

Source: DMDC (2012)

than the 3,767 casualties attributed to indirect fire. Table 2 presents data on ‘hostile’ deaths and injuries in Afghanistan and Iraq.

The data does not reflect the hundreds of Afghan and Iraqi civilians who have lost their lives in rocket attacks. Unlike car bombs, which often kill

dozens of people at a time, the cumulative death toll from rockets grows slowly. A review of media and government reports on rocket attacks suggests that many cause no casualties at all, and those that do inflict three or fewer deaths and injuries. When multiplied by thousands of attacks, however, the casualties caused by artillery rockets begin to rival the number of casualties caused by other types of weapons.

Furthermore, rockets occasionally hit highly populated areas, resulting in a sudden spike in the casualty rate. In 2005, a 122 mm rocket fired by an Iraqi armed group hit a bus station in central Baghdad, killing or wounding 13 Iraqi citizens and damaging 24 vehicles (Task Force Baghdad, 2005). A year later, 29 people were killed or injured when five rockets slammed into the Abu Teshar neighbourhood in Baghdad (Becatoros, 2006). 🇺🇸



Image 16: Villagers show US soldiers a home damaged by a 107 mm rocket in Khost, Afghanistan, 2002

© Wally Santana/Associated Press, 2002

## Policy implications: artillery rockets and the Arms Trade Treaty

The acquisition and use of artillery rockets by armed groups pose an acute threat to soldiers, government officials, and civilians. Their large warheads, long ranges, and ease of operation make them attractive to terrorists and insurgents, and the difficulty of firing them accurately increases the likelihood of civilian casualties. The risk of accidental explosions also makes artillery rockets a threat, not only to the armed groups that use them but also to civilians in the vicinity of stockpiles or launch sites.

Despite this threat, artillery rockets are often either marginalized or excluded from multilateral agreements on small arms and light weapons and transparency mechanisms. While the Arms Trade Treaty (ATT) is different in that it covers most artillery rockets and their launchers, not all of the treaty's provisions apply to the rockets. Multiple launch rocket systems that are 75 mm or larger in calibre<sup>40</sup> are included in Article 2(1)(c) of the treaty<sup>41</sup> and are therefore subject to all of the treaty's provisions on export, transit and trans-shipment, import, brokering, record-keeping, and reporting. Articles 6 and 7 on exports, export assessments, and export prohibitions—the operational heart of the treaty<sup>42</sup>—apply to artillery rockets, but not other key provisions. Specifically, states parties are not required to apply the provisions on

- imports, transit, and transshipment in Articles VIII and IX;
- brokering in Article X;
- preventing diversion in Article XI;
- record-keeping in Article XII;
- reporting in Article XIII; and
- international co-operation in Articles XV(4) and XV(6) (UNGA, 2013).

It should be noted that the treaty does not preclude application of these controls to transfers of rockets. Indeed, it encourages states to 'apply the

provisions of this Treaty to the broadest range of conventional arms' (UNGA, 2013, art. 5(3)). However, by categorizing artillery rockets as 'ammunition', which is subject to fewer of the treaty's provisions, the current categorization makes it easier for states to elect not to apply key provisions to transfers of artillery rockets.

Many current- and next-generation guided rockets are also categorized as 'ammunition'<sup>43</sup> even though their diversion would pose an even greater threat to peace and security than the rockets currently used by armed groups. Several companies have developed—or are developing—guided artillery rockets, the accuracy of which is much better than their unguided counterparts. If diverted to terrorists or other unauthorized end-users, these rockets could be used to deliver large explosive payloads on heavily populated, exposed targets, such as outdoor markets or stadiums. Such attacks could cause dozens or hundreds of casualties, depending on the target and the type of rockets fired. Use of guided rockets on a scale comparable to rocket activity in Iraq would have profound economic, political, and strategic implications for the affected state.

Many of the items used by armed groups to construct improvised launchers for artillery rockets also fall outside the purview of the treaty. While some launchers seized in Afghanistan and Iraq were made from disassembled multi-launch rocket systems (which are covered by the treaty), most were constructed from items that are not subject to transfer controls, such as car jacks. This limitation is not unique to the ATT; no multilateral regime controls the transfer of car jacks or most other common components of improvised launchers, and for good reason. Given the wide array of these items, their ready availability in most parts of the world, and their many legitimate uses, establishing licensing requirements for international transfers of these items would hurt legitimate businesses and overwhelm export control agencies while having little impact on the availability of improvised rocket launchers.

Another potential obstacle is the reluctance of several states that produce and export artillery rockets to sign the treaty. Some of these states may eventually join the ATT, or at least modify their transfer controls to conform to key

provisions of the ATT, but others—including key proliferators such as Iran and Sudan—are likely to remain outside the fold for the foreseeable future.

Finally, publicly available data on exports of artillery rockets is scarce, making it difficult to monitor the proliferation (authorized and illicit) of artillery rockets. The primary multilateral mechanism for tracking arms transfers is the UN Register of Conventional Arms (UNROCA). UN member states are expected to submit data on transfers of most multiple launch rocket systems (i.e. those with calibres of 75 mm or larger) and transfers of artillery rockets with ranges of 25 km or longer (UNODA, 2007, pp. 4, 16, 18–19) but not transfers of the rockets most commonly used by armed groups (e.g. 57 mm S5 rockets, 107 mm Type 63-style rockets, and many 122 mm Grad-style rockets). Similarly, the ATT's annual reporting requirements do not apply to artillery rockets. In theory, member states could submit information on these transfers but, if reporting to UNROCA is any indicator of future reporting under the treaty, data on the trade in artillery rockets will continue to be sparse.

Some exports of these items are reported by other sources, but not frequently enough to systematically track international transfers. Data on co-production and licensed production agreements is also missing from reports to the UN Arms Register, as is data on transfers of parts and components used in the production of artillery rockets. As evidenced by the widespread illicit proliferation of weapons originally produced under licence, controlling the capacity to produce artillery rockets is as important as controlling transfers of the rockets themselves.

For these reasons, the impact of the ATT on the proliferation of artillery rockets will be diminished unless articles 8 through 13 are broadened to include items categorized as 'ammunition'. Even then, much will depend on which states ultimately adopt key provisions of the treaty, and how these provisions are implemented. Tracking implementation will be difficult unless public reporting on international transfers of artillery rockets improves significantly, as a result of modifications to the UN Arms Register or of the introduction of new reporting mechanisms. Such changes could help to reduce future proliferation of artillery rockets, including next-generation guided systems that will be much more capable than the rockets in circulation today. 🍷

# Endnotes

- 1 See Small Arms Survey (2008, pp. 8–11). The Small Arms Survey has established a weight limit for ‘light weapons’ but not a limit on length.
- 2 Examples include 240 mm rockets used by armed groups in Iraq (Ness and Williams, 2011, p. 807) and the 220 mm and 302 mm rockets deployed by Lebanese Hezbollah (IHS Jane’s, 2006a).
- 3 Grenades, grenade launchers, mortars, and recoilless rifles are also excluded.
- 4 See Ness and Williams (2011) and Foss (2011).
- 5 See Binnie (2012), Chivers (2011b; 2011c), Conflict Armament Research (2013, p. 16), Katz (2012), IHS Jane’s (2005b; 2006a), Najib (2010), and Sri Lankan MOD (2010).
- 6 For an example of rockets used in the construction of IEDs, see 3<sup>rd</sup> ID Public Affairs (2007b).
- 7 See Schroeder and King (2012, pp. 317, 330).
- 8 Data compiled from the Defense Video and Imagery Distribution System (DVIDS), US ARCENT (2011), and US CENTCOM (2011a; 2011b).
- 9 See, for example, DCSINT (n.d.).
- 10 See, for example, 3<sup>rd</sup> ID Public Affairs (2007b).
- 11 Manufacturers in several countries have produced Type 63-style rockets. These countries include Egypt, Iran, Iraq, North Korea, South Africa, Sudan, and Turkey (Foss, 2013; Ness and Williams, 2011).
- 12 Video footage seized from insurgents shows what appears to be an attack with 240 mm rockets in 2007 (see Image 15).
- 13 See, for example, USF-A (2009), Scavetta (2005), and ISAF Joint Command (2011).
- 14 Similar rockets are evident in photographs and videos of IRAMs used in Syria. See Aldourmany (2012) and Higgins (2013).
- 15 See also Garamone (2011).
- 16 See also Caggins (2009).
- 17 See, for example, Hutto (2007), Brody (2008), 3<sup>rd</sup> ID Public Affairs (2008a), and Schroeder and King (2012, p. 319).
- 18 The discovery of a detonating device nearby led coalition troops to conclude that the trucks were ‘potential bombs that were in a pre-assembly state’ (US DOD, 2003).
- 19 See US Centcom (2011a), 1<sup>st</sup> Cavalry Division Public Affairs (2008), 3<sup>rd</sup> Brigade Combat Team (2008), US MNF-I, (2006), and French (2007).
- 20 A summary of the seizure published by the Defense Department indicated that ‘the majority of the rockets found are in serviceable condition’ (MND-B, 2008j).
- 21 NATO defines counter-battery fire as ‘[f]ire delivered for the purpose of destroying or neutralizing the enemy’s fire support system’ (NATO, 2013, 2-C-16).
- 22 See, for example, Chivers (2011c).

- 23 Some analysts claim that the poor condition of locally sourced 122 mm rockets prompted certain Iraqi armed groups to acquire them from Iran. See Knights (2011).
- 24 Identifying the source of weapons held by armed groups is often an extremely difficult task. Most publicly available reports on seized weapons provide few clues to their origins, and fewer still include hard evidence, such as photographs of the markings on the seized items. Even when photographs of the markings are provided, they often tell us little about the chain of custody of the item, including the proximate source.
- 25 Iranian rockets have received significantly more scrutiny from government and non-government analysts than other makes and models, in part because of concerns about Iran's interference in Afghanistan and Iraq.
- 26 Other potential targets identified in the brochure include artillery batteries, armoured vehicles (including 'platoons of tanks'), command posts, and ordnance depots (DIO, n.d.).
- 27 In 2009, a US Army official claimed that the US military had seized hundreds of Iranian-made 107 mm and 122 mm rockets, some 'with a manufacture date as late as 2008' (Kruzal, 2009).
- 28 See, for example, De Young (2007).
- 29 As quoted by Reuters, the ambassador gave the following statement: 'Security agencies in your country assessed these containers. I informed them formally that this consignment was not meant for Nigeria, it was meant for another country which you know is the Gambia ... It is based on the agreement signed between Iran and the Gambia three years back and this is not the first part of that consignment. This is the third part and I asked them to please not allow people who are not happy with our friendly relations to gain advantage of this incident' (Eboh, 2011). The shipment also contained small arms ammunition packaged in green 'battle bags' similar in appearance to bags of ammunition identified as Iranian that were seized in the Levant in 2002 and in Iraq in 2008, and observed in the inventories of rebel forces in Côte d'Ivoire in 2010 (Conflict Armament Research, 2012, pp. 14–15, 30).
- 30 In February 2011, UK Special Forces reportedly seized 48 Iranian-made 122 mm rockets being transported in three trucks. A NATO spokesman interviewed by the *Telegraph* claimed that the rockets 'had been deliberately sanitised to hide their origin' (Farmer, 2011). See also Ripley (2013).
- 31 See CJTF Troy (2008), Isby (2007), and MND-Center (2007).
- 32 See JIEDDO (n.d.), Roggio (2008), and Garamone (2011).
- 33 See ISAF (2009) and MND-B (2008a).
- 34 It is not clear if the Chairman's aircraft was deliberately targeted.
- 35 An example is a rocket fired at Camp Salerno, Afghanistan, that landed in a nearby village, killing three girls aged four, five, and seven, and injuring their mother (Powell, 2010).
- 36 See, for example, ISAF JC (2012).
- 37 See MND-B (2008d; 2008g; 2008h).
- 38 In 2005, an Iraqi group fired rockets from an ice-cream truck that had been converted into a mobile rocket launcher. One of the rockets hit a civilian vehicle, killing one person and injuring another (Goemaere, 2005).

- 39 Author email correspondence with DMDC official, 18 April 2014. This definition does not include 'injuries or death due to the elements, self-inflicted wounds, combat fatigue, and except in unusual cases, wounds or death inflicted by a friendly force while the individual is in an AWOL, deserter, or dropped-from-rolls status or is voluntarily absent without authority from a place of duty'.
- 40 Article 2(1) is aligned with the categories of equipment covered by the UN Arms Register, which categorizes multiple-launch rocket systems with a calibre equal to or greater than 75 mm as 'large-calibre artillery systems'. Article 2(1) also includes 'small arms and light weapons.' See UNODA (2007) and UNGA (2013, art. 5(3)).
- 41 See Article 2(1)c.
- 42 Author correspondence with Glenn McDonald, senior researcher, Small Arms Survey, 10 March 2014.
- 43 Guided or unguided rockets with ranges of 25 km or longer are categorized as 'missiles and missile launchers'.



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# Publications list

## Yearbooks

The *Small Arms Survey* yearbook, which is published with Cambridge University Press, is the flagship publication of the Small Arms Survey. It serves as an annual review of global small arms issues and themes and is recognized as the principal international source of impartial and reliable information on all aspects of small arms.

## Occasional Papers

- 1 *Re-Armament in Sierra Leone: One Year after the Lomé Peace Agreement*, by Eric Berman, December 2000
- 2 *Removing Small Arms from Society: A Review of Weapons Collection and Destruction Programmes*, by Sami Faltas, Glenn McDonald, and Camilla Waszink, July 2001
- 3 *Legal Controls on Small Arms and Light Weapons in Southeast Asia*, by Katherine Kramer (with Nonviolence International Southeast Asia), July 2001
- 4 *Shining a Light on Small Arms Exports: The Record of State Transparency*, by Maria Haug, Martin Langvandslien, Lora Lumpe, and Nic Marsh (with NISAT), January 2002
- 5 *Stray Bullets: The Impact of Small Arms Misuse in Central America*, by William Godnick, with Robert Muggah and Camilla Waszink, November 2002
- 6 *Politics from the Barrel of a Gun: Small Arms Proliferation and Conflict in the Republic of Georgia*, by Spyros Demetriou, November 2002
- 7 *Making Global Public Policy: The Case of Small Arms and Light Weapons*, by Edward Laurance and Rachel Stohl, December 2002
- 8 *Small Arms in the Pacific*, by Philip Alpers and Conor Twyford, March 2003
- 9 *Demand, Stockpiles, and Social Controls: Small Arms in Yemen*, by Derek B. Miller, May 2003
- 10 *Beyond the Kalashnikov: Small Arms Production, Exports, and Stockpiles in the Russian Federation*, by Maxim Pyadushkin, with Maria Haug and Anna Matveeva, August 2003
- 11 *In the Shadow of a Cease-fire: The Impacts of Small Arms Availability and Misuse in Sri Lanka*, by Chris Smith, October 2003
- 12 *Small Arms in Kyrgyzstan: Post-revolutionary Proliferation*, by S. Neil MacFarlane and Stina Torjesen, March 2007, ISBN 2-8288-0076-8, also in Kyrgyz and Russian (first printed as *Kyrgyzstan: A Small Arms Anomaly in Central Asia?*, by S. Neil MacFarlane and Stina Torjesen, February 2004)
- 13 *Small Arms and Light Weapons Production in Eastern, Central, and Southeast Europe*, by Yudit Kiss, October 2004, ISBN 2-8288-0057-1



- 14 *Securing Haiti's Transition: Reviewing Human Insecurity and the Prospects for Disarmament, Demobilization, and Reintegration*, by Robert Muggah, October 2005, updated, ISBN 2-8288-0066-0
- 15 *Silencing Guns: Local Perspectives on Small Arms and Armed Violence in Rural South Pacific Islands Communities*, edited by Emile LeBrun and Robert Muggah, June 2005, ISBN 2-8288-0064-4
- 16 *Behind a Veil of Secrecy: Military Small Arms and Light Weapons Production in Western Europe*, by Reinhilde Weidacher, November 2005, ISBN 2-8288-0065-2
- 17 *Tajikistan's Road to Stability: Reduction in Small Arms Proliferation and Remaining Challenges*, by Stina Torjesen, Christina Wille, and S. Neil MacFarlane, November 2005, ISBN 2-8288-0067-9
- 18 *Demanding Attention: Addressing the Dynamics of Small Arms Demand*, by David Atwood, Anne-Kathrin Glatz, and Robert Muggah, January 2006, ISBN 2-8288-0069-5
- 19 *A Guide to the US Small Arms Market, Industry, and Exports, 1998–2004*, by Tamar Gabelnick, Maria Haug, and Lora Lumpe, September 2006, ISBN 2-8288-0071-7
- 20 *Small Arms, Armed Violence, and Insecurity in Nigeria: The Niger Delta in Perspective*, by Jennifer M. Hazen with Jonas Horner, December 2007, 2-8288-0090-3
- 21 *Crisis in Karamoja: Armed Violence and the Failure of Disarmament in Uganda's Most Deprived Region*, by James Bevan, June 2008, ISBN 2-8288-0094-6
- 22 *Blowback: Kenya's Illicit Ammunition Problem in Turkana North District*, by James Bevan, June 2008, ISBN 2-8288-0098-9
- 23 *Gangs of Central America: Causes, Costs, and Interventions*, by Dennis Rodgers, Robert Muggah, and Chris Stevenson, May 2009, ISBN 978-2-940415-13-7
- 24 *Arms in and around Mauritania: National and Regional Security Implications*, by Stéphanie Pézard with Anne-Kathrin Glatz, June 2010, ISBN 978-2-940415-35-9 (also available in French)
- 25 *Transparency Counts: Assessing State Reporting on Small Arms Transfers, 2001–08*, by Jasna Lazarevic, June 2010, ISBN 978-2-940415-34-2
- 26 *Confronting the Don: The Political Economy of Gang Violence in Jamaica*, by Glaister Leslie, November 2010, ISBN 978-2-940415-38-0
- 27 *Safer Stockpiles: Practitioners' Experiences with Physical Security and Stockpile Management (PSSM) Assistance Programmes*, edited by Benjamin King, April 2011, ISBN 978-2-940415-54-0
- 28 *Analysis of National Reports: Implementation of the UN Programme of Action on Small Arms and the International Tracing Instrument in 2009–10*, by Sarah Parker, May 2011, ISBN 978-2-940415-55-7
- 29 *Blue Skies and Dark Clouds: Kazakhstan and Small Arms*, by Nicolas Florquin, Dauren Aben, and Takhmina Karimova, May 2012, ISBN 978-2-9700771-5-2 (also available in Kazakh and Russian)
- 30 *The Programme of Action Implementation Monitor (Phase 1): Assessing Reported Progress*, Sarah Parker with Katherine Green, August 2012, ISBN 978-2-9700816-2-3
- 31 *Internal Control: Codes of Conducts within Insurgent Armed Groups*, by Olivier Bangerter, November 2012, ISBN 978-2-9700816-8-5

## Special Reports

- 1 *Humanitarianism Under Threat: The Humanitarian Impact of Small Arms and Light Weapons*, by Robert Muggah and Eric Berman, commissioned by the Reference Group on Small Arms of the UN Inter-Agency Standing Committee, July 2001
- 2 *Small Arms Availability, Trade, and Impacts in the Republic of Congo*, by Spyros Demetriou, Robert Muggah, and Ian Biddle, commissioned by the International Organisation for Migration and the UN Development Programme, April 2002
- 3 *Kosovo and the Gun: A Baseline Assessment of Small Arms and Light Weapons in Kosovo*, by Anna Khakee and Nicolas Florquin, commissioned by the United Nations Development Programme, June 2003
- 4 *A Fragile Peace: Guns and Security in Post-conflict Macedonia*, by Suzette R. Grillo, Wolf-Christian Paes, Hans Risser, and Shelly O. Stoneman, commissioned by United Nations Development Programme, and co-published by the Bonn International Center for Conversion, SEESAC in Belgrade, and the Small Arms Survey, June 2004, ISBN 2-8288-0056-3
- 5 *Gun-running in Papua New Guinea: From Arrows to Assault Weapons in the Southern Highlands*, by Philip Alpers, June 2005, ISBN 2-8288-0062-8
- 6 *La République Centrafricaine: Une étude de cas sur les armes légères et les conflits*, by Eric G. Berman, published with financial support from UNDP, July 2006, ISBN 2-8288-0073-3
- 7 *Small Arms in Burundi: Disarming the Civilian Population in Peacetime (Les armes légères au Burundi : après la paix, le défi du désarmement civil)*, by Stéphanie Pézard and Nicolas Florquin, co-published with Ligue Iteka with support from UNDP–Burundi and Oxfam–NOVIB, in English and French, August 2007, ISBN 2-8288-0080-6 ISSN 1661-4453
- 8 *Quoi de neuf sur le front congolais ? Evaluation de base sur la circulation des armes légères et de petit calibre en République du Congo*, par Robert Muggah et Ryan Nichols, publié avec le Programme des Nations Unies pour le Développement (PNUD)–République du Congo, décembre 2007, 2-8288-0089-X
- 9 *Small Arms in Rio de Janeiro: The Guns, the Buyback, and the Victims*, by Pablo Dreyfus, Luis Eduardo Guedes, Ben Lessing, Antônio Rangel Bandeira, Marcelo de Sousa Nascimento, and Patricia Silveira Rivero, a study by the Small Arms Survey, Viva Rio, and ISER, December 2008, ISBN 2-8288-0102-0
- 10 *Firearms-related Violence in Mozambique*, a joint publication of the Ministry of the Interior of Mozambique, the World Health Organization–Mozambique, and the Small Arms Survey, June 2009, ISBN 978-2-940415-14-4
- 11 *Small Arms Production in Brazil: Production, Trade, and Holdings*, by Pablo Dreyfus, Benjamin Lessing, Marcelo de Sousa Nascimento, and Júlio Cesar Purcena, a joint publication with Viva Rio and ISER, September 2010, ISBN 978-2-940415-40-3
- 12 *Timor-Leste Armed Violence Assessment Final Report*, edited by Robert Muggah and Emile LeBrun, a joint publication of ActionAid, AusAID, and the Small Arms Survey, October 2010, ISBN 978-2-940415-43-4
- 13 *Significant Surpluses: Weapons and Ammunition Stockpiles in South-east Europe*, by Pierre Gobinet, a study of the RASR Initiative, December 2011, ISBN 978-2-9700771-2-1

- 14 *Enquête nationale sur les armes légères et de petit calibre en Côte d'Ivoire: les défis du contrôle des armes et de la lutte contre la violence armée avant la crise post-électorale*, by Savannah de Tessières, a joint publication of the UNDP, the Commission Nationale de Lutte contre la Prolifération et la Circulation Illicite des Armes Légères et de Petit Calibre, Côte d'Ivoire, and the Small Arms Survey, April 2012, ISBN 978-2-9700771-7-6
- 15 *Capabilities and Capacities: A Survey of South-east Europe's Demilitarization Infrastructure*, by Pierre Gobinet, a joint publication of the Regional Approach for Stockpile Reduction, the US Department of State's Office of Weapons Removal and Abatement, and the Small Arms Survey, April 2012, ISBN 978-2-9700771-7-6
- 16 *Availability of Small Arms and Perceptions of Security in Kenya: An Assessment*, by Manasseh Wepundi, Eliud Nthiga, Eliud Kabuu, Ryan Murray, and Anna Alvazzi del Frate, a joint publication of the Kenya National Focus Point on Small Arms and Light Weapons and the Small Arms Survey, June 2012, in English and Kiswahili, ISBN 978-2-9700771-8-3
- 17 *Security Provision and Small Arms in Karamoja: A Survey of Perceptions*, by Kees Kingma, Frank Muhereza, Ryan Murray, Matthias Nowak, and Lilo Thapa, a joint publication of the Danish Demining Group and the Small Arms Survey, September 2012, ISBN 978-2-9700816-3-0
- 18 *Costs and Consequences: Unplanned Explosions and Demilitarization in South-east Europe*, by Jasna Lazarević, a joint publication of the Regional Approach for Stockpile Reduction, the US Department of State's Office of Weapons Removal and Abatement, and the Small Arms Survey, November 2012, ISBN 978-2-9700816-7-8
- 19 *Making a Mark: Reporting on Firearms Marking in the RECSA Region*, by James Bevan and Benjamin King, a joint publication of Regional Centre on Small Arms in the Great Lakes Region, the Horn of Africa and Bordering States, and the Small Arms Survey; with support from the US Department of State's Office of Weapons Removal and Abatement, April 2013, ISBN 978-2-9700856-1-4
- 20 *In Search of Lasting Security: An Assessment of Armed Violence in Nepal*, by Mihaela Racovita, Ryan Murray, and Sudhindra Sharma, a joint publication of Interdisciplinary Analysts and the Small Arms Survey / Nepal Armed Violence Assessment project; with support from Australian Aid, AusAID, May 2013, ISBN 978-2-9700856-3-8 (also available in Nepali)
- 21 *Identifying Sources: Small-calibre Ammunition in Côte d'Ivoire*, by Holger Anders, a joint publication of the Small Arms Survey/Security Assessment North Africa project and the Integrated Embargo Monitoring Unit of the United Nations Operation in Côte d'Ivoire, with support from the US State Department, the Ministry of Foreign Affairs of the Netherlands, the Royal Norwegian Ministry of Foreign Affairs, the Danish Ministry of Foreign Affairs, and the Swiss Federal Department of Foreign Affairs, June 2014, ISBN 978-2-940548-02-6

## Book Series

*Armed and Aimless: Armed Groups, Guns, and Human Security in the ECOWAS Region*, edited by Nicolas Florquin and Eric G. Berman, May 2005, ISBN 2-8288-0063-6

- Armés mais désœuvrés: Groupes armés, armes légères et sécurité humaine dans la région de la CEDEAO*, edited by Nicolas Florquin and Eric Berman, co-published with GRIP, March 2006, ISBN 2-87291-023-9
- Targeting Ammunition: A Primer*, edited by Stéphanie Pézard and Holger Anders, co-published with CICS, GRIP, SEESAC, and Viva Rio, June 2006, ISBN 2-8288-0072-5
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- Conventional Ammunition in Surplus: A Reference Guide*, edited by James Bevan, published in cooperation with BICC, FAS, GRIP, and SEESAC, January 2008, ISBN 2-8288-0092-X
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## Handbooks

- 1 *Regional Organizations and the UN Programme of Action on Small Arms (PoA)*, by Eric G. Berman and Kerry Maze, August 2012, ISBN 978-2-9700816-5-4
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