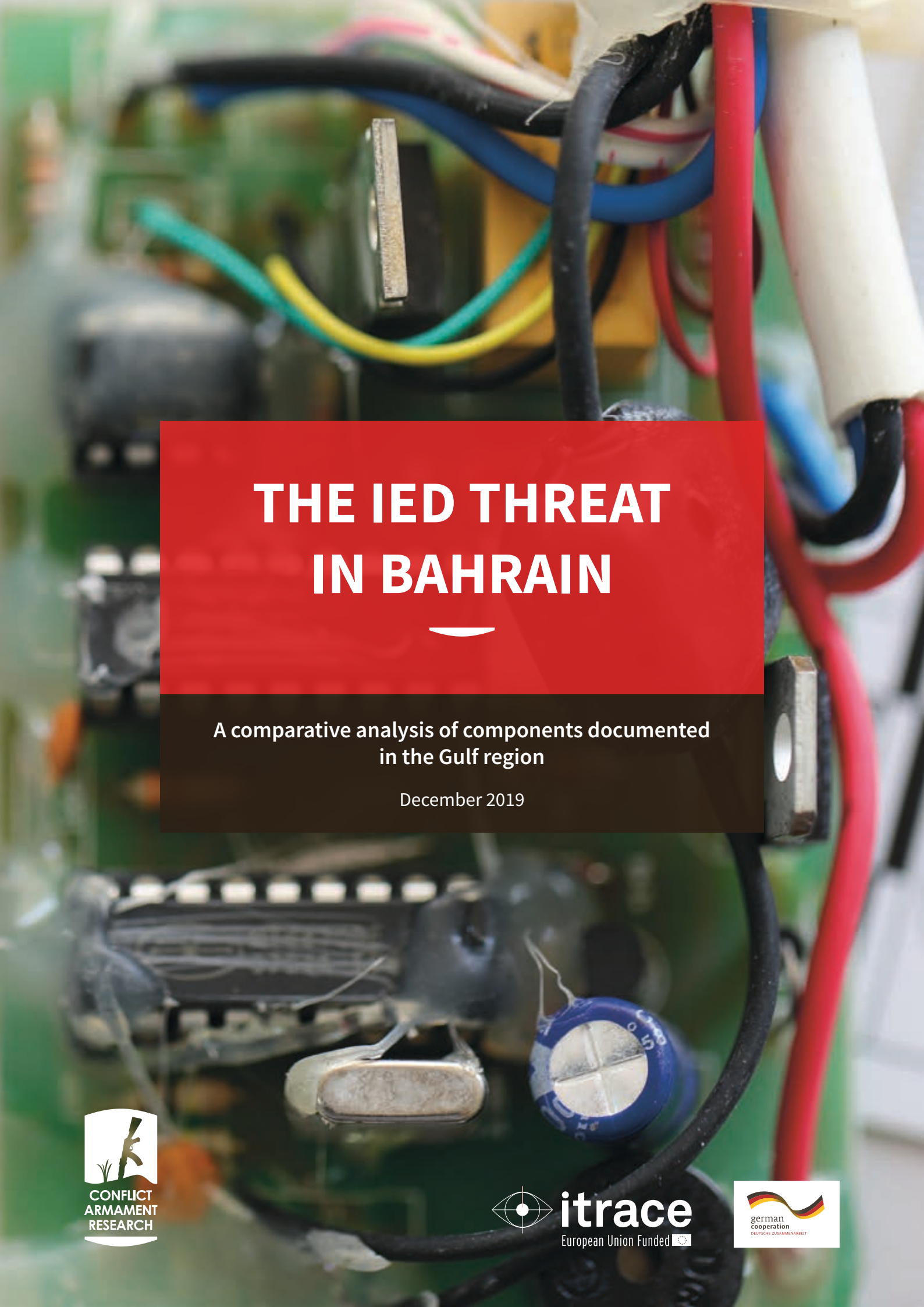

THE IED THREAT IN BAHRAIN

A comparative analysis of components documented in the Gulf region

December 2019

CONFLICT ARMAMENT RESEARCH

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Front cover image: Attempted obliteration of marks on the circuit board components of an RCIED kit, recovered by Bahraini security forces.
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Inside cover image: Improvised directional fragmentation charge with cast TNT main charge and steel ball bearing fragmentation matrix.
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INTRODUCTION

In July 2017 and April 2018 Conflict Armament Research (CAR) field investigation teams deployed to the Kingdom of Bahrain to document materiel seized by Bahraini national security forces from militant cells between 2013 and 2018.[1]

The timeline of seizures is important because 2013 marks a significant change in the sophistication of weapons and related materiel available to militant factions in Bahrain. The groups had initially—during violent confrontations in 2011 and 2012—targeted Bahraini security forces with crude, domestically manufactured improvised explosive devices (IEDs) and improvised weapons; from 2013 onwards, however, Bahraini security forces began to interdict vessels in Bahrain's territorial waters whose cargoes included pre-configured IED components mixed with conventional military weapons.

As this report demonstrates, much of the materiel recovered at sea is identical to items recovered from militant factions after 2013 on mainland Bahrain and in other conflict-affected Gulf countries, such as Yemen. It includes radio-controlled IED (RCIED) components; passive infrared (PIR) sensors, which are used as victim-operated firing switches for IEDs; explosively formed projectile (EFP) main charges; under-vehicle IED (UVIED) charge configurations; military grade explosives; and homemade explosive (HME) precursors.

Bahrain's security forces typically recovered this materiel among shipments of conventional weapons, including assault rifles, assault rifle-calibre ammunition, and shoulder-launched rockets. In many cases, parties in the supply chain have systematically obliterated weapon-identifying marks (by grinding) in an attempt to conceal the weapons' provenance. The frequency of mark obliteration is significantly higher for weapons documented in these cases than for any other region in which CAR has collected data since 2011 (more than 30 conflict-affected states worldwide).

The main findings of this report are:

- Most electronic IED components documented in Bahrain are identical to or very closely resemble IED components recovered from Ansar Allah 'Houthi' forces in Yemen and components found on board the *Jihan 1* cargo vessel, which US naval and Yemeni coast guard forces intercepted off Yemen's southern coast in 2013.[2]

- A significant quantity of IED components documented by CAR in Bahrain, namely PIR sensors, RCIED components, and Woer-brand heat-shrink sleeving, are identical or similar to components that CAR has documented in Yemen, following their recovery from Houthi forces. These specific components were also present on the *Jihan 1* cargo vessel. The components either originated in Iran or are linked to Iranian-backed supply networks in the region.

- Militant factions in Bahrain have developed a domestic capacity to manufacture EFPs and improvised directional fragmentation charges (DFCs), as well as homemade high-explosive and less complex RCIED transmitters and receivers. However, they appear to have acquired RCIED circuit board components—and more complex, pre-assembled RCIED 'kits'—from sources outside of Bahrain.

- In a number of cases, parties to the supply chain have obliterated (removed by abrasion) identifying information, including manufacturer symbols and part numbers, applied to RCIED circuit board components. These activities, which are intended to conceal the provenance of components, are very rare in other areas of prevalent RCIED use—for example, in devices documented throughout CAR's Iraq and Syria operations. The only other cases of high-frequency mark obliteration observed by CAR have been on devices documented by CAR following their recovery from Houthi forces in Yemen.

- Two features of the IED component sample documented by CAR in Bahrain are notable: 1) Bahraini security forces did not recover complete (fully assembled) devices, and 2) of the seized IED main charges, only two had been filled with explosives. These findings suggest that militant factions prepare and fill explosives at locations other than those in which they cache non-explosive IED main components (such as electronic switches and detonators) and that they delay the assembly of complete devices (through the

addition of a main charge) until close to the time of use. This pause in the chain of construction—between the assembly of explosive and non-explosive main components—implies that militant factions use relatively sophisticated tactics, techniques, and procedures; are aware of explosive shelf-time limits; and recognise the vulnerability of explosive production to detection, in contrast to non-explosive IED main components, which are more easily concealed. It also suggests that militant factions centralise the construction of non-explosive components in preparation for onward distribution.

- Finally, RCIED kits recovered in multiple operations in Bahrain contain counterfeit circuit board components. These are similar to counterfeit components that CAR has documented in Iraq and Yemen. These findings suggest that parties operating in the two countries may be conduits for circuit board components that enter Bahrain.

The materiel presented in this report encompasses items seized by Bahraini security forces during the following operations in 2013–18, as well as during an April 2017 operation led by Saudi Arabian security forces (see Table 1 and Map 1).

Map 1

Recovery sites of materiel documented in this report

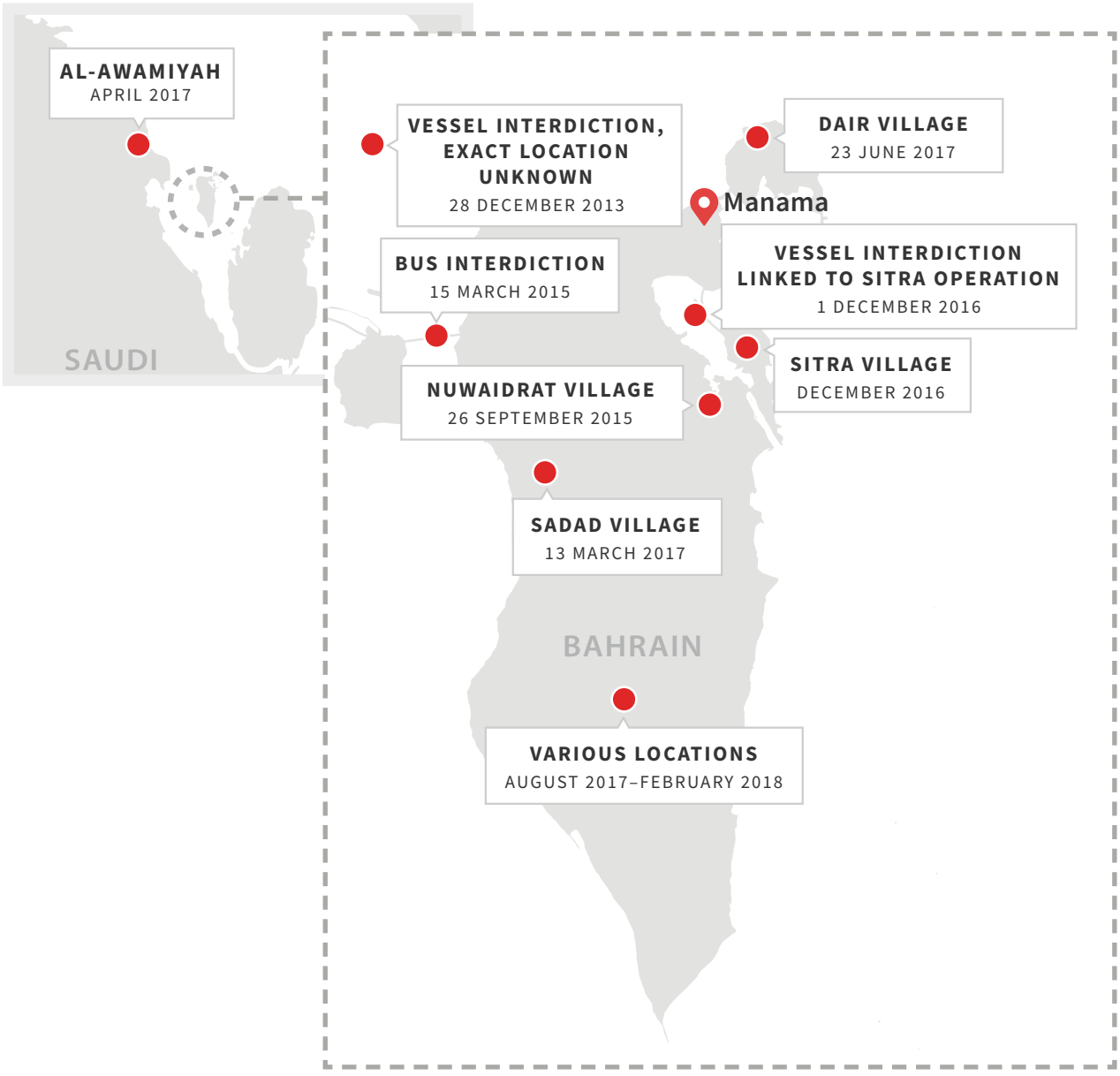

Table 1

Materiel recovered during security operations and covered in this report

Date	Lead security forces	Operation/interdiction target	Seized materiel
28 December 2013	Bahraini security forces	Vessel entering Bahraini territorial waters	Weapons, ammunition, IEDs, and IED components
29 December 2013	Bahraini security forces	Related to vessel interdiction of the previous day, location unknown	IED components
15 March 2015	Bahraini security forces	Materiel transported on a bus from Iraq, through Saudi Arabia, to Bahrain	IED components
26 September 2015	Bahraini security forces	Network of under- and above-ground caches in Nuwaidrat village, Bahrain	IEDs, IED components, military-grade high explosives, weapons, and ammunition
December 2016	Bahraini security forces, based on intelligence gathered from a vessel interdicted off the coast of Bahrain, near the village of Nabih Saleh	Sitra village, Bahrain	IEDs, weapons, and ammunition
13 March 2017	Bahraini security forces	Militant factions in Sadad village, Bahrain	IED components
April 2017	Saudi Arabian security forces	Militant factions in Al-Awamiyah city, Saudi Arabia	Weapons, ammunition, IEDs, IED components, and homemade explosives
23 June 2017	Bahraini security forces	Militant factions in Dair village, north of Bahrain International Airport	IEDs, IED components, and ammunition
August 2017–February 2018	Bahraini security forces	Al Ashtar Brigades and Bahraini Hezbollah militant factions in various locations	IEDs, IED components, explosives, HME precursors, weapons, and ammunition

METHODOLOGY

Conflict Armament Research (CAR) field teams document illicit weapons, ammunition, and related materiel in conflict-affected locations and trace their supply sources. Teams inspect weapons in a variety of situations—whether recovered by state security forces, surrendered at the cessation of hostilities, cached, or held by insurgent forces. CAR's field investigation teams document all items photographically, date and geo-reference the documentation sites, and incorporate contextual interview data gathered from the forces in control of the items at the time of documentation.

CAR occasionally uses information and photographs from social media as background information, but does not base its investigations on them, since the provenance of such data is often difficult to verify. Moreover, open-source information does not always provide the detailed physical elements—notably external and internal markings required to trace weapons and ammunition.

CAR traces only a portion of the items it documents in the field. This traced materiel is usually of particular significance for CAR's investigations. If numerous individual items were to be traced, an excessive burden would need to be placed on the national governments and manufacturing companies concerned. Furthermore, some of the documented items are untraceable. For example, most loose small-calibre ammunition lacks the lot numbers required to identify it in production, sales, and export records. Similarly, records pertaining to the production, sale, and export of many older weapons are no longer available.

CAR supplements formal weapon tracing with analysis of physical evidence gathered from the weapons themselves and that of related materiel; obtaining government, commercial, transport, and other documents; and interviewing individuals with knowledge or experience of the equipment transfers under scrutiny. CAR retains all documents, interview notes, emails, recordings, photographs, and other data obtained from third parties in a secure, encrypted format. Wherever relevant, this report refers to these items as being 'on file.' To protect sources, CAR is unable to publish the precise details of the sources or circumstances of acquisition of every evidential item it obtains. CAR's sources provide all such items willingly and with full knowledge of their use by CAR. CAR does not undertake undercover work or use other clandestine investigation methods. For privacy reasons, CAR's publications do not refer to private individuals by name, except in the case of well-known public officials.

CAR has contacted all governments and companies referenced in this report. Unless specified, no reference to the names of countries of manufacture, manufacturing companies, intermediary parties, distributors, or intended end users implies illegality or wrongdoing on the part of the named entity. CAR would like to acknowledge the cooperation of the governments, companies and individuals whose responses to CAR's trace requests and provision of other information have been critical in its ongoing investigations.

CAR SUPPLEMENTS FORMAL WEAPON TRACING WITH ANALYSIS OF PHYSICAL EVIDENCE GATHERED FROM THE WEAPONS THEMSELVES AND THAT OF RELATED MATERIEL.

PREQUEL: THE *JIHAN 1* DHOW SEIZURE

In January 2013, US naval and Yemeni coast guard forces interdicted a cargo vessel off the coast of southern Yemen. The contents of the cargo have since served as a source of comparison against conventional and non-conventional weapons documented following their recovery from militant factions in Bahrain, Saudi Arabia, and Yemen.

The *Jihan 1* transported a significant quantity of conventional military items of Chinese, Iranian, and possibly Russian manufacture. The cargo included man-portable air defence systems (MANPADS), M112 plastic explosives, other high explosives, sound moderators, and ammunition. The vessel also carried thousands of IED components, including PIR sensors, RCIED kits, commercial electric detonators, and chemical precursors for HME production.

The UN Panel of Experts on Yemen documented the *Jihan 1* materiel at a Yemeni government facility in Aden, and reported that the cargo comprised:

> *16,723 blocks of C-4 explosives, 133 plastic containers of RDX powder explosives, 10 man-portable air defence system type 9M32M, 62,040 rounds of 12.7-mm ammunition, 316,000 rounds of 7.62-mm ammunition, 100 rocket-propelled grenades, 18 Katyousha rockets (122-mm), 17 aiming equipment, 1,615 boxes connected with improvised explosive devices and relevant electrical equipment, 10 laser rangefinders LH80A, 48 night vision goggles, 5 long range binoculars with mounts, 90 lensatic compasses, 66 silencers and 800 electric detonators (UNSC, 2015, p. 38).*

The Panel also interviewed Yemeni crew members and analysed waypoint data from the vessel's GPS navigation system. According to the Panel's 2013 report, after travelling to Iran, the crew members were transferred from Bandar Abbas to Bandar Lengeh port, and then via speedboat to the *Jihan 1*, which was stationed approximately 2 km off Iran's coast. The vessel then steamed into Yemeni territorial waters (UNSC, 2013, p. 14). The materiel on the *Jihan 1* was consistent with weapons that the Panel had previously inspected and which its members concluded had originated in Iran, including materiel of Iranian manufacture (p. 15). As a result, five of the eight Panel members 'found that all available information placed the Islamic Republic of Iran at the centre of the *Jihan* operation' (p. 15).

According to the Panel's report, the *Jihan 1* cargo was bound for the Saada governorate in Yemen—the Houthi movement's stronghold.[3] Upon their takeover over Sana'a in 2014, the Houthis released eight Yemeni crew members, two Hezbollah members, and three Iranian Revolutionary Guard Corps personnel that were involved in the incident (UNSC, 2015, p. 38).

The *Jihan 1* materiel provides crucial insight into the supply of illicit materiel to militant groups across the Arabian Peninsula. RCIED electronics kits, transmitters, and PIR sensor components documented by CAR in Bahrain are identical or similar to materiel recovered from the *Jihan 1*. CAR field investigation teams have also documented RCIED components and PIR sensors captured by Saudi-led Arab coalition forces from Houthi forces on Yemen's western coast. These are either identical to the *Jihan 1* materiel and to IED components documented in Bahrain, or their construction is strikingly similar.

Figures 1–8 provide an annotated introduction to some of the items in the *Jihan 1*'s cargo and their relevance to CAR investigations in Bahrain, Yemen, and the broader region.

THE MATERIEL ON THE *JIHAN 1* WAS CONSISTENT WITH WEAPONS PREVIOUSLY INSPECTED BY THE PANEL, WHO CONCLUDED IT HAD ORIGINATED IN IRAN.

Figure 1

Boxed M112 plastic explosive, recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013. Of Iranian production, this explosive is frequently used in the manufacture of IEDs in Bahrain and Yemen, as discussed below.

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Figure 2

Wooden crates containing Chinese- and Iranian-manufactured 7.62 x 39 mm ammunition, recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013. The marks on most of the crates have been overpainted to conceal their provenance. In other cases, labels affixed to the boxes have been scratched to remove key identifying information.

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Figure 3

Obliteration performed by the scratching of marks applied to a crate containing small-calibre ammunition, recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013.

© United Nations

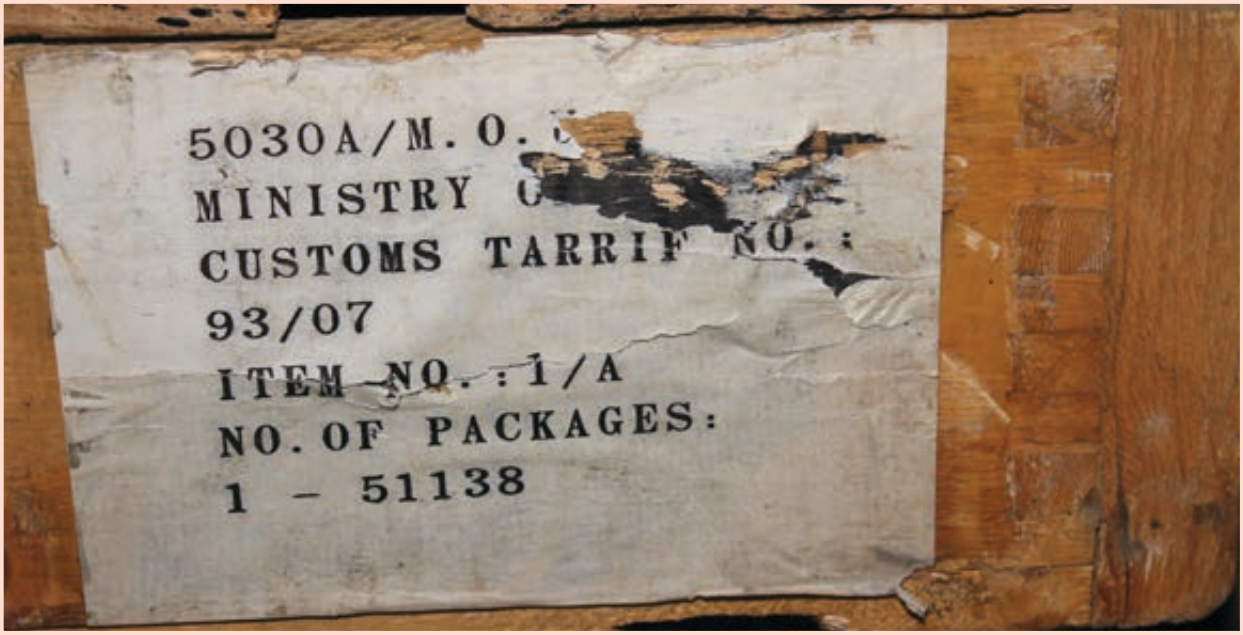

Figure 4

Label affixed to a crate containing small-calibre ammunition, recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013. The label has been scratched in an attempt to remove identifying information (in the same fashion as shown in Figure 3). In this case, parties have attempted to obliterate details pertaining to an Iranian military body, the Ministry of Sepah. The obliteration of thousands of marks in the shipment was clearly a time-consuming process and, as evidenced here, not all such efforts were effective. The Ministry of Sepah was the name of the dedicated government body of the Iranian Revolutionary Guards Corps between 1982 and 1989. It was then integrated into the Ministry of Defence and Armed Forces Logistics.

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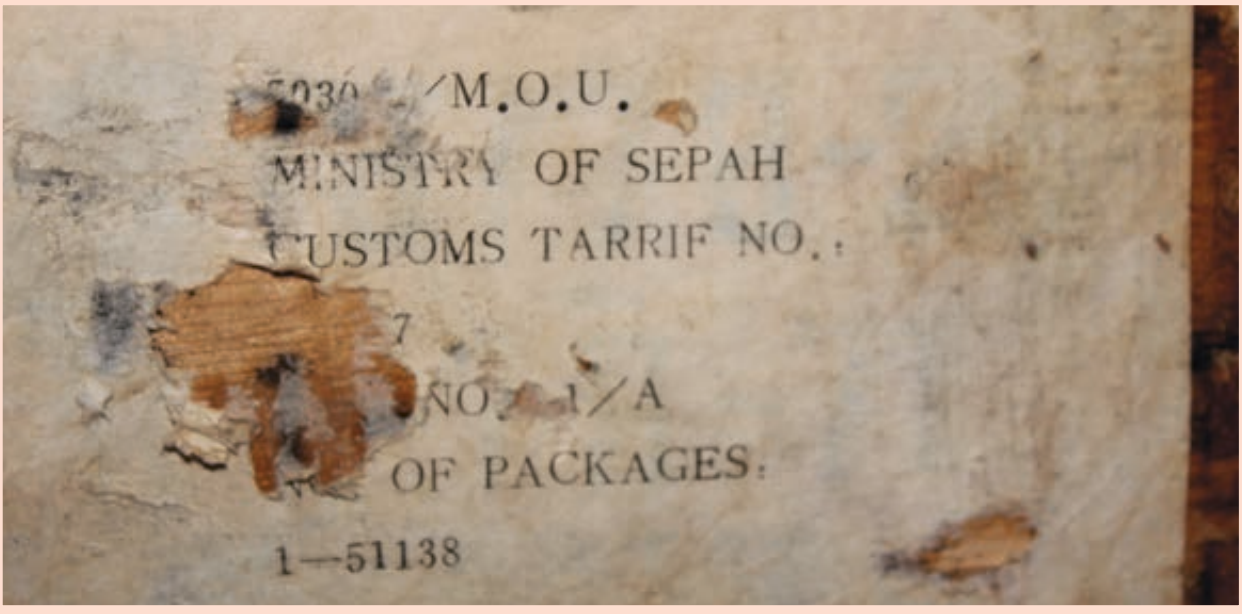

Figure 5

A box containing RCIED kits, recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, 24 February 2013.

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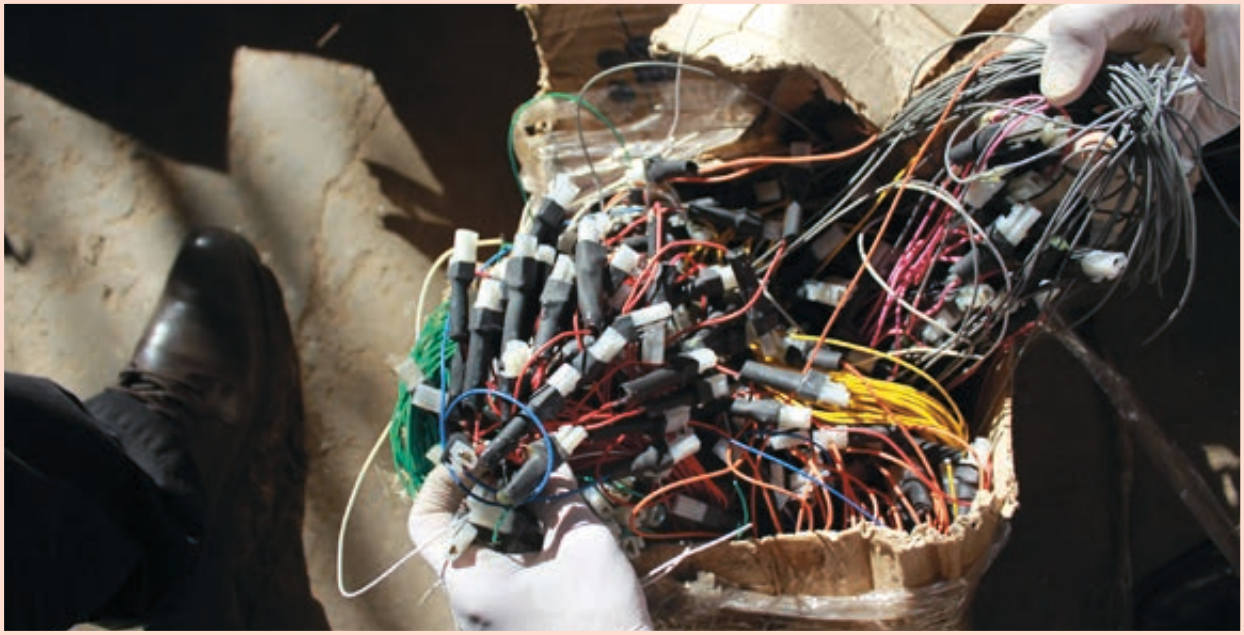

Figure 6

Plastic cans containing cyclotrimethylenetrinitramine high explosive, commonly known as RDX, recovered from the Jihan 1 and documented by UN investigators in Aden, Yemen, 24 February 2013.

© United Nations

Figure 7

HME precursors, recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, 24 February 2013.

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Figure 8

Electronic IED components, recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013. As presented below, these recoveries match items subsequently recovered in Bahrain and Yemen and documented by CAR.

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DOCUMENTATION

This section presents materiel documented by CAR in Bahrain, following its recovery from militant factions in the country during successive operations conducted between 2013 and 2018. CAR documented selected items of the total volume of materiel recovered by Bahraini forces. CAR has compared each item of Bahraini materiel with ones documented elsewhere in the region, including those recovered in the *Jihan 1* seizure and seizures from Houthi forces in Yemen.

During the course of its investigations in Bahrain, CAR documented examples of all five main IED components: the power source, switch, detonator, main charge, and container. As described below, there are considerable similarities between this materiel and device components recovered during the *Jihan 1* seizure and in the course of Saudi-led Arab coalition operations in Yemen.

MAIN CHARGES

Between 2013 and 2018, security forces in Bahrain recovered a range of military-grade explosives, HME, associated HME precursor chemicals, and main charge components. The materiel documented by CAR was recovered in three conditions:

in its raw state, which pertains exclusively to explosives and precursors; as unfilled main charges, such as EFP containers awaiting an explosive fill; and, in two cases, as complete (filled) main charges.[4]

Military-grade high explosive

The seized military-grade, secondary high explosive includes TNT, RDX, and plastic explosive.[5] All of the plastic explosive (at least 38 blocks) is of Iranian manufacture and bears the model designation M112.[6] CAR documented two M112 blocks (see Figure 9), which Bahraini security forces had recovered during operations against the Al Ashtar Brigades and Bahraini Hezbollah militant factions between August 2017 and February 2018. On 14 October 2019, CAR issued a formal trace request to the Islamic Republic of Iran for information on exports of this materiel, but it has yet to receive a response.

Figure 9

Two blocks (inner packaging) of Iranian-manufactured M112 plastic explosive.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

CAR has documented Iranian-manufactured M112 plastic explosives—which is packaged in 1.25 lbs (560 g) 'blocks'— in three countries: Bahrain, Iraq, and Yemen.

In Yemen, CAR documented M112 blocks in January 2018, following their recovery from Islamic State forces in Aden (see Figure 10). The lot and year marks of these blocks are identical to those of M112 blocks seized on board the *Jihan 1*.[7] It is possible that the blocks originated from the storage facility that was used to house the seized *Jihan 1* materiel, and which may have been looted following the outbreak of civil war in 2015.

Notably, the lot numbers on M112 blocks recovered from militant factions in Bahrain that were documented by CAR differ from those of blocks recovered from the *Jihan 1* (see Figures 10–11) and subsequent seizures in Yemen. Their lots also differ from those of M112 blocks documented by CAR following recovery from Islamic State forces in Iraq. These findings indicate that while Iranian-manufactured M112 plastic explosive circulates among non-state groups in the region, there is insufficient information (notably corresponding lot numbers) to suggest a common supply source for any of the groups concerned.

Figure 10

M112 plastic explosive (outer packaging containing six blocks) recovered from Islamic State forces in Aden, Yemen. The lot and date stamps on the packaging are identical to those of the M112 blocks recovered from the *Jihan 1*.

Documented by a CAR field investigation team in Aden, Yemen, on 11 January 2018.

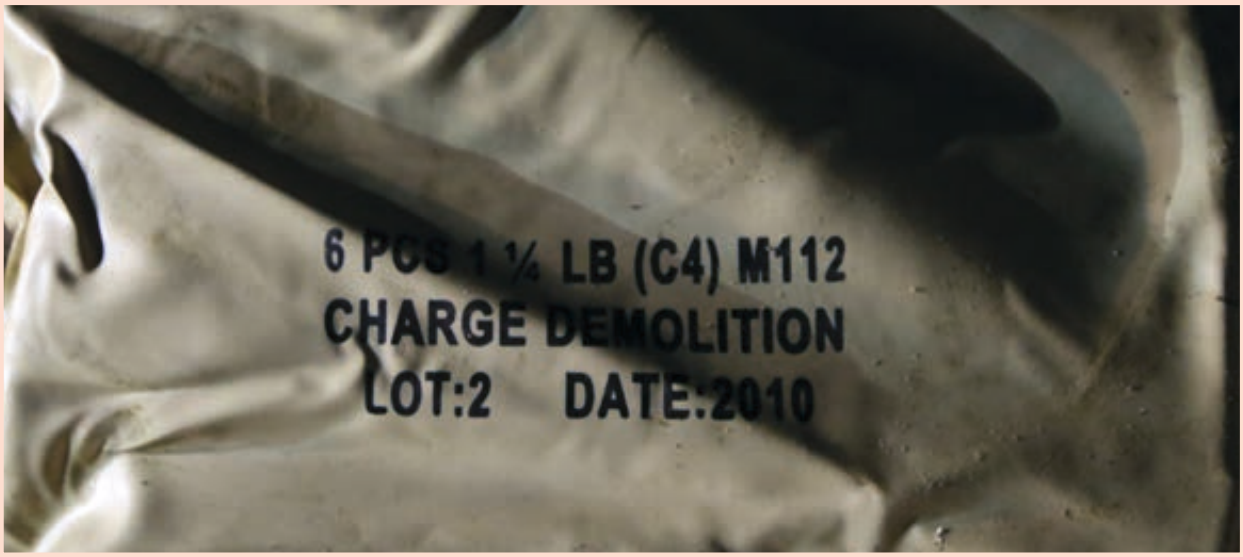

Figure 11

Crates containing M112 plastic explosive, recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013.

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In addition to plastic explosives, CAR field investigation teams also documented military-grade TNT explosives in Bahrain. In two cases, the TNT appears to have served as the main charge in an improvised DFC; the explosive was probably cast (moulded) into the DFC container (see Figure 12).

Figure 12

Probable cast TNT main charge for use in an improvised DFC.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Homemade explosives

Nitrate-based HME, intended for use in IED main charges, constitutes the largest proportion of seized high explosives in Bahrain, totalling approximately four tonnes of explosive. Since 2012, Bahraini security forces have also recovered peroxide-based HME in improvised detonators.[8]

Since 2015, Bahraini security forces have become increasingly concerned about discoveries of IED laboratories and production facilities in the country. This emerging trend points to IED technology transfers from external sources—possibly backed up by supplies of IED components, as discussed below. If such transfers are taking place, domestic militant factions may be able to acquire the capacity to develop and manufacture IEDs without external assistance and without depending on extra-territorial supply chains, which are at increased risk of interdiction.[9]

The availability of common HME precursors within Bahrain compounds the problem of domestic IED production. Bahrain has significant domestic industrial output of ammonium fertilizer products, which are key precursors for ammonium nitrate-based HME (Thapliyal, 2018).

In April 2018, a CAR field investigation team documented such chemical precursors for ammonium nitrate-based HME. Between August 2017 and February 2018, Bahraini security forces recovered the materiel in various locations during operations against the Al Ashtar Brigades and Bahraini Hezbollah militant cells (see Figures 13–15). The blue chemical barrels pictured in Figures 13 and 14 appear to contain ammonium nitrate. The urea nitrate, manufactured by the Bahraini company Gulf Petrochemical Industries Co. and depicted in Figures 14 and 15, contains a sufficiently high percentage of nitrate to facilitate HME production.[10]

Figure 13

Chemical barrels containing probable ammonium nitrate and other HME precursors and granular urea manufactured in Bahrain, recovered from Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 14

Left: Probable ammonium nitrate. Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018. Right: Probable ammonium nitrate prills.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 15

Granular urea with a high nitrate content manufactured in Bahrain.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

There is some evidence to suggest that the increasing domestic capacity of militant factions to manufacture HME—and IEDs more broadly—may extend from Bahrain to nearby regions of Saudi Arabia. Consequently, Bahraini security forces have interdicted IED components, weapons, and ammunition travelling in both directions over the King Fahd Causeway, which links Bahrain to eastern Saudi Arabia.[11]

On 18 December 2017, a CAR field investigation team in Riyadh, Saudi Arabia, documented materiel recovered by Saudi Arabian security forces during operations conducted in April 2017 in the town of Al-Awamiyah, Saudi Arabia. Al-Awamiyah is a Shia-majority town approximately 90 km northwest of the King Fahd Causeway. Among a range of weapons and IED components, Saudi Arabian forces seized nitrate-based HME—in this case, a binary explosive produced by mixing ammonium nitrate and aluminium powder, which is known as ANAL (see Figure 16).

These findings may provide further indications of cross-border sharing of HME precursor supply sources.

Figure 16

ANAL HME recovered from militant factions in Al-Awamiyah, Saudi Arabia, in April 2017.

Documented by a CAR field investigation team in Riyadh, Saudi Arabia, on 18 December 2017.

MAIN CHARGE CONFIGURATIONS

CAR field investigation teams documented three types of main charge configuration in Bahrain: explosively formed projectiles, improvised directional fragmentation charges, and devices constructed to be attached (usually by magnets) to the underside of vehicles.

Explosively formed projectiles

EFPs employ a shallow-profile copper liner, which, when initiated, centrally deforms the liner into a high-velocity projectile capable of defeating armour.

Militant factions in Bahrain appear to have first received EFPs in 2013. A Bahraini security source reports that the first interdiction of foreign-supplied EFPs, transported to the kingdom by boat, occurred in December 2013. In addition to a range of weapons, ammunition, and RCIED electronic components, the shipment contained 12 EFPs (see Figure 17).[12]

Figure 17

EFPs recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 18

An EFP recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

The seized EFPs have a depth of 80 mm and feature copper liners with a diameter of 68 mm (see Figure 18). The devices are sealed at the rear with a press cap, through which a length of teal-coloured detonating cord passes.

The teal-coloured detonating cord closely resembles a spool of detonating cord that CAR documented in Saudi Arabia following its recovery in the aforementioned April 2017 operation in Al-Awamiyah (see Figure 19). The strong similarity suggests that the detonating cord recovered from the boat in Bahrain and the spool of detonating cord recovered in Saudi Arabia originate from the same source. However, because the detonating cord lacks markings (notably lot numbers), this assumption cannot be confirmed.

Figure 19

Left: Teal-coloured detonating cord inserted through the rear cap of an EFP recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Right: Detonating cord recovered from militant factions in Al-Awamiyah, Saudi Arabia, in April 2017.

Documented by a CAR field investigation team in Riyadh, Saudi Arabia, on 17 December 2017.

By around 2015, militant factions had started to manufacture EFPs domestically. In September 2015, and again in 2016, Bahraini security forces uncovered EFP production facilities that employed hydraulic presses to manufacture copper EFP liners.[13]

Between 27 and 29 September 2015, for example, Bahraini police conducted a series of raids in Nuwaidrat village, south of Manama, Bahrain. Bahraini officials report having uncovered a network of caches and a production facility containing dual-use industrial equipment, including lathes and a hydraulic press for manufacturing EFP copper liners.[14] In addition to the equipment, security forces recovered an unrecorded number of EFPs, more than one tonne of high explosives (including TNT and Iranian-manufactured M112 plastic explosives, as shown in Figure 9), improvised DFCs, small arms, and 20 hand grenades.

On 22 July 2017, a CAR field investigation team documented an EFP seized during the operations (see Figure 20). The device appears to be constructed from green plastic plumbing components, has a copper liner, but contains no explosive fill.

Figure 20

An EFP recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 22 July 2017. The device measures 96 mm in length and has an overall diameter of 108 mm.

Subsequently, on 23 June 2017, Bahraini security forces conducted operations in Dair village, just to the north of Bahrain International Airport. The operation recovered an unrecorded number of EFPs, improvised DFCs, RCIED circuits, UVIEDs, 7.62 x 39 mm ammunition manufactured in Iran and China, and .32 calibre ammunition manufactured in Serbia.

The following month, a CAR field investigation team documented one of the EFPs recovered during the operation. The device matches the one recovered during the above-mentioned Nuwaidrat operations of nearly two years earlier. This finding suggests one of two possible scenarios: 1) the militant faction maintained its EFP production capability despite the capture of a production facility and materials two years earlier, or 2) the Nuwaidrat facility had already manufactured and disseminated EFPs to allied militant cells. Dair and Nuwaidrat villages are 24 km apart.

The copper liners in the EFPs documented by CAR following recovery in Nuwaidrat and Dair each measure 5 mm in depth at the rim of the liner and 18 mm in depth when measured at the centre of the liner. The diameter of each liner is 94 mm (see Figures 21–23). The external dimensions of the devices are also identical (see Figure 20).

Figure 21

An EFP recovered by Bahraini security forces in Dair village, Bahrain, on 23 June 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 22 July 2017.

Figure 22

Copper liner from an EFP recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 22 July 2017.

Figure 23

Copper liner from an EFP recovered by Bahraini security forces in Dair village, Bahrain, on 23 June 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

The production of EFPs in the immediate region is not restricted to Bahrain. The April 2017 Saudi Arabian operations in Al-Awamiyah, for example, also recovered EFPs, copper liners, and a hydraulic press capable of manufacturing copper liners.

The EFPs shown in Figures 24 and 25 differ in design from those recovered in Dair and Nuwaidrat, yet Saudi Arabian forces also recovered a wide range of components and other materiel (such as detonating cord, ANAL, and ammunition) that are identical to materiel circulating in Bahrain. The recovery—together with a seizure of EFPs destined for Saudi Arabia from Bahrain on 18 May 2015 (Knights, 2016)—indicates that militant factions in the two countries share resources and expertise.

Figure 24

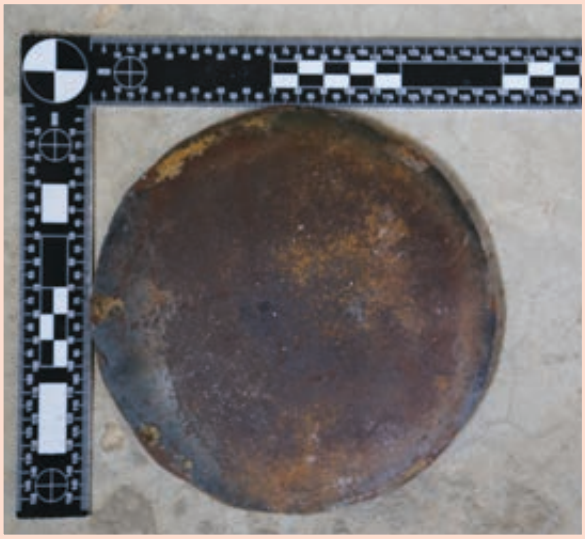
The body, rear cap, copper liner, and ANAL main charge of an EFP recovered from militant factions in Al-Awamiyah, Saudi Arabia, in April 2017.

Documented by a CAR field investigation team in Riyadh, Saudi Arabia, on 17 December 2017.

Figure 25

Copper liner of approximately 170 mm in diameter from an EFP recovered from militant factions in Al-Awamiyah, Saudi Arabia, in April 2017.

Documented by a CAR field investigation team in Riyadh, Saudi Arabia, on 17 December 2017..



Improvised directional fragmentation charges

Bahraini security forces recovered improvised DFCs in six of the eight operations conducted between 2013 and 2018.

Militant factions in Bahrain construct DFCs using square-profile charges of the 'Claymore' type (see Figures 26 and 27) and cylindrical cases, which resemble the EFPs described above (see Figure 28). IED attacks that militants in Bahrain have successfully executed have primarily used improvised DFCs.

Bahraini security forces recovered 31 improvised DFCs from the above-mentioned boat interdiction of December 2013. In July 2017, a CAR field investigation team documented one of the DFCs in Manama, Bahrain (see Figure 26).

On 20 April 2018, a CAR field investigation team documented one improvised DFC, which Bahraini security forces had seized during a series of operations between August 2017 and February 2018, when they targeted the Al Ashtar Brigades and Bahraini Hezbollah cells.[15]

The DFC recovered in the operations is similar in construction to other improvised DFCs seized in Bahrain. Unlike DFCs previously documented by CAR in Bahrain, however, it contained a complete explosive fill. The fill appears to be cast TNT, which features a cavity to accommodate a detonator. The use of TNT in this manner demonstrates a level of technical knowledge within the construction process. The item appears to be nearly identical in construction to the DFCs recovered from the 28 December boat interdiction described above. The similarity suggests that militant factions either had access to the same supply chain four years later, had successfully copied the improvised DFCs, or were able to store the items undiscovered for a number of years after receiving them.

Figure 26

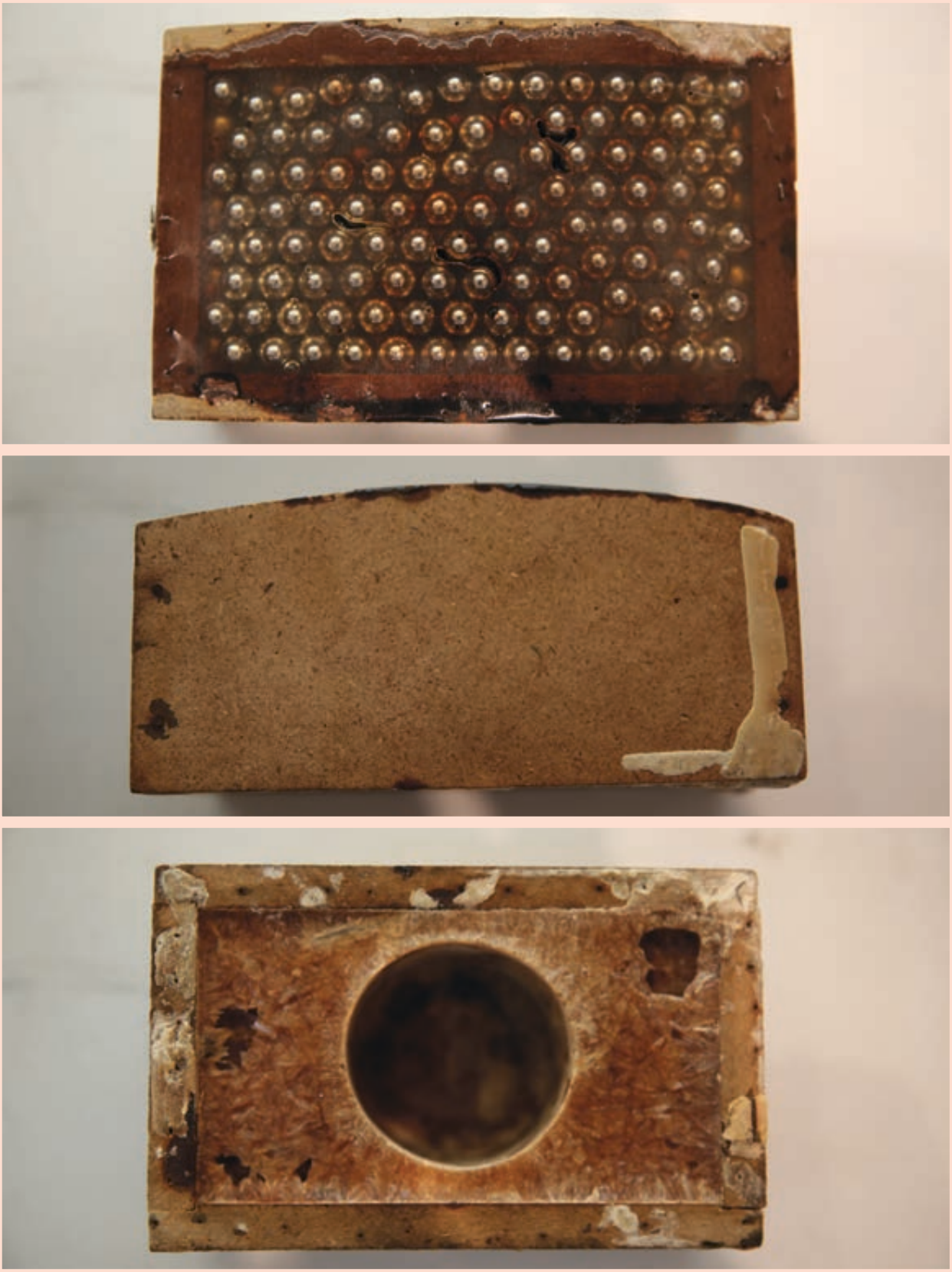
An improvised DFC with a probable cast TNT main charge and steel ball bearing fragmentation matrix, recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 27

A complete improvised DFC with cast TNT main charge and steel ball bearing fragmentation matrix, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.



Focused-charge IEDs

In July 2017, a CAR field investigation team documented 12 IEDs, which Bahraini security forces had recovered during the Nuwaidrat operations (see Figure 28). The devices are similar in construction to the EFPs captured during the same operations (see Figure 20), yet they differ from the EFPs in that they are fitted with four external brackets, which may be used to affix the device to a target. The IED containers appear to be made of material that is similar to those used for the EFPs.

Instead of copper liners, however, the devices are fitted with repurposed ladles or dishes, which are designed to focus the blast effect of the main charge.

This type of focused charge device with added brackets is probably intended for use against static, reinforced targets. In November 2017, militant factions reportedly made successful use of similar devices against the main oil pipeline linking Saudi Arabia to refineries in Bahrain.[16]

Figure 28

A focused-charge IED recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 22 July 2017.

MAGNETIC UNDER-VEHICLE IEDS

Bahraini security forces captured UVIEDs with radio-controlled triggers during three operations. These UVIEDs employ an anti-personnel main charge, which is intended for use in targeted attacks on individuals. UVIEDs are typically placed under the seat of a car, where the targeted individual sits. Despite the presence of these devices, there are no reports of UVIED attacks in Bahrain. CAR field investigation teams have documented a total of 11 UVIEDs in the country.

In July 2017 a CAR field investigation team documented five UVIEDs, which were recovered during the 28 December 2013 boat interdiction described above (see Figures 29–31). The IED containers are constructed from plastic electric junction boxes, which hold steel ball bearing fragmentation matrices. Four of the items have two circular magnets attached to one side for placement underneath or on a vehicle (see Figure 30), while one device employs a single, large magnet (see Figure 32). Detonating cord protrudes from the front and rear of the device shown in Figure 31.

Figure 29

A UVIED recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 30

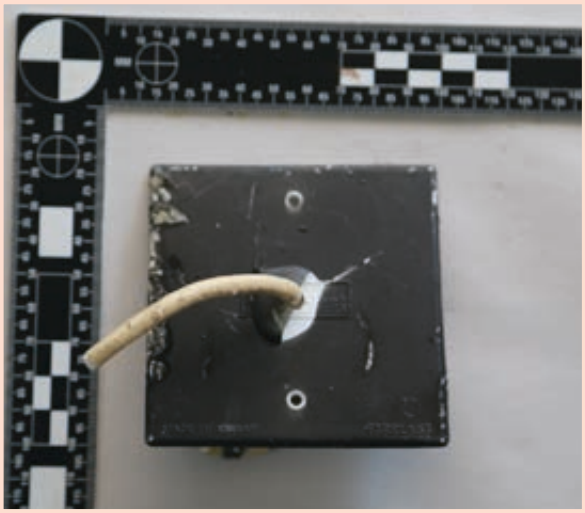
UVIED recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 31

UVIED recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017. One side of the container is painted black, probably to aid concealment when the device is affixed beneath a targeted vehicle.



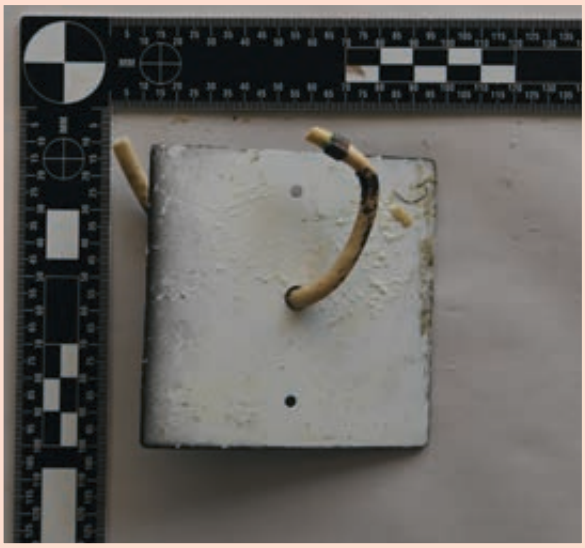
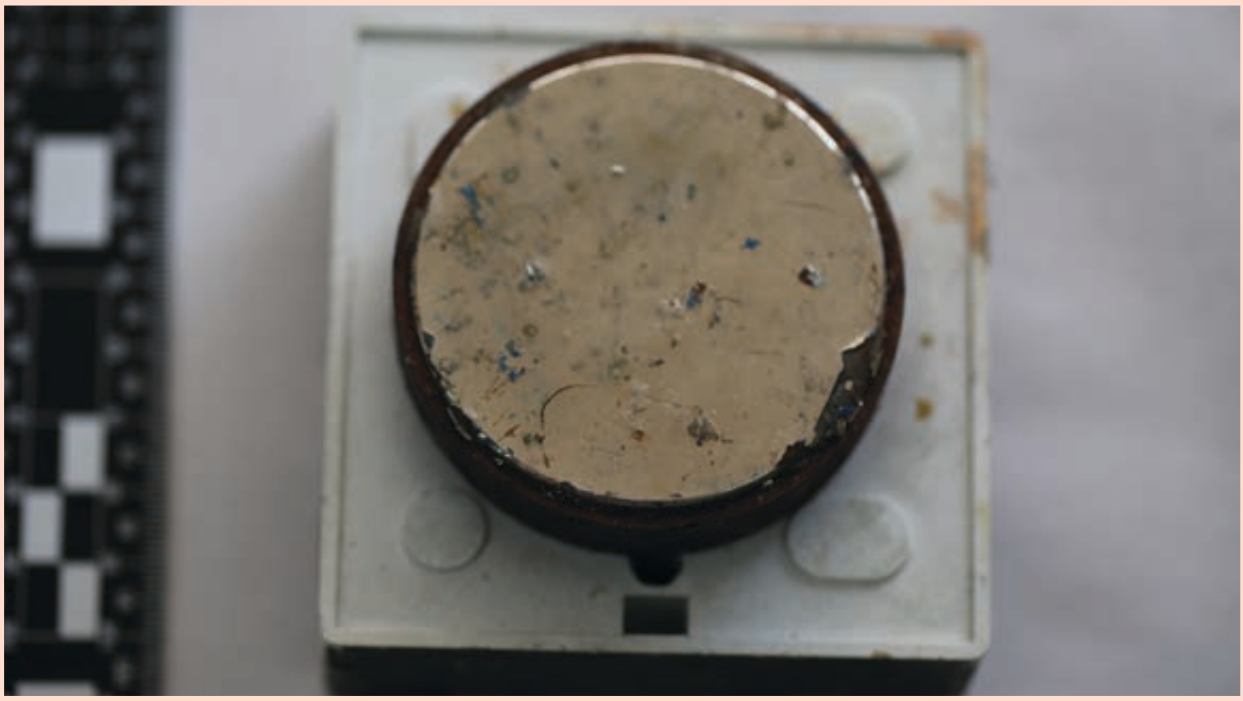


Figure 32

A UVIED recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.



A CAR field investigation team also documented a UVIED, which Bahraini security forces recovered during the aforementioned operation in Dair village on 23 June 2017. This device includes a receiver with circular magnets for possible attachment to the intended target (see Figure 33) and a commercial transmitter (see Figure 34). The device had not been filled with explosives. It matches transmitters that CAR documented in Yemen, following recovery from Houthi forces, and ones that the UN Panel of Experts on Yemen recorded when investigating the *Jihan 1* seizure (see the section on RCIED electronics, below).[17]

Figure 33

Magnetic UVIED case, recovered by Bahraini security forces in Dair village, Bahrain, on 23 June 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

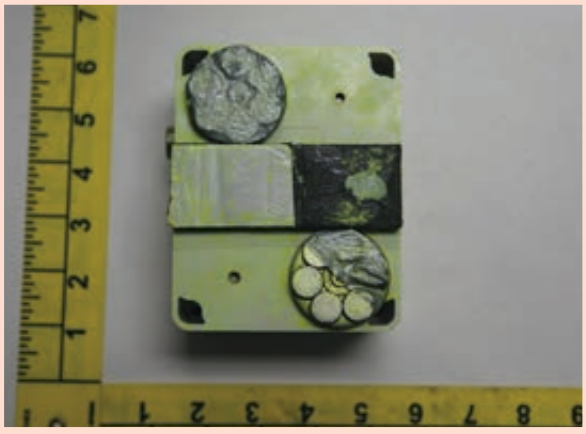


Figure 34

A radio-controlled transmitter captured with the UVIED shown in Figure 33, recovered by Bahraini security forces in Dair village, Bahrain, on 23 June 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Later, in April 2018, a CAR field investigation team documented UVIEDs that Bahraini security forces had recovered during operations against the Al Ashtar Brigades and Bahraini Hezbollah between August 2017 and February 2018 (see Figures 35–38). The UVIEDs were recovered among a range of materiel, including Iranian-manufactured plastic explosives, improvised DFCs, other fragmentation IEDs, and Iranian-manufactured anti-personnel rockets (see Figure 35).

Figure 35

UVIEDs and military plastic explosives, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

As with the UVIEDs captured in Dair village, the transmitters and receivers recovered with the magnetic UVIEDs appear to be identical to materiel that CAR documented after it was recovered from Houthi forces in Yemen and found on board the *Jihan 1*.

Importantly, the circuit boards and electronic components inside the transmitter display signs of attempted mark obliteration through the application of black paint (see Figures 37 and 38). The obliteration of identifying marks, such as serial numbers and date codes, which might otherwise have permitted tracing of the items' chains of custody, indicates that an attempt was made to conceal their provenance.

The obliteration of marks on IED components is rare in CAR's numerous areas of operations around the globe; the only example is an obliteration of marks from an IED component recovered from Houthi forces in Yemen.

Figure 36

UVIED and radio-controlled receiver, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 37

Obliteration of markings on an RCIED circuit board, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

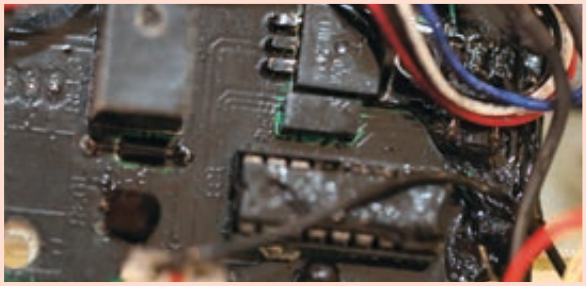
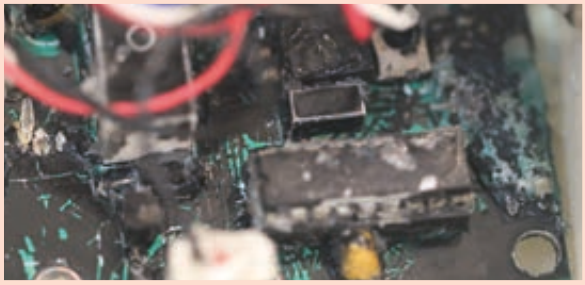


Figure 38

Attempted obliteration of markings on an RCIED circuit board, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.



COMMAND AND VICTIM-OPERATED SWITCHES

During five of the eight seizures documented by CAR, Bahraini forces recovered command-operated transmitter and receiver RCIED electronics kits and victim-operated PIR trigger components.

It is probable that external networks supplied the switch kits, because many of their characteristics correspond to similar kits that CAR documented in Yemen or that were recovered from the *Jihan 1*. The RCIED kits and PIR sensors can be used together, with the radio-controlled units receiving the arming signal for the IED, which functions when the PIR sensor is tripped. The main charge types and two switch systems are modular and can be used together in different combinations.

RCIED electronics

CAR field investigation teams documented hundreds of RCIED electronic components recovered from militant factions in Bahrain between 2013 and 2018.

These kits are used within IEDs that are initiated by radio signal and provide the attacker with a stand-off attack capability. Once the circuit has been armed, it is completed when the mobile phone receives the attack signal from the transmitter.

Three such kits look identical in construction. Two of them feature what appears to be a serialised mark applied to the blue heat-shrink sleeving, which protects the circuit boards from moisture (see Figures 39 and 42). Marks on the components of one circuit board bear signs of attempted obliteration. It is likely that the producer of these kits mass-produced them in a workshop, as indicated by the serialised marks and obliterated internal component marks. The RCIED kits are similar in construction to, and contain the same components as, RCIED kits documented by CAR in Yemen following recovery from Houthi forces, and kits found on board the *Jihan 1*.[18]

Figure 39

An RCIED receiver, recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 40

Attempted obliteration of marks on the circuit board components of an RCIED kit, which Bahraini security forces recovered from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 41

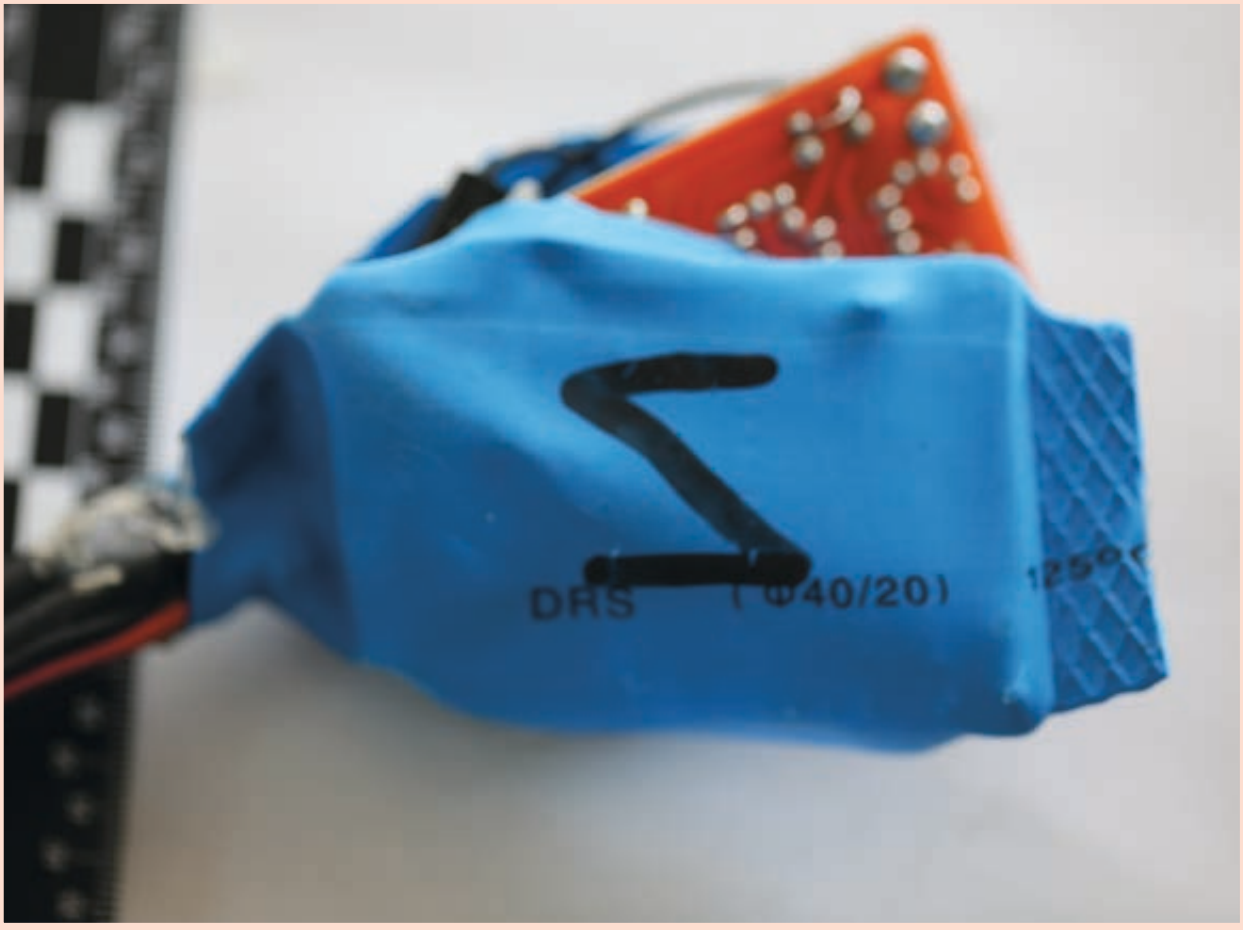
Attempted obliteration of marks on a circuit board component in an RCIED kit, which Saudi-led Arab coalition forces captured from Houthis in 2018.

Documented by a CAR field investigation team in Mokha, Yemen, on 17 July 2018.

Figure 42

Hand-written serialisation mark on heat-shrink sleeving, recovered by Bahraini security forces from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.



On 15 March 2015, Bahraini security forces searched a passenger bus after it crossed into the kingdom from Saudi Arabia. Bahraini officials report that the bus carried Bahraini pilgrims who were returning from the Shia holy cities of southern Iraq.[19] The security forces recovered a number of electronic components that had been concealed inside a video cassette recorder (see Figure 43).

One of the receivers found within the video cassette recorder contained brands and models of electronic components that are identical to those CAR has documented in other RCIED kits recovered by Bahraini forces (see Figure 44). A second receiver kit was identical in construction and components to a kit that was recovered by Bahraini security forces from a boat on 28 December 2013 as well as a kit captured in Sadad village, Bahrain, on 13 March 2017 (see Figure 45).

Like the RCIED kits discussed above, the boat and bus kits feature handwritten marks that may indicate serialisation. Many of the electrical components in all three kits—which were captured in different locations and sometimes years apart—are identical in makes and models, such as two MT8770DE integrated dual-tone multi-frequency (DTMF) receivers (see Figures 46 and 47).

The items were probably either transported from Iraq, or placed on the bus during a stop in Saudi Arabia. Due to the attempt by Bahraini militants to transport EFPs into Saudi Arabia, it is probable that these militant factions have a relationship with counterparts in the Eastern Province of Saudi Arabia (Embassy of the Kingdom of Bahrain, 2015).

Figure 43

RCIED components concealed inside a video cassette recorder, which Bahraini security forces recovered from a bus on 15 March 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 44

An RCIED receiver, which Bahraini security forces recovered from a bus on 15 March 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

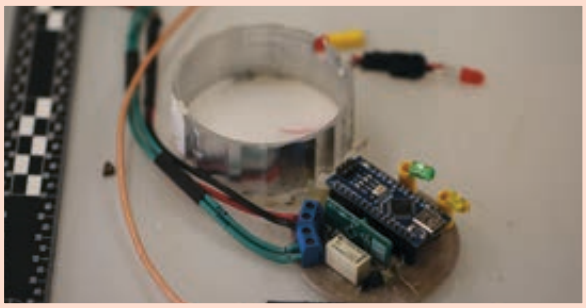


Figure 45

An RCIED receiver, which Bahraini security forces recovered from a bus on 15 March 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Further, receivers in the Nuwaidrat and Sadad kits have identical date codes, as does the kit recovered on the bus traveling from Iraq (see Figures 46 and 47). The markings on the two MT8770DE receivers indicate that the manufacturer is Mitel Networks Corporation, an electronics company based in Ottawa, Canada. CAR traced the items with Mitel Networks Corporation, which confirmed that it did not manufacture the two MT8770DE DTMF receivers because the company discontinued use of this type of component prior to 2006/7, when these receivers were probably manufactured.[20] In 2001, Mitel Networks Corporation's semi-conductor business was sold and renamed Zarlink Semiconductor Inc, and thus the components may have been produced by Zarlink, which itself was bought by the US-based Microsemi Corporation in October 2011 (McCrank and Jordan, 2011).

CAR subsequently traced the items with Microsemi Corporation. The company confirmed that the marks on each of the two MT8770DE DTMF receivers do not match the marks of authentic MT8770DE parts and, further, that the MT8770DE DTMF receiver with serial number 0638C appears to have been sanded and remarked.[21] The identical characteristics of the RCIED kits recovered from Nuwaidrat village and during the bus seizure—including the same counterfeit components, which bear the same date codes—suggest that the two kits were constructed by the same manufacturer.

Figure 46

Date code on an RCIED component, which Bahraini police recovered during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

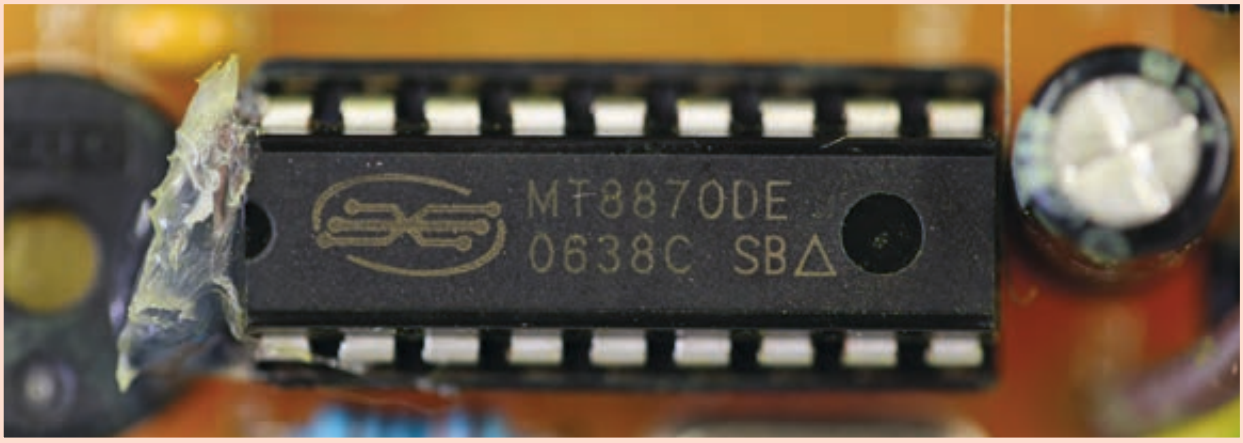


Figure 47

Identical date code on a component from an RCIED kit, which Bahraini security forces recovered in Sadad village, Bahrain, on 13 March 2017.

Documented by a CAR a field investigation team in Manama, Bahrain, on 23 July 2017.

The construction of kits recovered in various security force operations in Bahrain is either similar or identical to that of RCIED kits documented by CAR following recovery from Houthi forces in Yemen and kits found on board the *Jihan 1* (see Figures 48–52).

Figure 48

An RCIED receiver in a circular container with safe-to-arm lights, which Bahraini security forces recovered from a bus on 15 March 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

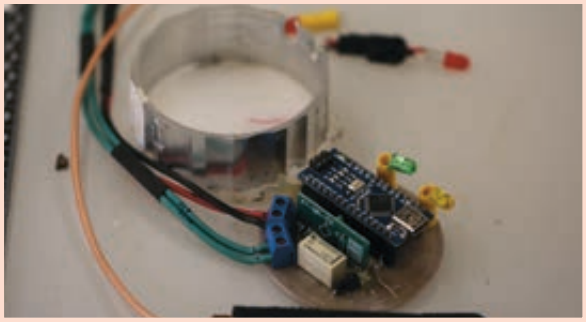


Figure 49

An RCIED receiver kit with a similar safe-to-arm light configuration, recovered by Arab coalition forces from Houthi combatants in western Yemen in early 2018.

Documented by a CAR field investigation team in the United Arab Emirates (UAE) on 26 April 2018.

Figure 50

An RCIED receiver kit recovered from Houthi forces in western Yemen.

Documented by a CAR field investigation team in the UAE on 26 April 2018.

Figure 51

An RCIED receiver, which Bahraini security forces recovered from a boat on 28 December 2013.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 52

An RCIED kit recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013.

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In July 2017, a CAR field investigation team documented RCIED transmitters and receivers, which Bahraini security forces recovered during the aforementioned operations in Nuwaidrat village in September 2015 (see Figures 53–55). Security forces recovered more than 200 of these paired sets, whose cases are constructed from medium-density fibreboard. These are the only RCIED components documented in Bahrain that are reportedly manufactured by militant factions themselves.[22]

Figure 53

A transmitter manufactured by Bahraini militant factions, recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

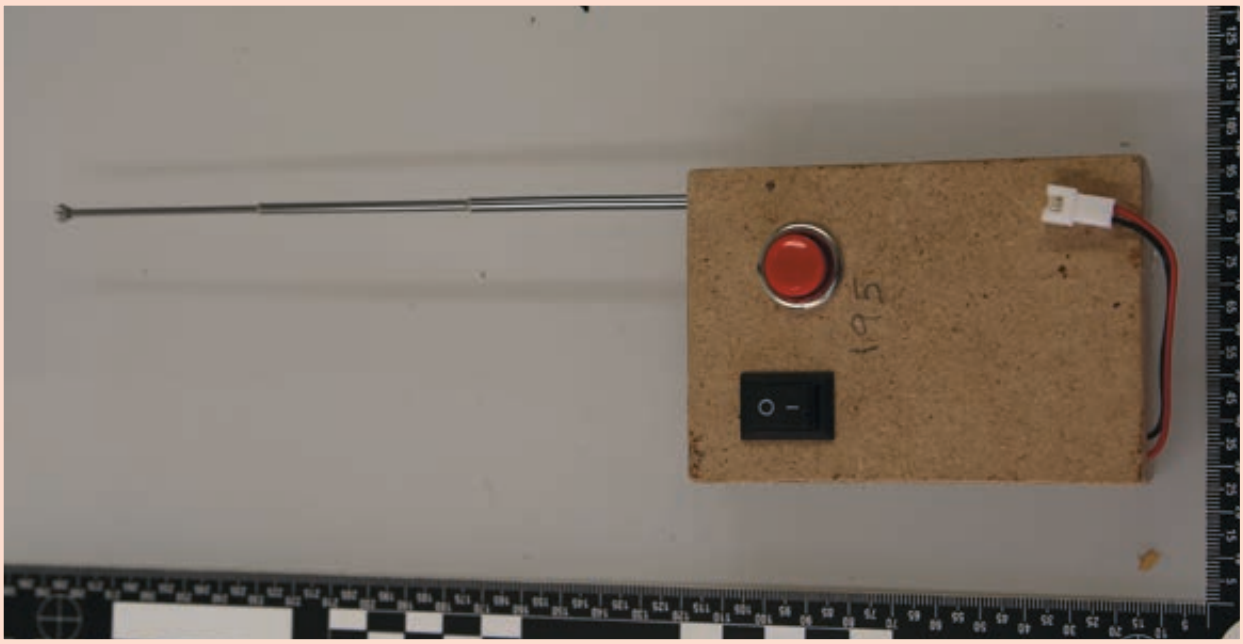


Figure 54

A receiver manufactured by Bahraini factions, recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

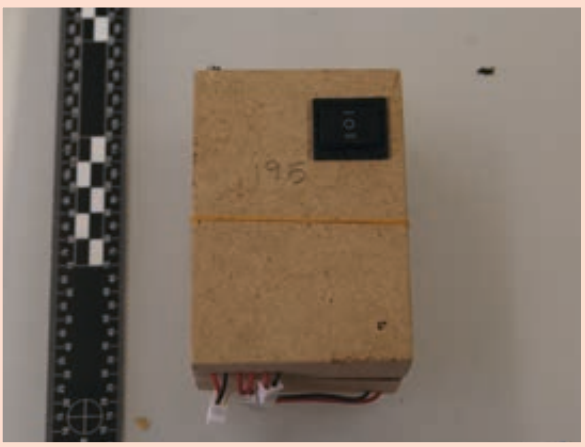
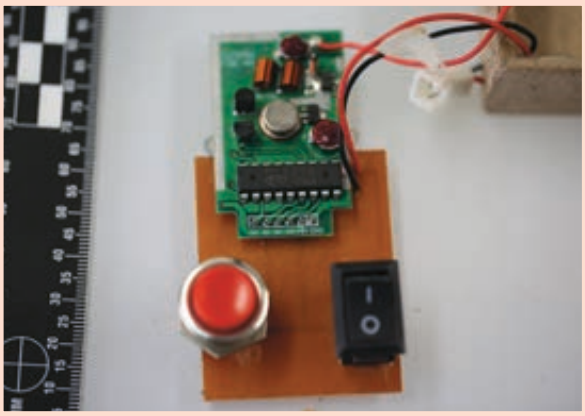


Figure 55

Internal components of a transmitter manufactured by Bahraini factions, recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.



CAR also documented transmitters and receivers that were recovered in a number of operations in Bahrain and that are similar to items recovered from Houthi forces in Yemen and found aboard the *Jihan 1* (see Figures 56–60).

Figure 56

An RCIED receiver recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013.

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Figure 57

An RCIED receiver, recovered by Bahraini security forces in Dair village, Bahrain, on 23 June 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 58

An RCIED transmitter recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

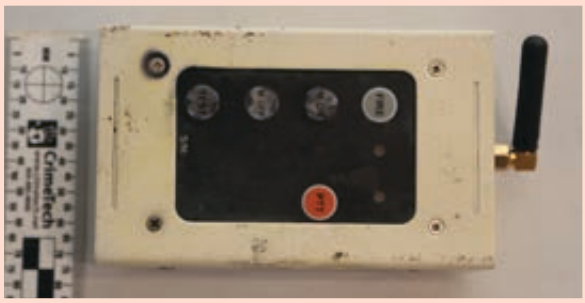


Figure 59

An RCIED switch box recovered from Houthi forces in Yemen.

Documented by a CAR field investigation team in Mokha, Yemen, on 17 July 2018.

Figure 60

An RCIED switch box recovered from Houthi rebels in western Yemen.

Documented by a CAR field investigation team in the UAE in April 2018.

PIR sensor victim-operated switches

CAR documented PIR sensor switches, which Bahraini security forces recovered during three of the operations addressed in this report.

In July 2017, a CAR field investigation team documented PIR sensor firing switches recovered by Bahraini security forces during operations in Nuwaidrat village in September 2015 (see Figures 61 and 62).

Figure 61

A PIR trigger kit, recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

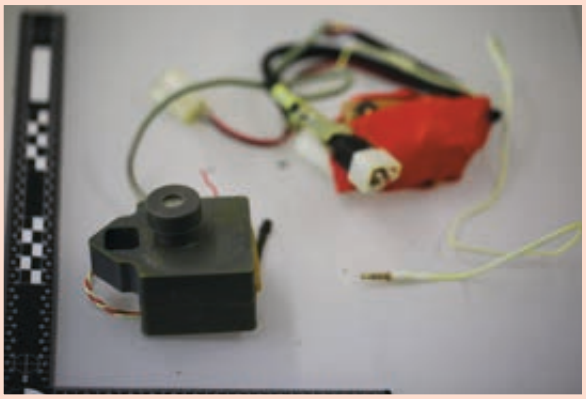
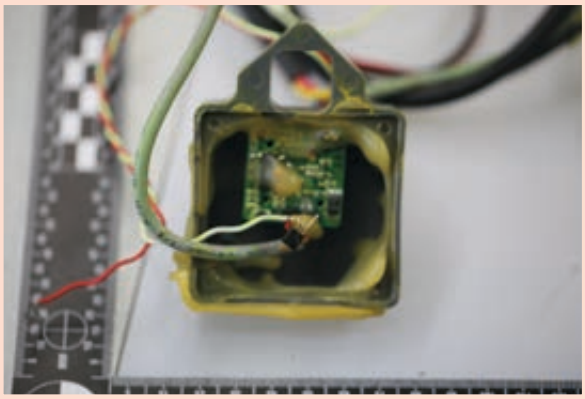


Figure 62

A PIR sensor, recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.



On 13 March 2017, Bahraini security forces also recovered PIR sensors and electronic components during operations in Sadad village, Bahrain. In July of the same year, a CAR field investigation team documented a number of these components (see Figures 63 and 64). The components shared characteristics with items recovered from militant factions elsewhere in Bahrain, including the same makes and models of electronic components and the attempted obliteration of circuit board marks.

Figure 63

A PIR sensor trigger, recovered by Bahraini security forces during operations in Sadad village, Bahrain, on 13 March 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 22 July 2017.

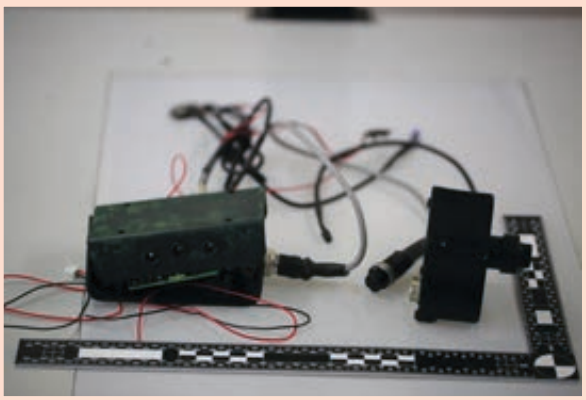
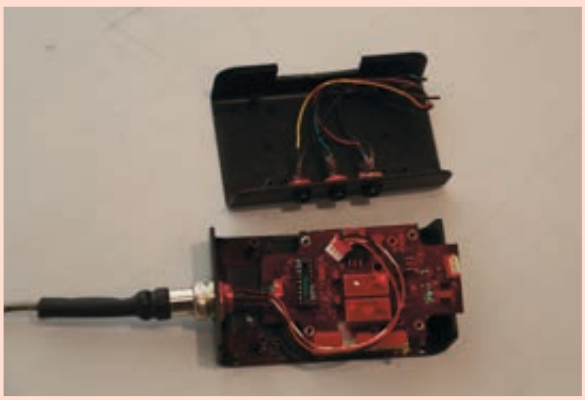


Figure 64

Internal components of a PIR sensor trigger, recovered by Bahraini security forces during operations in Sadad village, Bahrain, on 13 March 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 22 July 2017.

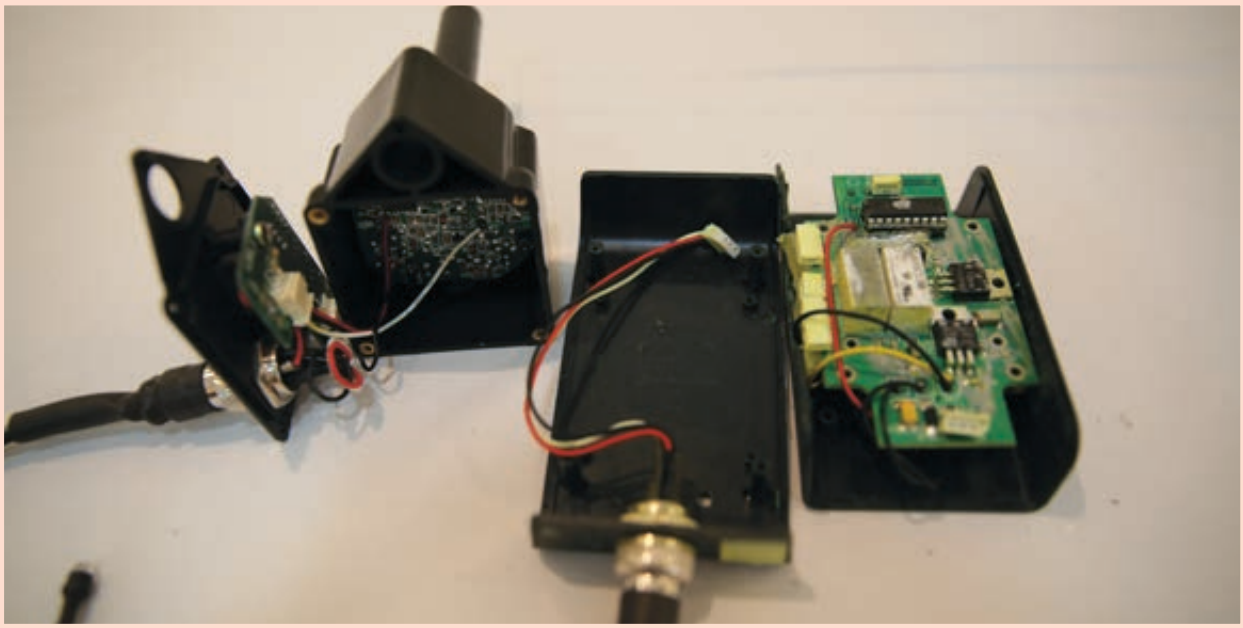


Bahraini security forces also recovered PIR sensor triggers from the Al Ashtar Brigades and Bahraini Hezbollah militant factions during operations between August 2017 and February 2018. A CAR field investigation team documented these items in April 2018 (see Figure 65).

Figure 65

A PIR sensor trigger recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.



The components and their construction appear to be identical to materiel that Saudi-led Arab coalition forces recovered from Houthi forces in Yemen and materiel found on board the *Jihan 1* (see Figures 66–71). The PIR sensors, for instance, appear to be identical to items recovered in these two other locations. Components used in the construction of the kits—including Woer-brand heat-shrink sleeving[23], grey cabling, red and white leg wires, electrical connector plugs, and a similar hot-glue construction technique—are consistent across the three locations. This suggests that actors in possession of the items in Yemen and Bahrain and the intended recipients of the *Jihan 1* materiel share a similar supply line or knowledge transfer.

Figure 66

PIR sensor kits recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013. The kits feature grey cabling, red and white leg wires, electrical connector plugs, and hot-glued sensor casing.

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Figure 67

A PIR sensor electrical connector plug with Woer-brand heat-shrink sleeving, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

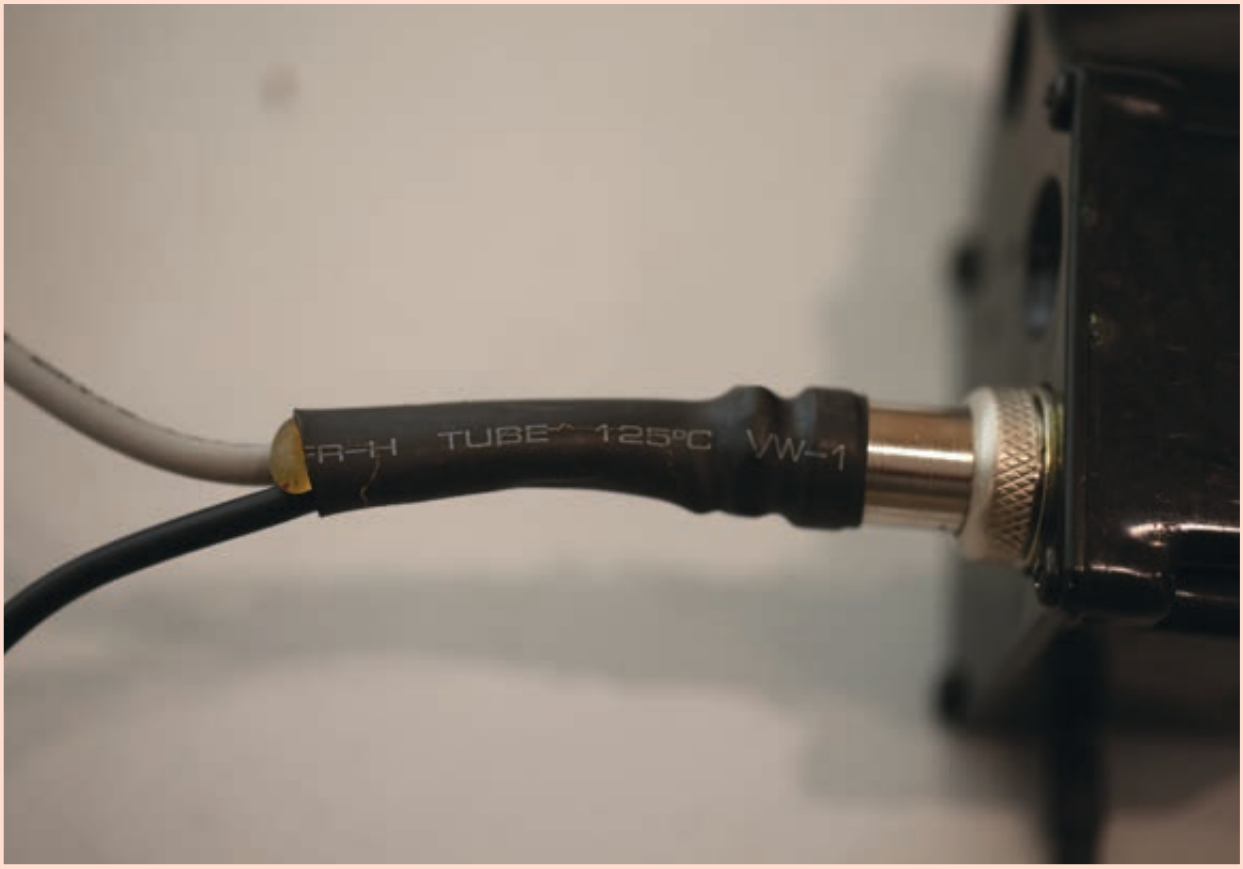

Figure 68

A PIR sensor captured from Houthi forces in Yemen. The sensor has distinctive red and white leg wires, a grey cable, and hot-glued casing.

Documented by a CAR field investigation team in Mokha, Yemen, on 17 July 2018.

Figure 69

A PIR sensor kit, recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015. The kit features red and white leg wires, a grey cable, and hot-glued casing.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 70

A PIR sensor captured from Houthi forces in Yemen.

Documented by a CAR field investigation team in Mokha, Yemen, on 17 July 2018.

Figure 71

Detail of grey cable recovered from the *Jihan 1*.

Documented by UN investigators in Aden, Yemen, on 24 February 2013.

CAR has documented Woer-brand heat shrink sleeving on electronic components in RCIED and PIR sensors recovered in Bahrain and Yemen and viewed it on components recovered from the *Jihan 1* (see Figures 72–77).[24] In addition, CAR has documented Woer sleeving on electronic components recovered from Houthi rebel unmanned aerial vehicles (UAVs) (see Figures 76–77). CAR has not documented any Woer sleeving in its other areas of operation.

Figure 72

An RCIED kit recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013.

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Figure 73

A Woer-brand heat-shrink sleeve used in a UVIED, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 74

An electrical connector plug connecting an RCIED receiver box to a UVIED, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 75

RCEID kits featuring Woer-brand heat-shrink sleeving seized from Houthi forces in Yemen.

Documented by a CAR field investigation team in Mokha, Yemen, on 17 July 2018.

Figure 76

Woer heat-shrink sleeving used to cover an electrical connector socket on an internal component of a Houthi UAV.

Documented by a CAR field investigation team in the UAE in February 2017.

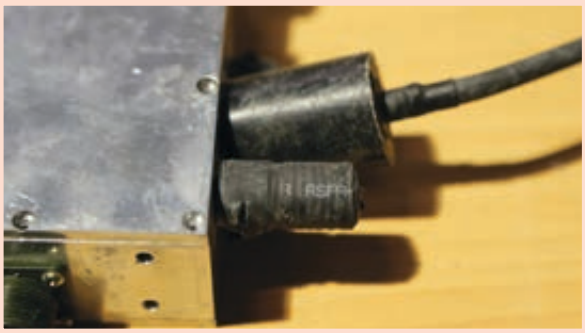


Figure 77

Woer heat-shrink sleeving in a Houthi UAV.

Documented by a CAR field investigation team in the UAE in February 2017.

COMMERCIAL AND IMPROVISED DETONATORS

Bahraini security forces have recovered hundreds of detonators, both improvised and commercially manufactured, during operations between 2012 and 2018. CAR has documented five detonators in total, because Bahraini forces destroyed most of the items soon after capturing them.

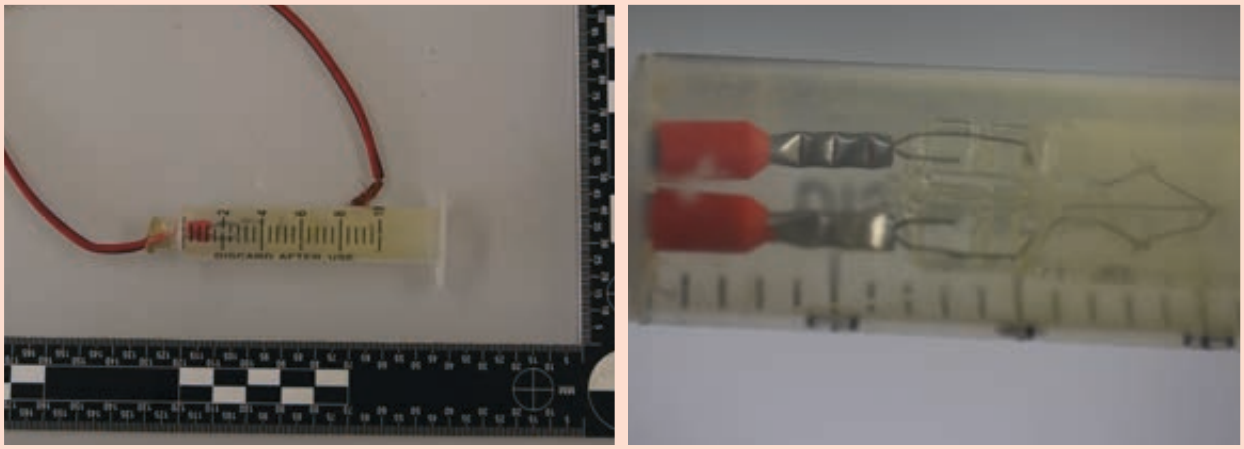
Improvised detonators

A CAR field investigation team documented an improvised detonator that Bahraini security forces had recovered during the Nuwaidrat operation. The improvised detonator was constructed using the body of a plastic medical syringe, within which red and black leg wires connect to a filament bulb. The entry point of the wires was sealed using hot glue and no explosive fill was present within the syringe body (see Figure 78).

Figure 78

Improvised detonator, recovered by Bahraini police during operations in Nuwaidrat village, Bahrain, between 27 and 29 September 2015.

Documented by a CAR field investigation team in Manama, Bahrain, on 23 July 2017.



Commercial electric detonators

CAR documented four makes of commercial electric detonator in Bahrain (see Figures 79–86). One of the commercial detonator types appears identical to detonators recovered from the *Jihan 1* (see Figure 80). Both sets of detonators come in pairs of two, with a white plug and blue and white leg wires.

Figure 79

Two commercial electric detonators, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 80

Left: Detail of one of the crates of commercial electric detonators recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013.

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Right: Bundles of detonators recovered from the *Jihan 1* and documented by UN investigators in Aden, Yemen, on 24 February 2013.

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A second type of commercial detonator appears identical to detonators that Saudi Arabian security forces captured from militants in Al-Awamiyah in April 2017 (see Figures 81–84). This set of matching detonators features yellow and white leg wires, a cream-coloured plug, and three crimps.

Figure 81

Commercial electric detonator, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 82

Commercial electric detonator, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 83

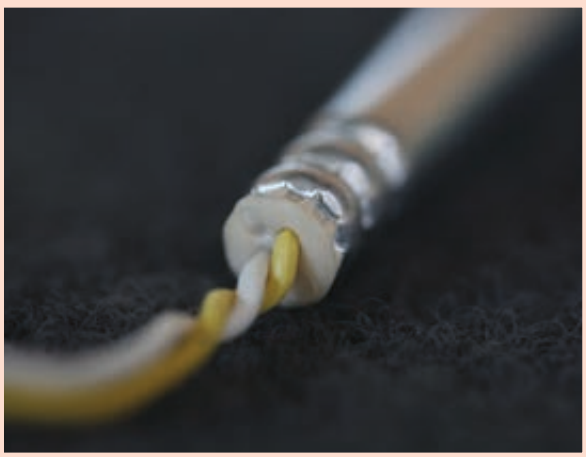
Commercial electric detonators recovered from militant factions in Al-Awamiyah, Saudi Arabia, in April 2017.

Documented by a CAR field investigation team in Riyadh, Saudi Arabia, on 17 December 2017.

Figure 84

Commercial electric detonator recovered from militant factions in Al-Awamiyah, Saudi Arabia, in April 2017.

Documented by a CAR field investigation team in Riyadh, Saudi Arabia, on 17 December 2017.



CAR investigators documented two other types of commercial electric detonator, which did not correlate with other findings in CAR's data set (see Figures 85–86). One of the detonators featured the headstamp 'ST' (see Figure 86).

Figure 85

Commercial electric detonator, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 86

Commercial electric detonator, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

OTHER IED COMPONENTS AND CHARACTERISTICS WITH REGIONAL CORRELATIONS

CAR has documented a number of other items included in the construction of IEDs and their components in Bahrain that it has also documented elsewhere in the Arabian Peninsula.

Quality control stickers

The placement of quality control (QC) stickers on or inside electronic components of IEDs and UAVs is a physical characteristic that CAR field investigation teams have only documented on Houthi materiel captured in Yemen, materiel captured from militant groups in Bahrain, and in a suspected Hezbollah or Iranian Revolutionary Guards Corps-Qods Force UAV, which Israeli forces shot down after the aircraft flew across the border from Syria (BBC News, 2018). The stickers are also visible on components recovered from the *Jihan 1*.

The stickers are typically, but not always, placed across the joining point of an enclosure box containing electronic components such as receiver circuit boards (see Figures 87–94). They are probably used to confirm the integrity of a relatively sophisticated electronic device in a central location before its export to groups that may not possess the skills or materials necessary to construct such devices. The use of the stickers in these electronic components strongly suggests that the production process is structured and that these electronics are manufactured in large quantities in a controlled, industrial environment, before export to militant factions such as those in Bahrain, Yemen, and the wider Middle East.

Figure 87

A QC sticker on the case of an RCIED receiver, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figure 88

A QC sticker on an RCIED, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

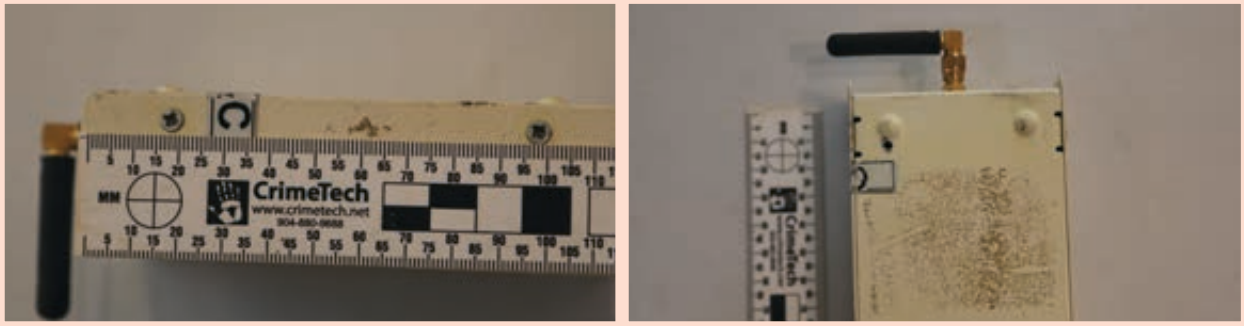


Figure 89

A QC sticker on an RCIED electronics case captured by Arab coalition forces from Houthi combatants on Yemen's west coast.

Documented by a CAR field investigation team in Mokha, Yemen, on 17 July 2018.

Figure 90

A QC sticker on an RCIED case recovered by Bahraini security forces in Dair village, Bahrain, on 23 June 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 22 July 2017.

Figure 91

A QC sticker on an electronics case used in a Qasef-1 UAV recovered by Arab coalition forces from Houthi combatants on Yemen's west coast.

Documented by a CAR field investigation team in the UAE in February 2017.

Figure 92

A QC sticker across the lid and body of a case containing navigational electronics from a Houthi Qasef-1 UAV, which Arab coalition forces recovered from Houthi combatants on Yemen's west coast.

Documented by a CAR field investigation team in the UAE in February 2017.

Figure 93

A QC sticker on a servo motor recovered from a suspected Hezbollah or Iranian Revolutionary Guards Corps-Qods Force UAV that was shot down by the Israeli air force after it crossed into Israeli airspace from Syria in February 2018.

Documented by a CAR field investigation team in Israel on 31 May 2018.

Figure 94

A QC sticker on an RCIED component kit recovered from the *Jihan 1*. Documented by UN investigators in Aden, Yemen, on 24 February 2013.

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Bahar-brand electronics containers

CAR has documented Bahar enclosure boxes only in RCIEDs that were captured in Bahrain and Yemen, and in UAVs captured in Yemen (see Figures 95–98). The manufacturer of the items, Bahar Enclosure GmbH, is headquartered in China and maintains an office in Germany and distribution companies in Ukraine and Iran. Bahar responded promptly to a CAR trace request regarding the enclosure boxes CAR documented in Bahrain and Yemen, confirming that the items were authentic, but that the company could not trace their chain of custody. Bahar stated that most of its sales are made to the domestic Chinese market.[25] The Iranian distributor still maintains a Farsi-language website, but due to international sanctions it has not sold any merchandise to Iran since 2017 (Bahar, n.d.).

Figures 95

Bahar enclosure boxes used to protect electronics in RCIEDs, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

Figures 96

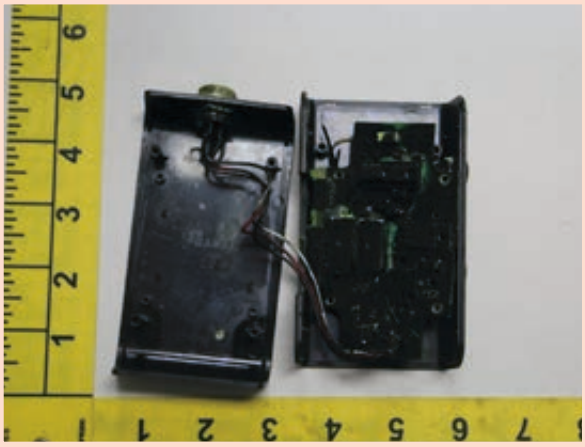
A Bahar enclosure box used as part of an RCIED kit, recovered by Bahraini security forces in Sadad village, Bahrain, on 13 March 2017.

Documented by a CAR a field investigation team in Manama, Bahrain, on 23 July 2017.

Figure 97

A Bahar enclosure box containing a circuit board with obliterated markings in an RCIED component, recovered by Bahraini security forces in Dair village, Bahrain, on 23 June 2017.

Documented by a CAR field investigation team in Manama, Bahrain, on 22 July 2017.



Figures 98

A Bahar enclosure box recovered from a Houthi Qasef-1 UAV.

Documented by a CAR field investigation team in the UAE in February 2017.

CIRCUIT BOARD COMPONENTS

The brands and models of circuit board components are largely consistent across RCIED components and UAVs documented by CAR in the Arabian Peninsula (see Table 2). Items captured from militants in Bahrain and Houthi rebels in Yemen share common components, while Islamic State in Yemen and Al Qaeda in the Arabian Peninsula (AQAP) mostly share a different set of electronic components.

CAR has also documented counterfeit STMicroelectronics voltage regulators in RCIED circuit boards captured from Islamic State militants in Iraq and Islamic State and AQAP militants in Yemen. These Sunni Salafist groups are unlikely to rely on the same external state or non-state support networks as Bahraini Shia militant factions or Yemeni Houthi forces, but they may have access to common supplies circulating in the region or in specific countries, such as Iraq.

Table 2

Circuit board components in UAVs and IEDs documented by CAR in the Arabian Peninsula and Iraq, 2016–18

Components	RCIED kits and PIR sensors in Bahrain	Houthi RCIED kits and PIR sensors in Yemen	Houthi UAVs in Yemen	Islamic State in Yemen/ AQAP RCIEDs	Islamic State-of Iraq RCIEDs
HKE signal relay	×	×	×	×	×
Microchip microcontrollers	×				X
Microchip Atmel microcontrollers	×		×		
Microsemi MT8770DE DTMF receiver	×			×	
Nais AGN2004H power relay	×	×			
Omron GS6K-2-H PCB power relay	×	×	×		
Panasonic signal relay	×				
Princeton Technology Corp PT2262 remote control encoder	×				
STMicroelectronics voltage regulators	×	×	×	×	×
Woer heat-shrink wrap	×	×	×		
Grey cable	×	×	×		

In July 2017, CAR documented a general voltage regulator contained within an RCIED component that was seized by Bahraini security forces from a militant group in the kingdom (see Figure 99).

CAR traced the item with the manufacturer, STMicroelectronics (STM), which confirmed that STM manufactured the LM78M05 general voltage regulator. STM informed CAR that the general voltage regulator was assembled in November 2013 in China and sold to distributors in China, Hong Kong, and South Korea.[26]

The following year, CAR documented a second STM general voltage regulator from an RCIED receiver board seized by Bahraini security forces during operations against the Al Ashtar Brigades and Bahraini Hezbollah militants between August 2017 and February 2018 (see Figure 100). STM informed CAR that the item was counterfeit and featured an incorrect trace code, marking layout, and assembly country code.[27]

CAR field investigators previously documented 24 STM-labelled transistors in Iraq that Islamic State forces had used in the construction of IEDs. All of these items also bore alphanumeric codes indicating that they were manufactured in 2013. STM stated, however, that the plant code used on the items relates to a factory that closed in 2009 and that all of the items were counterfeit (CAR, 2017b).

In addition, CAR has documented four authentic and two counterfeit STM electronic components in Yemen. All of the authentic STM items were general voltage regulators. Two were components in a Houthi UAV; according to STM's statement to CAR, they were manufactured in Shenzhen, China, in 2012[28]. The third was also contained in a Houthi UAV,[29] and the fourth was from an AQAP IED, which STM confirmed was assembled and shipped in 2007 to one of its distributors.[30] Yemeni counterterrorism forces recovered one of the counterfeit STM-labelled voltage regulators in an Islamic State in Yemen IED in Aden.[31] Saudi-led Arab coalition forces recovered the second from a Houthi IED on Yemen's west coast.[32]

One general-voltage regulator documented by CAR in Bahrain is authentic (see Figure 99); the other is counterfeit (see Figure 100).[33] It is potentially significant that counterfeited semiconductors bearing similar marks have been acquired and used in IED construction by Islamic State forces in Iraq as well as by Houthi and AQAP forces in Yemen. Other items captured from militants in Bahrain have originated in Iraq (see Figures 43–47), and thus Iraq may be an important conduit for the flow of illicit materiel into Bahrain.

Figure 99

An authentic STMicroelectronics general-voltage regulator in an RCIED, which Bahraini security forces recovered from a bus on 15 March 2015.

Documented by a CAR field investigation team in Manama, Bahrain, 23 July 2017.

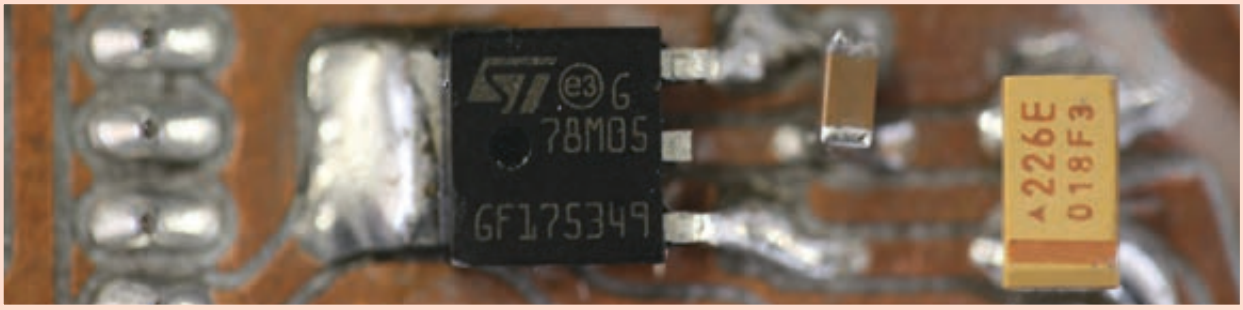


Figure 100

A counterfeit STMicroelectronics general-voltage regulator in an RCIED kit, recovered from the Al Ashtar Brigades and Bahraini Hezbollah militant cells between August 2017 and February 2018.

Documented by a CAR field investigation team in Manama, Bahrain, on 20 April 2018.

CONCLUSION

Between 2012 and 2018, the IED threat in Bahrain grew significantly as materiel recovered from militant groups illustrated an evolution of capabilities and access to resources.

Thanks to expanding domestic capabilities and supply chains that deliver material support from external patrons, Bahraini militant groups have been able to evolve from launching Molotov cocktails to deploying EFPs and radio-controlled IEDs against Bahraini security forces in a relatively short period of time.

The RCIED and PIR sensor materiel that CAR documented in Bahrain, in particular, indicates that militants in the kingdom and Houthi forces in Yemen may have a common source of supply for such items, some of which probably originate in Iran.

The components and construction of electronics kits documented in Bahrain closely match those of kits documented by CAR in Yemen. The attempt to obliterate markings on many of these components suggests an effort was made to obscure their provenance. The use of counterfeit electronic components further complicates the tracing process.

As improvised threats evolve in Bahrain and the greater Arabian Peninsula, it is critical to assess commonalities in tactics, techniques, and procedures and IED construction across the various non-state actors operating in the region. Building an understanding of their capacity to inflict damage, and of component procurement and technological know-how behind their attacks, is a key step in identifying the networks responsible for their supply.

THE ATTEMPT TO OBLITERATE MARKINGS ON MANY OF THESE COMPONENTS INDICATES AN ATTEMPT TO OBSCURE THEIR PROVENANCE.

ENDNOTES

1 In their attacks on security forces, Bahraini militants primarily employ improvised explosive devices (IEDs). They conducted at least 32 IED attacks in Bahrain in 2012–19, killing no fewer than 21 security personnel (Knights and Levitt, 2018; CAR interviews with Bahraini security personnel, Bahrain, August 2019, on file).

2 See CAR (2017a; 2018).

3 See ICG (2015).

4 CAR interview with a Bahraini security official (on file).

5 CAR interview with a Bahraini security official (on file).

6 CAR interview with a Bahraini security official (on file).

7 The lot mark is 2 and the date is 2010.

8 CAR was unable to document detonators containing peroxide-based HME because Bahraini security forces had destroyed them for safety reasons. Bahraini security forces report that militant factions use these detonators and that they have also seized peroxide-based HME chemical precursors from the groups concerned. In April 2018, for example, a CAR field investigation team documented hydrogen peroxide solution that Bahraini security forces had recovered from Al Ashtar Brigades and Bahraini Hezbollah militant factions between August 2017 and February 2018 (CAR interview with a Bahraini security official, on file).

9 See note 7.

10 CAR issued a formal trace request to Gulf Petrochemical Industries Co. on 21 October 2019 and a reminder on 20 November 2019. At the time of writing, it had not yet received a response.

11 See, for example, data reported in Embassy of the Kingdom of Bahrain (2015).

12 CAR interview with a Bahraini security official (on file).

13 CAR interview with a Bahraini security official (on file). In 2015 Bahraini security forces recovered an industrial press that used 'specialized dies (possibly imported) to make EFP liners. A range of EFPs were found there as well, with diameters of six, eight, and twelve inches' (Knights, 2016). The press was reportedly seized from a workshop in the village of Dar Kulaib in Western Bahrain. See also UNGA (2015, p. 3).

14 CAR interview with a Bahraini security official (on file). See also Mekhennet and Warrick (2017).

15 CAR interview with a Bahraini security official (on file).

16 CAR interview with a Bahraini security official (on file). See also Shamseddine (2017).

17 See CAR (2018) and the presentation of the *Jihan 1* case at the beginning of this report.

18 See CAR (2018, p. 6), which concludes: 'All of the electronics used in RCIEDs documented by CAR [in Yemen], including PIR sensors, transmitters, and receivers, were manufactured in 2008. Their design and construction are consistently identical to materiel that CAR has previously documented, and which it has determined originated from Iran.'

19 CAR interview with Bahraini security officials (on file).

20 On 13 October 2017, Mitel Networks Corporation responded promptly to a formal trace request issued by CAR on 29 August 2017. This response confirms that Mitel Networks Corporation did not manufacture the Integrated DTMF Receiver with serial number 0638C, subject to CAR's trace request.

Mitel Networks Corporation informed CAR that use of the component in its products was discontinued before 2006/07 (the likely date of manufacture).

On 13 October 2017, Mitel Networks Corporation responded promptly to a formal trace request issued by CAR on 29 August 2017. This response confirms that Mitel Networks Corporation did not manufacture the Integrated DTMF Receiver with serial number 0737F, subject to CAR's trace request.

Mitel Networks Corporation informed CAR that use of the component in its products was discontinued before 2006/07 (the likely date of manufacture).

21 On 18 January 2018, Microsemi Corporation responded to a formal trace request issued by CAR on 1 November 2017. This response confirms that: 1) Zarlink Semiconductor, a subsidiary of Microsemi Corporation since 2011, did not manufacture the MT8770DE Integrated DTMF Receiver with serial number 0638C, subject to CAR's trace request. Microsemi further informed CAR that the markings are not consistent with an authentic MT8770DE part and is likely to have been sanded and remarked.

On 18 January 2018, Microsemi Corporation responded to a formal trace request issued by CAR on 1 November 2017. This response confirms that: 1) Zarlink Semiconductor, a subsidiary of Microsemi Corporation since 2011, sold MT8770DE Integrated DTMF Receivers with the serial number 0737F in 2007, subject to CAR's trace request, however, the images provided by CAR are not consistent with an authentic MT8770DE part.

22 CAR interview with a Bahraini security official (on file).

23 CAR issued a formal trace request to Woer on 31 January 2018 and a reminder on 26 February 2019. CAR additionally issued an advance notification on 5 November 2019. At the time of writing, CAR has not yet received a response.

24 See CAR (2018).

25 On 14 October 2019, Bahar responded promptly to a formal trace request issued by CAR on 11 October 2019. This response confirms that; 1) Bahar manufactured the 3-5 RMB enclosures, subject to CAR's trace request; 2) 80-90% of these enclosures are sold on the domestic market in China, however Bahar additionally has distributors in Ukraine and Iran, a store in Shenzhen, a company in Germany, and sells its products through online distributors; 3) as a result of sanctions placed on the Islamic Republic of Iran, no sales have been made to Iran since 2017 as the Iranian government has restricted import goods; and 4) Bahar was unable to determine the product code of the item subject to CAR's trace request.

On 14 October 2019, Bahar responded promptly to a formal trace request issued by CAR on 11 October 2019. This response confirms that; 1) Bahar manufactured the 3-5 RMB enclosures, subject to CAR's trace request; 2) 80-90% of these enclosures are sold on the domestic market in China, however Bahar additionally has distributors in Ukraine and Iran, a store in Shenzhen, a company in Germany, and sells its products through online distributors; 3) as a result of sanctions placed on the Islamic Republic, no sales have been made to Iran since 2017; and 4) Bahar was unable to determine the product code of the item subject to CAR's trace request.

26 On 18 August 2017, STMicroelectronics responded promptly to an informal request for information sent by CAR on 17 August 2017. This response confirms that: 1) STMicroelectronics manufactured the LM78M05 general voltage regulator seized from an extremist group in Bahrain; 2) the item was assembled in China, in November 2013; and 3) the item was sold to different distributors in China, Hong Kong and Korea.

27 On 18 October 2019, STMicroelectronics responded to a formal trace request issued by CAR on 23 September 2019. This response confirms that: 1) STMicroelectronics did not manufacture the ST voltage regulator L7808CV, subject to CAR's trace request; and 2) the trace code, marking layout and marked assembly country code does not follow that of genuine STMicroelectronics manufacture.

28 On 10 March 2017, STMicroelectronics responded promptly to an informal request for information sent by CAR on 9 March 2017. This response confirms that: 1) the two L78M05 voltage regulators documented by CAR were manufactured in Shenzhen manufacturing plant, China, in 2012; 2) the L78M05 voltage regulators were part of production lot W06; and 3) this type of product is used widely in electronic applications and is readily available for purchase on the web.

29 On 21 September 2019, STMicroelectronics responded to a formal trace request issued by CAR on 15 August 2019. This response confirms that: 1) the ST voltage regulator L7808CV, subject to CAR's trace request, is a genuine STM product as marking on the product is in line with original product marking; 2) STM shipped the item between October and November 2009; 3) STMicroelectronics confirmed that it cannot

determine the precise chain of custody of the item CAR documented as the company does not retain that information.

30 On 1 February 2018, STMicroelectronics responded to a formal trace request issued by CAR on 31 January 2018. This response confirms that STMicroelectronics assembled and shipped the L7805CV voltage regulator with CC04H V6 mark, subject to CAR's trace request, to one of its distributors, in 2007.

31 On 1 February 2018, STMicroelectronics responded to a formal trace request issued by CAR on 31 January 2018. This response confirms that the STMicroelectronic component with KTPSJ W mark, subject to CAR's trace request, is counterfeit.

32 On 1 February 2018, STMicroelectronics responded to a formal trace request issued by CAR on 31 January 2018. This response confirms that the STMicroelectronic component with (e3) E710 mark, subject to CAR's trace request, is counterfeit.

33 On 18 October 2019, STMicroelectronics responded to a formal trace request issued by CAR on 23 September 2019. This response confirms that: 1) STMicroelectronics did not manufacture the ST voltage regulator L7808CV, subject to CAR's trace request; and 2) the trace code, marking layout and marked assembly country code does not follow that of genuine STMicroelectronics manufacture.

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ABBREVIATIONS

ANAL	ammonium nitrate and aluminium powder
AQAP	Al Qaeda in the Arabian Peninsula
CAR	Conflict Armament Research
EFP	explosively formed projectile
DFC	directional fragmentation charge
DTMF	dual-tone multi-frequency
HME	homemade explosive
IED	improvised explosive device
PIR	passive infrared
QC	quality control
RCIED	radio-controlled improvised explosive device
STM	STMicroelectronics
UAE	United Arab Emirates
UAV	unmanned aerial vehicle
UVIED	under-vehicle improvised explosive device

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