


DISPATCH FROM THE FIELD

**MINES AND IEDs
EMPLOYED BY
HOUTHI FORCES
ON YEMEN'S
WEST COAST**

September 2018





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Cover Image: Improvised mines and other materiel being prepared for demolition, Mokha, Yemen, July 2018.

Inside image: CAR field investigator documenting materiel captured from Houthi forces, Mokha, Yemen, February 2018.

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BACKGROUND

Across every front line in the conflict in Yemen, Houthi forces have employed significant numbers of landmines and improvised explosive devices (IEDs) against Arab Coalition forces. According to the Yemen Executive Mine Action Centre, between 2016 and 2018, the Yemeni army removed some 300,000 landmines that Houthi forces had laid throughout Yemen.¹ While Conflict Armament Research (CAR) has been unable to verify these figures, a growing body of information, compiled by CAR, suggests that the use of landmines and IEDs has been widespread and has increased as Houthi forces retreat from Coalition advances.

Since April 2017, CAR has conducted eight field missions to Yemen to document materiel seized from non-state armed groups, including Houthi forces. During its most recent field mission in July 2018, CAR documented a range of materiel recovered during Coalition advances along the west coast of

Yemen, toward the port city of Hodeida. While some of the recovered materiel consists of conventional landmines and naval mines, which probably originate from former Yemeni army stockpiles, the vast majority of landmines are improvised and mass-produced, domestically, by Houthi forces in Yemen.

SINCE APRIL 2017, CAR HAS CONDUCTED EIGHT FIELD MISSIONS TO YEMEN TO DOCUMENT MATERIEL SEIZED FROM NON-STATE ARMED GROUPS, INCLUDING HOUTHİ FORCES.



KEY FINDINGS

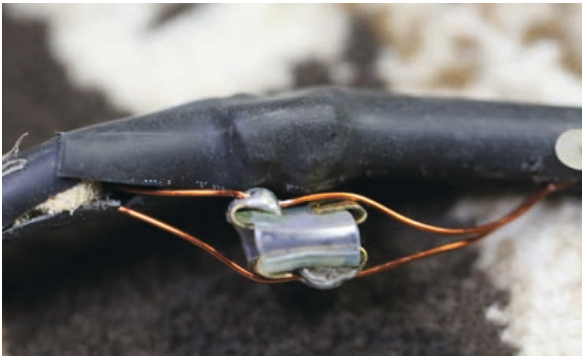
Improvised mines, IEDs, IED main charges, and IED pressure plates are standardised and mass-produced by Houthi forces.



Basic printed instructions affixed to IED pressure plates, and other military materiel, suggest that they have been issued for use by low-skilled forces.



IED switches and electronics, including passive infrared (PIR) sensors, crush wires, transmitters, and corresponding receivers, originate in Iran.



Transmitters, used to arm radio-controlled IEDs (RCIEDs), contain components with obliterated markings, which indicates attempts to obscure their provenance.



DOCUMENTATION

In July 2018, CAR conducted its eighth field mission to the west coast of Yemen to document materiel, which Coalition forces had recovered from Houthi forces during their advance toward the port city of Hodeida. A significant portion of the documented materiel consists of landmines, naval mines, IEDs, and related materiel.

Houthi forces have employed significant quantities of improvised landmines and naval mines, supplemented by a much smaller proportion of conventionally manufactured mines. The improvised mines are standardised and, in some cases, serialised, which suggests mass production—they are either identical in design to conventional materiel, or closely resemble conventional mines.

Houthi forces likewise standardise, serialise, and mass-produce IEDs, IED main charges, and IED switches, such as pressure plates. CAR has documented hundreds of pressure plates, in addition to improvised grenades and the gripstock of a man-portable air defence system (MANPADS), which have basic instructions on their use affixed to the exterior of the items. These labels probably indicate that Houthi forces distributed the materiel to low-skilled users.

All of the electronics used in RCIEDs documented by CAR, 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.²

MINES

Conventional landmines

CAR has documented six types of conventional landmine: three anti-personnel (Figures 1-6) and three anti-vehicle variants (Figures 7-8, 11-12, 15-16).³ Although CAR cannot identify the precise provenance of these mines, several mines, which Coalition forces seized from Houthi forces, have similar lot numbers and production dates

(1960s-1970s) to mines that Coalition forces also seized in Aden from an Islamic State in Yemen cell. Several of these mine varieties are known to have existed in Yemeni army stockpiles prior to the current conflict, which suggests that both groups obtained the materiel following the collapse of the Yemeni state (Figures 9-10, 13-14).⁴



PMN ANTI-PERSONNEL MINE

DIMENSIONS – HEIGHT: 57MM • DIAMETER: 112MM



Figures 1 and 2

PMN anti-personnel mine (left and right) from an unknown manufacturer.⁵

Documented by a CAR field investigation team in Mokha, Yemen, July 2017.

PPM-2 ANTI-PERSONNEL MINE

DIMENSIONS – HEIGHT: 60 MM • DIAMETER: 125 MM



Figures 3 and 4

Former German Democratic Republic-manufactured PPM-2 anti-personnel mine (left and right).⁶

Documented by a CAR field investigation team in Mokha, Yemen, January 2018.

TYPE GLD 150A DIRECTIONAL MINE

DIMENSIONS – HEIGHT: 100 MM ■ LENGTH: 215 MM ■ WIDTH: 40 MM



Figures 5 and 6

Chinese-manufactured Type GLD 150A directional mine (left and right).⁷
 Documented by a CAR field investigation team in Mokha, Yemen, July 2018.

TM-57 ANTI-VEHICLE MINE

DIMENSIONS – HEIGHT: 102 MM ■ DIAMETER: 316 MM



Figures 7 and 8

TM-57 anti-vehicle mine (left) and corresponding MVZ-57 pressure fuse (right) from an unknown manufacturer.⁸
 Documented by a CAR field investigation team in Mokha, Yemen, February 2018.

TM-57 ANTI-VEHICLE MINE (continued)



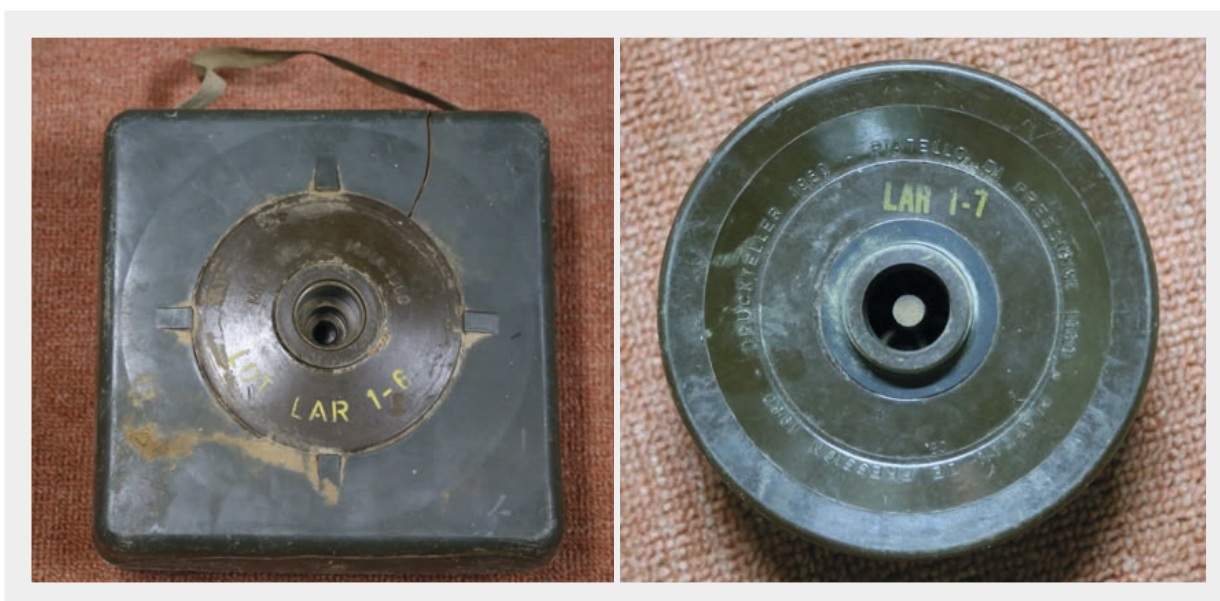
Figures 9 and 10

TM-57 anti-vehicle mines seized from an Islamic State in Yemen cell in Aden bearing similar lot markings to TM-57 mines seized from Houthi forces (Figures 7 and 8).

Documented by CAR field investigation teams in Aden, Yemen, in January 2018 (left) and December 2017 (right).⁹

PRB ATK-M3 ANTI-VEHICLE MINE

DIMENSIONS – HEIGHT: 130 MM = LENGTH: 230 MM = WIDTH: 230 MM



Figures 11 and 12

Belgian-manufactured PRB ATK-M3 anti-vehicle mine (left) and corresponding M30 pressure plate (right).¹⁰

Documented by a CAR field investigation team in Mokha, Yemen, January 2018.¹¹

PRB ATK-M3 ANTI-VEHICLE MINE (continued)



Figures 13 and 14

Belgian-manufactured PRB ATK-M3 anti-vehicle mine (left and right), seized from an Islamic State in Yemen cell in Aden and bearing similar lot markings to PRB ATK-M3 mines seized from Houthi forces.

Documented by a CAR field investigation team in Aden, Yemen, January 2018.¹²

VS-1.6 ANTI-VEHICLE MINE

DIMENSIONS – HEIGHT: 92 MM ■ DIAMETER: 222 MM



Figures 15 and 16

Italian-manufactured VS-1.6 anti-vehicle mine (left and right).¹³

Documented by a CAR field investigation team in Mokha, Yemen, January 2018.

Improvised landmines

CAR has documented three types of improvised landmine, which Coalition forces have recovered from Houthi forces on the west coast of Yemen. CAR concludes that Houthi forces manufactured the landmines in Yemen, based on the following reasons:

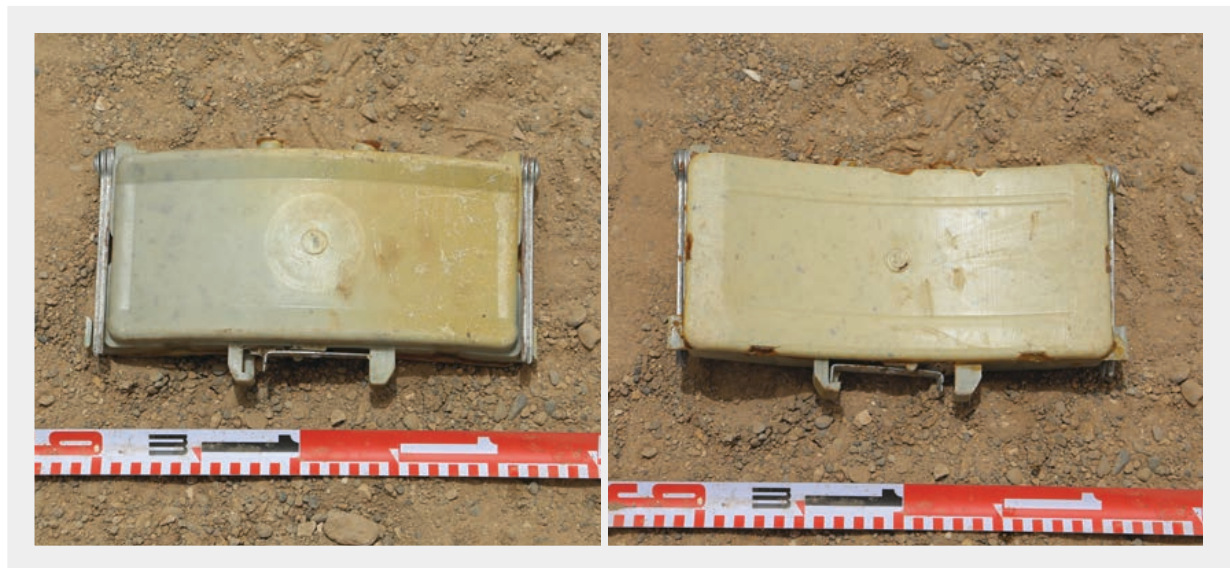
1. The landmines are clearly improvised, and whilst similar in form to conventional mines, have construction characteristics that are inconsistent with conventionally manufactured materiel.
2. The use of these improvised mines appears to be restricted to Houthi forces and they have not been recovered from other parties to Yemen's conflict.
3. A workshop featured in video footage released by Houthi forces provides clear details of numerous identical mines, in conjunction with other IEDs and improvised weapons under construction. Importantly, Houthi forces do not appear to have released the video to showcase the workshop, but rather for alternative reasons that are unconnected with the workshop and its contents.¹⁴

4. CAR has neither documented improvised mines of this type during extensive regional investigations beyond Yemen's borders, nor in its analysis of intercepted weapon shipments destined for Yemen.
5. Several recent defectors from Houthi forces, interviewed independently by Coalition officials and a journalist, report the domestic manufacture of improvised mines and other IEDs by Houthi forces.¹⁵

The first of the improvised mines documented by CAR is a small Claymore-type directional mine. This is, at first glance, identical in design to—and probably based on—a Chinese-manufactured Type 150A GLD directional mine (Figures 17-20). The second, a larger directional mine, most closely resembles an Iranian-manufactured M18A2 directional mine, but with notable physical differences (Figures 21-22).¹⁶ The third, and by far the most prevalent, is an anti-vehicle mine, which loosely resembles a TM-46 or TM-57 anti-vehicle mine and bears a number, marked in Arabic script, which ranges from three to five digits in length (Figures 23-26).

SMALL DIRECTIONAL MINE

DIMENSIONS – HEIGHT: 100 MM = LENGTH: 215 MM = WIDTH: 40 MM



Figures 17 and 18

Houthi-manufactured directional mine (left and right), probably based on the Chinese Type GLD 150A directional mine. Documented by a CAR field investigation team in Mokha, Yemen, July 2018.

SMALL DIRECTIONAL MINE (continued)



Figures 19 and 20

A side-by-side comparison of a Houthi-manufactured directional mine (left) and a Chinese-manufactured Type GLD 150A directional mine (right).

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

LARGE DIRECTIONAL MINE

DIMENSIONS – HEIGHT: 155 MM • LENGTH: 300 MM • WIDTH: 85 MM



Figures 21 and 22

Houthi-manufactured directional mine (left and right).

Documented by a CAR field investigation team in Mokha, Yemen, July 2018. The mine shares some design features with an Iranian-manufactured M18A2 directional mine.

ANTI-VEHICLE MINE

DIMENSIONS – HEIGHT: 95 MM • DIAMETER: 280 MM



Figures 23 and 24

Houthi-manufactured anti-vehicle mine (left and right), loosely based on the design of a TM-46 or TM-57 anti-vehicle mine. Documented by a CAR field investigation team in Mokha, Yemen, July 2018.



Figures 25 and 26

Houthi-manufactured anti-vehicle mines bearing Arabic script markings.

Documented by CAR field investigation teams in Mokha, Yemen, July 2018 (left) and May 2017 (right).

Conventional naval mines

CAR documented transit containers for naval mines, which Coalition forces recovered south of Hodeida in late May 2018 (Figure 27).¹⁷ CAR has been unable to determine the exact designation of the naval mines. However, a July 2018 confidential report by the United Nations Panel of Experts on Yemen identified the mines as a KMN-1000 variant, although CAR has not been able to verify this assertion.¹⁸ Each container holds three mines and a packing slip. CAR recovered an example of the latter from one of the containers. The packing slip states that the former Soviet Union manufactured and exported the mines under contract number 80/6125050-51564 in 1986 (see Annex A).

DIMENSIONS – UNKNOWN



Figure 27

Transit containers with unknown variant naval mines. Documented by a CAR field investigation team in Mokha, Yemen, July 2018.

Improvised naval mines

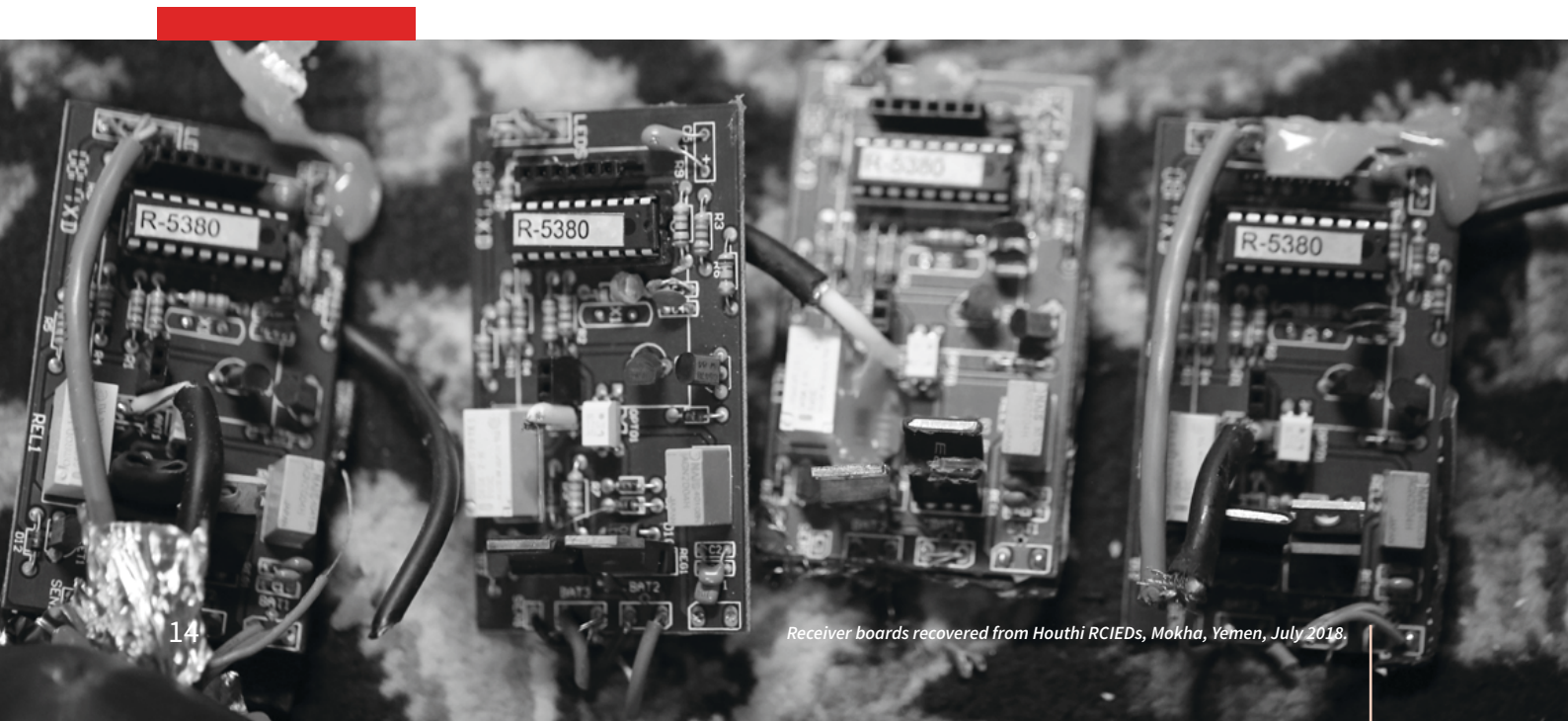
CAR has documented one improvised naval mine in Yemen (Figure 28). However, several mines of identical design can be viewed on social media¹⁹ and the United Nations Panel of Experts on Yemen recorded 35 similar improvised naval mines, which Coalition forces reportedly recovered or detonated on the west coast of Yemen.²⁰

DIMENSIONS – LENGTH: 585 MM ■ DIAMETER: 380 MM



Figure 28

Houthi-manufactured naval mine. Documented by a CAR field investigation team in Mokha, Yemen, January 2018.



IED MAIN CHARGES, COMPLETE IEDS, AND SWITCHES

IED main charges

CAR has documented two types of IED main charge, which Coalition forces have recovered in significant quantities along the west coast of Yemen. Each type is standardised and serialised. The first is contained in a cylindrical PVC pipe with a nylon carrying strap and bears a three-digit number stencilled on its side (Figures 29-30). The second is contained in a larger metal cylinder with two handles constructed

from rebar (Figures 31-32). The small and large main charges are commonly emplaced under roads—in culverts or hand-dug ditches—and are connected to pressure plates or crush wires.²¹ Coalition forces have reportedly recovered thousands of examples of each of the two main charge types across all frontline areas.²²

SMALL CYLINDRICAL MAIN CHARGE – PLASTIC

DIMENSIONS – LENGTH: 380 MM • DIAMETER: 160 MM



Figures 29 and 30

Houthi-manufactured main charges, contained in PVC piping, painted, and bearing a stencilled numerical marking. Documented by CAR field investigation teams in Mokha, Yemen, April 2017 (left) and July 2018 (right).

LARGE CYLINDRICAL MAIN CHARGE – METAL

DIMENSIONS – LENGTH: 615 MM • DIAMETER: 260 MM



Figures 31 and 32

Houthi-manufactured main charge, contained in a metal cylinder. Documented by a CAR field investigation team in Mokha, Yemen, July 2018.

Complete IEDs

CAR has documented dozens of synthetic rock-concealed IEDs, which Coalition forces have recovered throughout Ta'iz and Hodeida governorates. Since late 2016, Houthi forces have emplaced these devices along motorways connecting Mokha-Dhubab, Mokha-Ta'iz, and Mokha-Hodeida.²³ The three most common variants of the synthetic rock-concealed IED employed by

Houthi forces are: 1) an RCIED containing between one and three explosively formed projectiles (EFPs) (Figures 33-36); 2) an anti-personnel IED containing an improvised directional mine (Figures 37-40); and 3) an IED containing single charges of varying size, which may be constructed to perform as shaped charges (Figures 41-44).

SYNTHETIC ROCK-CONCEALED RCIED - EFP



Figures 33 and 34

Synthetic rock-concealed RCIED containing three EFPs.

Documented by a CAR field investigation team in Mokha, Yemen, July 2017.

EXPLOSIVELY FORMED PROJECTILE

DIMENSIONS – LENGTH: 120 MM – DIAMETER: 110 MM



Figures 35 and 36

EFPs removed from a synthetic rock-concealed RCIED.

Documented by a CAR field investigation team in Mokha, Yemen, January 2018.

SYNTHETIC ROCK-CONCEALED IED – IMPROVED DIRECTIONAL MINE



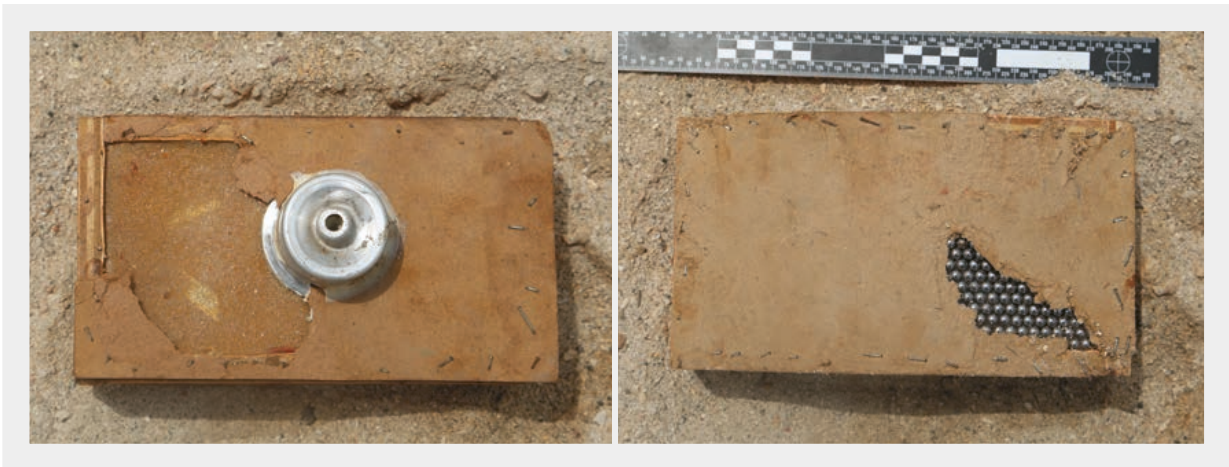
Figures 37 and 38

Synthetic rock-concealed IED containing an improvised directional mine.

Documented by a CAR field investigation team in Mokha, Yemen, July 2017.

IMPROVED DIRECTIONAL MINE

DIMENSIONS – HEIGHT: 125 MM – LENGTH: 230 MM – WIDTH: 80 MM



Figures 39 and 40

Improved directional mine removed from a synthetic rock-concealed IED.

Documented by a CAR field investigation team in Mokha, Yemen, July 2017.

SYNTHETIC ROCK-CONCEALED IED CONTAINING A POSSIBLE SHAPED CHARGE



Figures 41 and 42

Synthetic rock-concealed IED containing a possible shaped charge.

Documented by a CAR field investigation team in Mokha, Yemen, May 2017.

POSSIBLE SHAPED CHARGE

DIMENSIONS – LENGTH: 225 MM ■ DIAMETER: 220 MM



Figures 43 and 44

Possible shaped charge removed from a synthetic rock-concealed IED.

Documented by a CAR field investigation team in Mokha, Yemen, October 2017.

IED switches

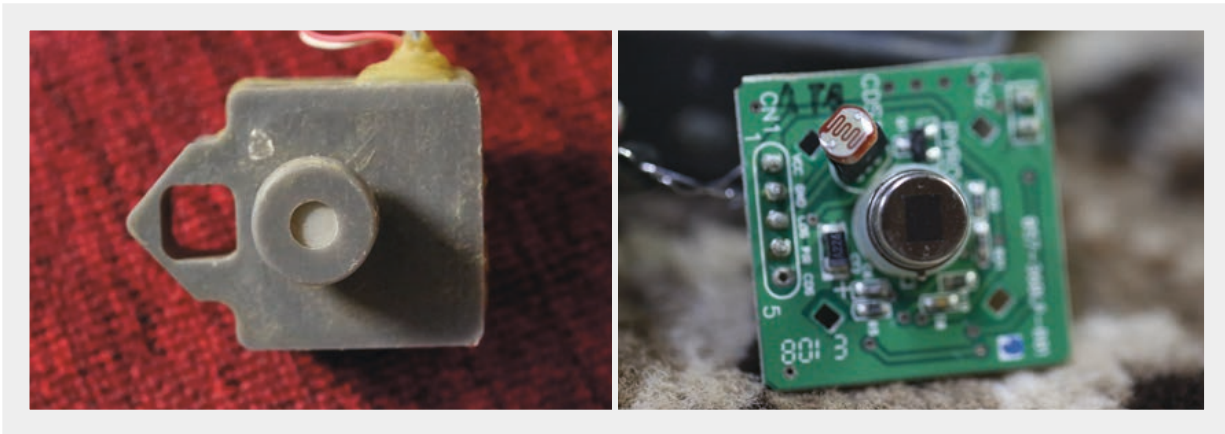
RCIEDs, other IEDs, and improvised main charges, which Coalition forces have recovered on the west coast of Yemen, are ‘victim-operated’ and initiated

by three common types of switch: 1) PIR sensor (Figures 45-49); 2) crush wire (Figures 73-75); and 3) pressure plate (Figures 78-81).

PASSIVE INFRARED SENSOR

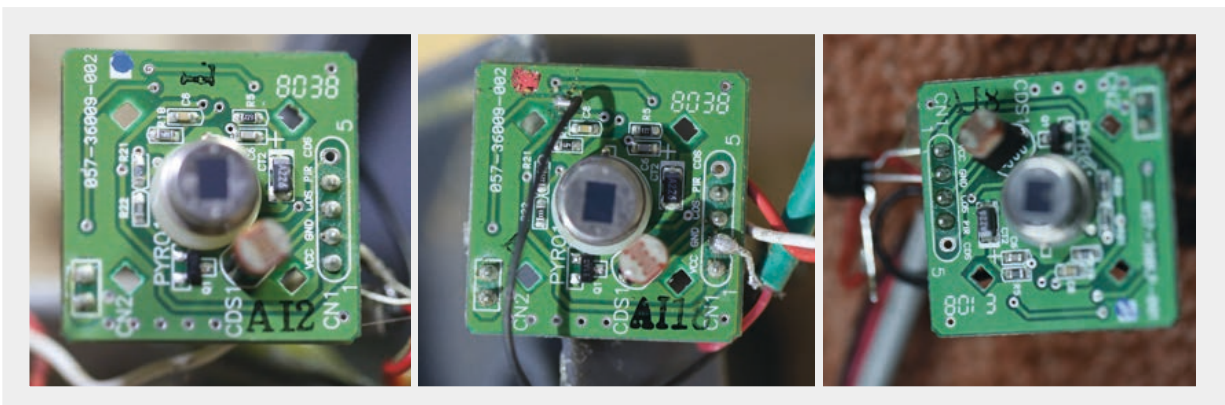
CAR has documented PIR sensors removed from—or still contained within—the body of synthetic rock-concealed RCIEDs. The PIR sensors were all probably manufactured in 2008, as indicated by the date stamp code on their printed circuit boards (PCBs).²⁴ Each PCB also bears black-coloured stamps with the code AI[XX].

CAR has documented PIR sensors, which Bahraini forces seized from militant groups in Bahrain, that are identical to those seized from Houthi forces in Yemen. This suggests that groups operating in the two countries share a common supply source (Figures 50-53).



Figures 45 and 46

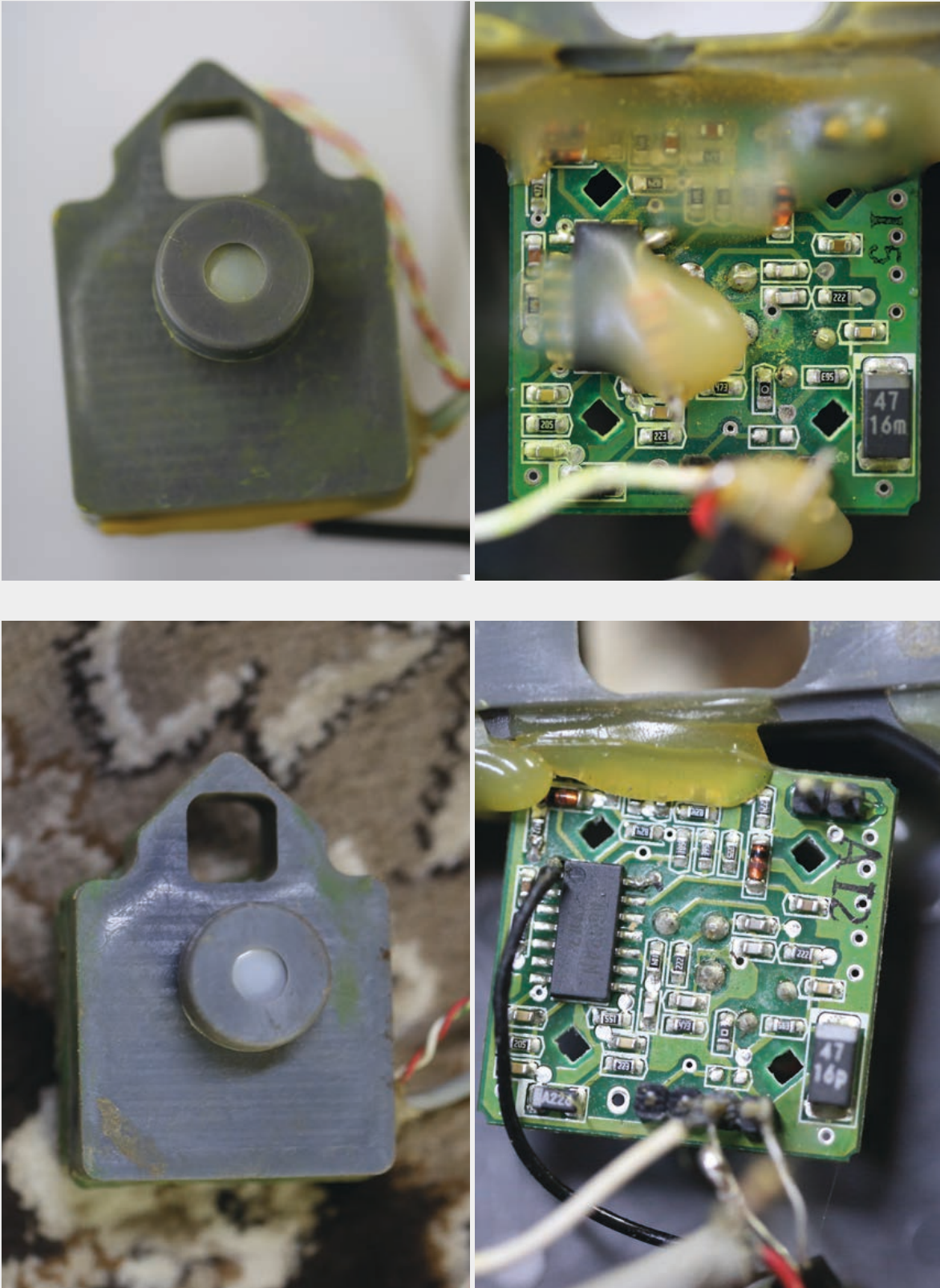
PIR sensor bearing the production date stamp code ‘8013’ (13th week of 2008) and stamped with ‘AI4’ in black ink. Documented by a CAR field investigation team in Mokha, Yemen, July 2018.



Figures 47 and 49

PIR sensors featuring similar production dates and stamped markings.

Documented by CAR field investigation teams in Mokha, Yemen, July 2018 (left), Abu Dhabi, United Arab Emirates (UAE), April 2018 (centre), and Mokha, October 2017 (right).



Figures 50-53

PIR sensor recovered by Bahraini security forces from a militant group in September 2015 (top), which is identical to PIR sensors recovered from Houthi forces in Yemen (bottom).

Documented by a CAR field investigation team in Manama, Bahrain, July 2017 (top) and Mokha, Yemen, July 2018 (bottom).

Electronic receivers and transmitters

The PIR sensor is connected to an electronics kit—embedded within the body of a synthetic rock-concealed RCIED (Figures 54-55)—and armed remotely with a transmitter (Figures 60-65). The transmitter operates on the same frequency as

a corresponding receiver within the electronics kit (Figures 56-59). As with the PIR sensors, the PCBs from the receivers and transmitters feature production date stamps that indicate they were also probably manufactured in 2008.



Figures 54 and 55

PIR sensor (left) and electronics kit (right) embedded within a synthetic rock-concealed RCIED.

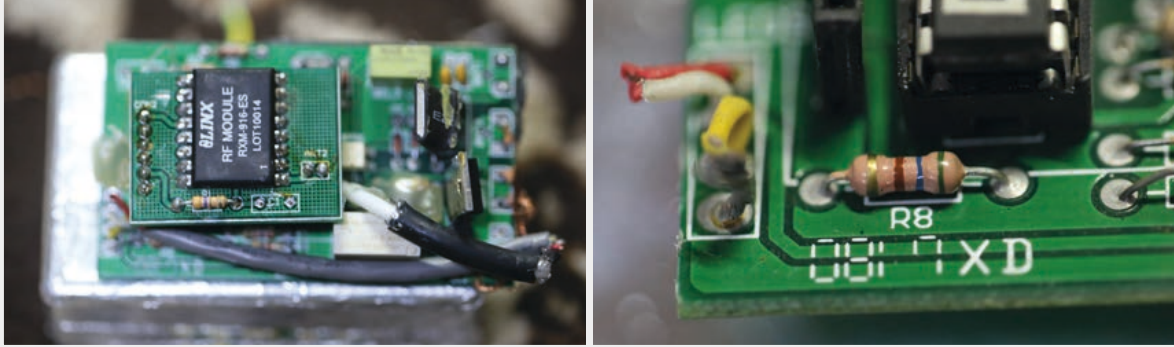
Documented by a CAR field investigation team in Mokha, Yemen, January 2018.



Figures 56 and 57

Bundle of electronic kits (left) recovered from an arms cache, labelled 'g380' in silver ink pen (right).

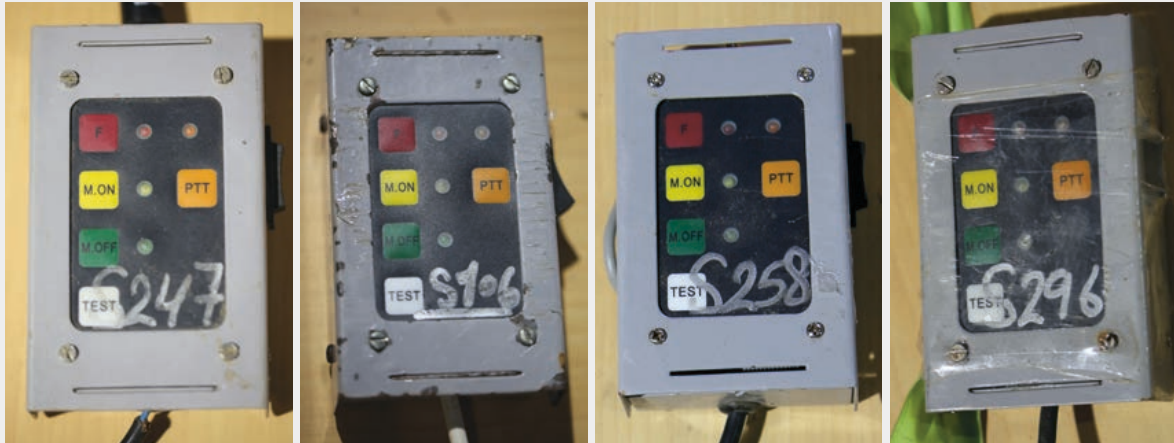
Documented by a CAR field investigation team in Mokha, Yemen, July 2018.



Figures 58 and 59

Receiver board of an electronics kit from the 'g380' batch containing a LINX radio frequency (RF) module (left) and bearing the production date stamp code '0817' (17th week of 2008) (right).

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

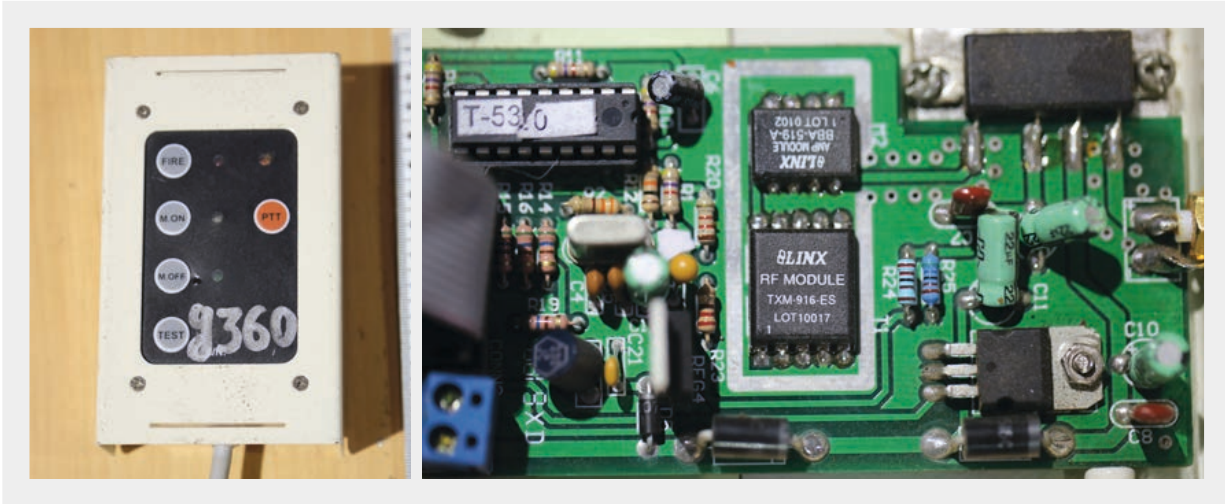


Figures 60-63

Transmitters used to arm RCIEDs.

Captured by Coalition forces near Khokha, Yemen, March 2018 and documented by a CAR field investigation team in Abu Dhabi, UAE, April 2018.





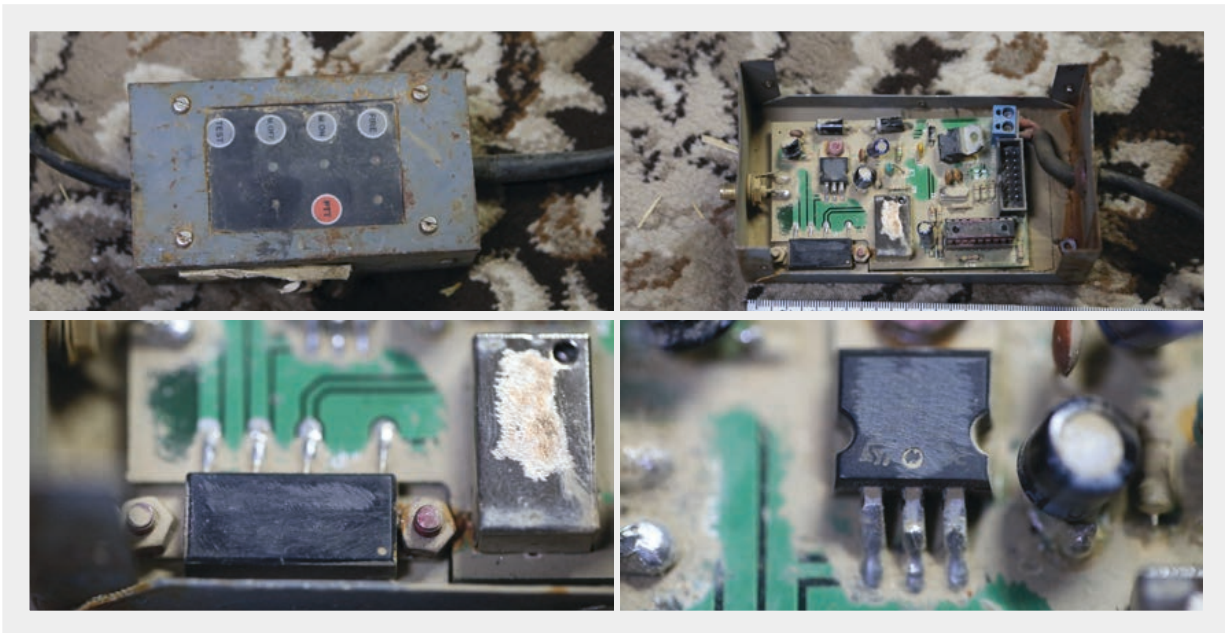
Figures 64 and 65

Transmitter labelled 'g360' in silver ink pen (left), containing a LINX RF module, and featuring the manufacturing date '0819' (19th week of 2008) on the PCB (right).

Captured by Coalition forces near Khokha, Yemen, March 2018 and documented by a CAR field investigation team in Abu Dhabi, UAE, April 2018.

Transmitters captured from Houthi forces by Coalition forces in mid-2018 contain components with obliterated markings (Figures 66-69). The removal of markings—a new development—suggests an attempt to obstruct any efforts to trace the provenance of the items.

CAR has documented transmitters and receivers, which Bahraini forces seized from militant groups in Bahrain, that are identical in construction to transmitters, which Coalition forces have seized from Houthi forces in Yemen. This provides further indication that both groups obtained supplies from a common source (Figures 70-72).



Figures 66-69

Transmitter containing internal components with obliterated markings (top and bottom).

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



Figures 70-72

Transmitter seized from Houthi forces in Yemen (left) and transmitter and receiver seized from militants in Bahrain (centre and right).

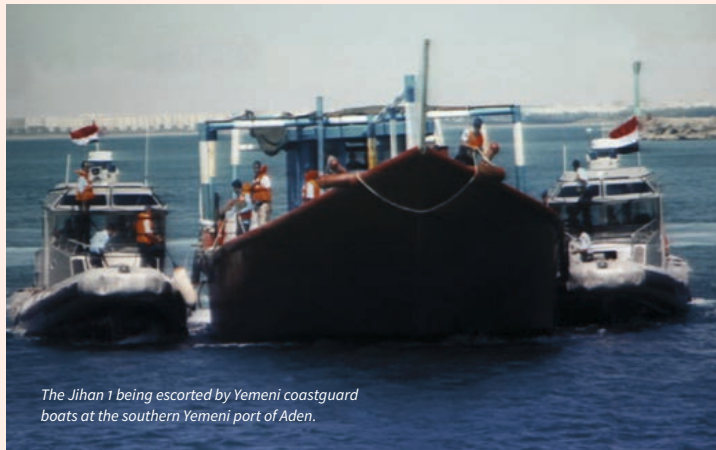
Documented by CAR field investigation teams in Abu Dhabi, UAE, April 2018 (left), and Manama, Bahrain, July 2017 (centre) and April 2018 (right).

THE *JIHAN 1* CASE

In January 2013, Yemeni security forces interdicted a cargo vessel, the *Jihan 1*, which was transporting military materiel off the coast of Yemen.²⁵ The *Jihan 1* carried a large consignment of materiel of different types and origins, including Iranian manufactured ammunition and C-4 explosives, MANPADS, PIR sensors, and nearly 2,000 electronic components used in the manufacture of RCIEDs. Initial reports claimed that the materiel was destined for al-Shabaab forces in Somalia.²⁶ However, Yemeni government officials asserted that the contents of the *Jihan 1* were intended for Houthi forces in Yemen.²⁷ The United Nations Panel of Experts on Iran, which investigated the incident, concluded that Iran was ‘at the centre of the *Jihan* operation’.²⁸

CAR compared confidential, unpublished photographs taken of the PIR sensors and RCIED components on the *Jihan 1* with

the PIR sensors, transmitters, and electronic kits documented by CAR in Yemen and Bahrain and determined that the components were identical. These findings strongly support assertions that similar shipments from Iran successfully made their way to Houthi forces and that the contents of the *Jihan 1* were, as claimed, intended for Houthi forces.²⁹ CAR continues to seek public release of the photographs and will publish them when authorised to do so.



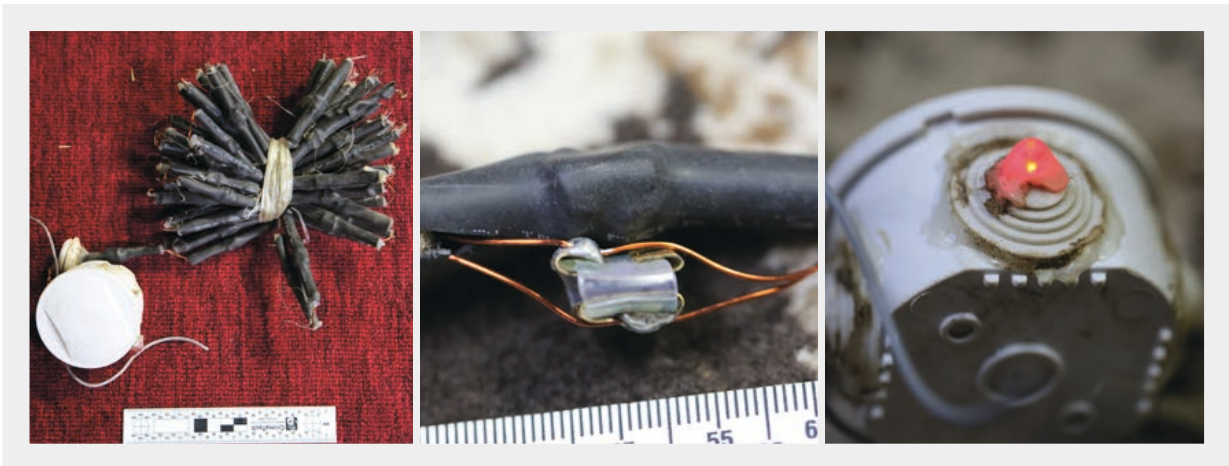
The Jihan 1 being escorted by Yemeni coastguard boats at the southern Yemeni port of Aden.

Crush wire

CAR documented several bundles of crush wires, which Coalition forces recovered from a Houthis weapon cache (Figures 73-75). The crush wires consist of 5.7 metres of copper wire, with multiple contact points, sealed in a heat-shrink wrap wiring covering, and connected to a junction box containing a single 9v PP3 battery and an indicator lamp used to test the integrity of the switch.

The crush wires are uniform in construction and feature WOLIDA-branded heat shrink wrap, an alternate trade name for WOER-manufactured heat shrink wrap, which is a consistent feature of such materiel commonly supplied by Iran (Figures 76-77).³⁰

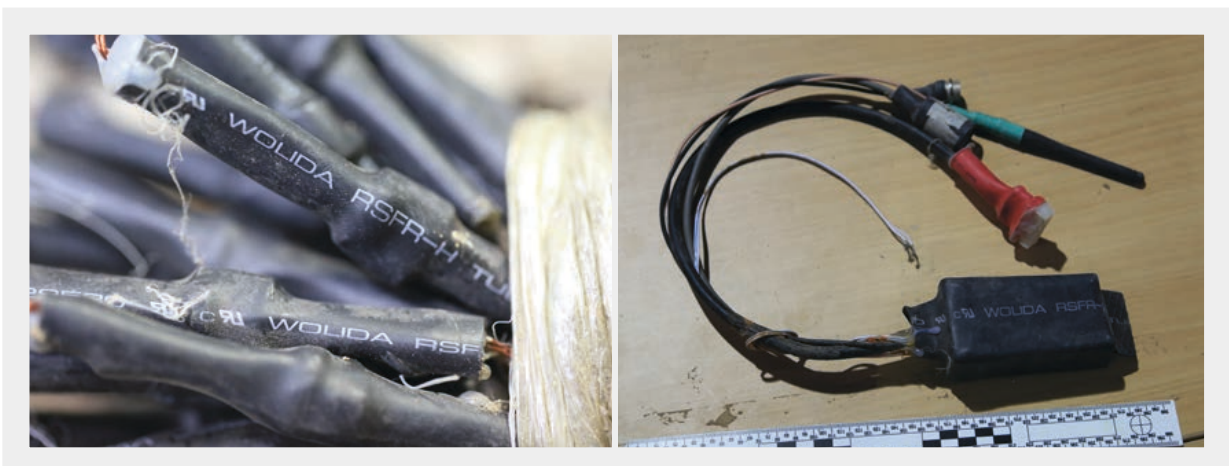
DIMENSIONS – LENGTH: 5.7 METERS



Figures 73-75

Crush wire (left) comprising several contact points (centre) connected to a junction box containing a single 9v PP3 battery and indicator lamp (right).

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



Figures 76 and 77

WOLIDA-branded heat-shrink wire covering on crush wire (left) and an electronics kit removed from an RCIED containing WOLIDA-branded heat-shrink wrap (right).

Documented by a CAR field investigation team in Mokha, Yemen, July 2018 (left) and Abu Dhabi, UAE, April 2018 (right).

Pressure plates

CAR has documented hundreds of pressure plates, which Coalition forces have recovered from Houthi forces. The pressure plates consist of two designs: 1) a lightweight person-operated pressure plate (Figures 78-79); and 2) a heavy vehicle-operated pressure plate (Figures 80-81). Each design contains two metal plates (the heavy pressure plate features an additional rounded sheet of aluminium folded over the primary plates), taped together and separated at the ends by pieces of wood. Each pressure plate contains a single 9v PP3 battery, all sealed within a piece of heavy polyethylene to protect the contents from the natural elements.

The pressure plates have printed instructions affixed to them externally (see labelling). The instructions contain information on the design type (person- or vehicle-operated), lot number, serial number, and basic instructions on the inspection and emplacement of the pressure plate. The standardisation and serialisation of these pressure plates indicates they were mass-produced, while the presence of basic instructions suggests that they have been distributed for use by low-skilled users.



Figures 78 and 79

Lightweight pressure plate designed to be initiated by an individual (left and right).

Documented by a CAR field investigation team in Mokha, Yemen, July 2017.



Figures 80 and 81

Heavy pressure plate designed to be initiated by a vehicle (left and right).

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

Labelling

CAR has documented hundreds of pressure plates with printed instructions affixed to them (Figures 82-86; see Annex B). The labels on these pressure plates reveal that, at some point after production, they were serialised with at least four distinct lots, indicating mass production and, potentially, an organised storage and distribution system.

Material with printed instructions affixed is not limited to pressure plates. CAR has also documented improvised grenades (Figures 87-88) and the gripstock of a MANPADS (Figures 89-91) with similar printed instructions (see Annexes C and D), a further indication that Houthi forces have distributed this materiel for use by low-skilled users.

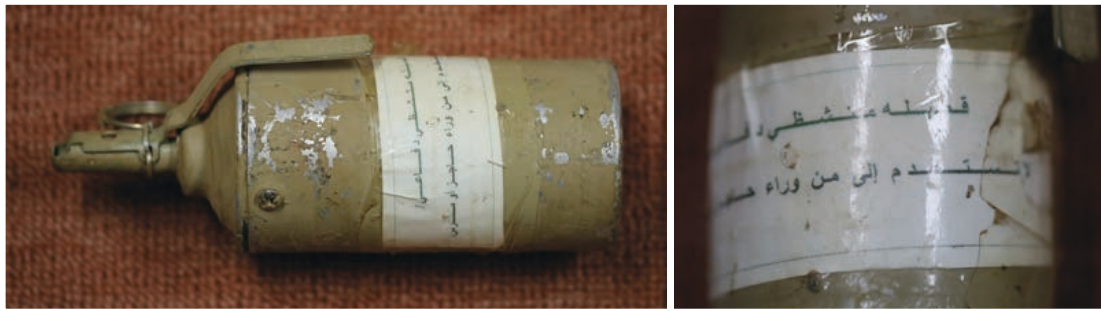


Figures 82-86

Pressure plates with printed instructions on basic use affixed.

Documented by CAR field investigation teams in Mokha, Yemen, May 2017 – July 2018.

Labelling (continued)



Figures 87 and 88

Improved grenade with printed instructions on basic use affixed.

Documented by a CAR field investigation team in Mokha, Yemen, October 2017.



قيضة حصار : طرق الرماية البدوية والأوتوماتيكية

- يدوية على هدف بطيء أو ثابت
- التصدية على الهدف
- فتح منبع التغذية
- ظهور العلام الضوئية والصوتية
- الضغط على الزناد مرحلة كاملة
- ثبات العلام الضوئية والصوتية
- إجراء التسييق اللازم
- استمرار التعتيق حتى الإطلاق
- مخصص للأهداف المديرة

٥٠	الارتفاع الأدنى بالمتر	١٣,٥	زمن جهورية النظام بالثانية
٢٣٠٠	الارتفاع الأقصى بالمتر	٧٠٠	المدى الأدنى لهدف ثابت بالمتر
٤٥٠	عسر المنبع الأرضي	١٥٠٠	المدى المثالي للمروحيات بالمتر
٧٠٠-١٥٠	وضعية الرمي ووقفا	٢٨٠٠	المدى الأقصى مقابل بالمتر
٤٥٠-٢٠	وضعية الرمي جليسا	٤٢٠٠	المدى الأقصى مدير بالمتر

تحذيرات

- يجب أن يكون الهدف بعيد عن الشمس بمقدار 30 درجة عند التصدية.
- يجب التصدية على هدف منخفض من الأعلى إلى الأسفل
- يجب نزع الغطاء الأمامي قبل فتح المنبع.
- يمنع الرمي على هدف برمي مضللات حرارية (بوالين).
- يمنع تحرير الزناد إذا لم ينطلق الصاروخ.
- توضع الإشارة الضوئية بشكل متناظم عند الرمي الأوتوماتيكي على هدف بطيء

قيضة التسييق بالمروحيات :

التسييق على هدف :	الجداد	الارتفاع
ثابت أو متناثر مرتفع	صفر	١٠
ثابت أو متناثر منخفض	صفر	٢٠
بطيء مرتفع عرضي	٥	١٠
بطيء منخفض عرضي	٥	٢٠
سريع مرتفع عرضي	١٠	١٠
سريع منخفض عرضي	١٠	٢٠
قيضة راس المتناثر الأسود	١٠	٢٠

تأثير المدى بواسطة العينات:

٢٠٠م

١٠٠م

٥٠م

Figures 89-91

MANPADS gripstock with printed instructions on use affixed.

Documented by a CAR field investigation team in Mokha, Yemen, May 2017.

CONCLUSION

The use of landmines and IEDs is a growing threat in Yemen and one that will persist long after the current phase of the conflict concludes. Improvised mines, the primary type of landmine contamination in Yemen, are mass-produced by Houthi forces on a scale only previously achieved by Islamic State forces in Iraq and Syria.³¹

IEDs and RCIEDs employed by Houthi forces continue to contain components that originate in Iran. The most recent seizures of IED electronics reveal attempts to conceal their provenance. Moreover, Houthi forces distribute military materiel to low-skilled users, as evidenced by their use of printed instructions, which are affixed to IED pressure plates, improvised grenades, and MANPADS.

CAR continues to conduct field research in Yemen and the broader region to monitor the transfer and evolution of landmines, IEDs, and related materiel entering the conflict and will report as new developments occur.

IMPROVISED MINES ARE MASS-PRODUCED BY HOUTHİ FORCES ON A SCALE ONLY PREVIOUSLY ACHIEVED BY ISLAMIC STATE FORCES IN IRAQ AND SYRIA.



ENDNOTES

- 1 See DeLozier (2018).
- 2 See CAR (2018, p.7-10).
- 3 CAR submitted formal trace requests for all conventionally-manufactured materiel with visible lot, batch, or serial numbers to the manufacturing governments or the manufacturing companies concerned and allowed a 28-day response period.
- 4 See The Monitor (2017) and Horton (2017).
- 5 See iTrace unique reference number (URN) 165E21F1F00921BA4.
- 6 See iTrace URN 165E21F1F0091EB55.
- 7 See iTrace URN 165E21F1F00921B97.
- 8 See iTrace URNs 165E21F1F00921B13 and 165E21F1F00921B1A.
- 9 See iTrace URNs 165E21F1F00921B21 and 165E21F1F0091E042.
- 10 See iTrace URNs 165E21F1F0091EB6B and 165E21F1F00921B2F.
- 11 On 30 August 2018, the Government of Belgium responded promptly to a formal trace request issued by CAR on 27 July 2018. This response confirmed that the Government of Belgium has no records of the PRB-M3 anti-tank mine, with lot number LAR 1-6, or PRB-M3 anti-tank mine pressure fuse, with lot number LAR 1-7, subject to CAR's trace request, due to Poudreries Reunies de Belgique S.A. going out of business in 1993 and the Government of Belgium having no access to the company's records. Furthermore, neither Belgian legislation nor international agreements oblige individual marking and record-keeping of this type of munition and therefore the relevant Belgian authorities are unable to trace the supply chain of these items.
- 12 See iTrace URN 165E21F1F00921B28.
- 13 See iTrace URN 165E21F1F00921BB1.
- 14 See Al Masirah (2018). Houthi forces appear to have released this internal video in April 2018 to 'prove' that Saleh Ali al-Samad, a senior Houthi leader featured in the footage, had not been killed in a Coalition airstrike—as reported by Coalition forces. In this respect, the fact that the video provides detailed imagery of the workshop and its contents could be seen as incidental, rather than as an attempt by Houthi forces to advertise domestic weapon production capacity to an international audience. Had the video been released solely to showcase weapon production, it would arguably have provided a less credible source of information.
- 15 Multiple conversations between CAR and a freelance journalist, who has worked on Yemen for the past four years, June to September 2018, and CAR discussions with military intelligence officials from the Arab Coalition in Mokha, Yemen, July 2018.

- 16 Assessment provided to CAR by an independent IED specialist, August 2018. The notable similarity between the Houthi-manufactured large directional mine and the Iranian M18A2 is the location of the detonator well on the back of the mine, which is very unusual. On most directional mines, the detonator well is located at the top or bottom of the device.
- 17 CAR discussions with UAE officials, May 2018; see also *Lost Weapons* (2018).
- 18 See UNSC (2018b, p.32).
- 19 See *Lost Weapons* (2017).
- 20 See UNSC (2018a, p.166).
- 21 CAR discussions with Coalition engineers, May 2017-July 2018.
- 22 See Yemen Army Media Centre (2018); *Special Guard Force* (2018); and *Hakar* (2018).
- 23 CAR discussions with Coalition engineers, May 2017-July 2018.
- 24 CAR consultation with three electrical engineers, specialised in electronic counter-measures, PCB manufacture, and avionics, respectively, April-September 2018. The consensus amongst the engineers was that although the codes on the PCBs could represent production batch numbers, they most likely represented the year and week of manufacture.
- 25 See Nichols and Charbonneau (2013).
- 26 *Ibid.*
- 27 *Ibid.*
- 28 See UNSC (2013, p. 14).
- 29 See Worth and Schmitt (2012).
- 30 Email with WOER on 6 August 2018 confirming that WOLIDA is an alternate name for WOER-manufactured shrink wrap, and CAR (2018, p.10-11).
- 31 See CAR (2016).

ANNEX A

INVOICE RECOVERED FROM TRANSIT CONTAINERS FOR NAVAL MINES

Экспорт		1003002 5				
Экспортер		УПАКОВОЧНЫЙ ЛИСТ				
Главинжуправление						
Грузополучатель	Контракт №	от				
207						
	Заказ-наряд №	80/6125050-	от			
	51564		1.10.86			
	Лист	1	Листов			
			1			
Марки и номера	Наименование товара (код)	Ед. изм.	Количество товара	Масса, кг брутто/нетто	Вид груз. мест	Номера мест
	72 6421 0003					
995.00.000	Изделе	шт.	1	1270/960	Контейнер	64/252
002.09.000-1.01	Контейнер	шт.	1			
002.09-1 ЗИ	Запасные части	к-т	1			
995.01.000 ЗИ	Запасные части	к-т	1			
995.02.000 ЗИ	Запасные части	к-т	1			
995.12.000 ЗИ	Запасные части	к-т	1			
001.25.000-III ЗИ	Запасные части	к-т	1			
354.24.000Т ЗИ	Запасные части	к-т	1			
	Силикагель-индикатор ГОСТ 8984-75	кг.	0.02			
	Съемные детали	к-т	1			
853.53.000ЗИ	Запасные части	к-т	1			
343.12.000ЗИ	Запасные части	к-т	1			
Маркировка 207-612505011						
М-6125050-51564						
Case No	64/252					
Gross weight	70 kg					
Net weight	960 kg					
Подпись	[Signature]					
Дата	8.12.86					

ANNEX B

TRANSLATION OF PRINTED INSTRUCTIONS AFFIXED TO PRESSURE PLATES

Type	Personnel	<p>After transportation, examine it.</p> <p>Connect it to a detonator away from the charge, then plant it but do not place the detonator inside the charge until the last step.</p> <p>If the cover is perforated, the item will be damaged when submerged.</p> <p>The trigger [pressure plate] is sensitive so make sure it is not pressed (e.g. a falling rock).</p> <p>Note: the trigger responds to 10kg worth of pressure</p>
Number	2	
Batch	30	
Please follows these guidelines		

Type	Personnel	<p>After transportation, examine it.</p> <p>Connect it to a detonator away from the charge, then plant it but do not place the detonator inside the charge until the last step.</p> <p>If the cover is perforated, the item will be damaged when submerged.</p> <p>The trigger [pressure plate] is sensitive so make sure it is not pressed (e.g. a falling rock).</p> <p>Note: The trigger responds to 10kg worth of pressure.</p>
Number	2	
Batch	28	
Please follows these guidelines		

Type	Vehicle	<ul style="list-style-type: none"> - After transportation, examine it. - Connect it to a detonator away from the charge, then plant it but do not place the detonator inside the charge until the last step. - If the cover is perforated, the item will be damaged when submerged. - The trigger [pressure plate] is sensitive, so make sure it is not pressed (e.g. a falling rock).
Number	2	
Batch	2	

15k

Type	Vehicle	<p>Check after shipment.</p> <p>Connect the detonator to the pedal [pressure plate] before putting the detonator in the package.</p> <p>Check the integrity of the pedal's cover, as any holes therein would damage the pedal when exposed to water.</p>
Number	2	
Batch	37	

ANNEX C

TRANSLATION OF PRINTED INSTRUCTIONS AFFIXED TO AN IMPROVISED GRENADE

‘Defensive fragmentation grenade, only use while under the cover of a barrier or barricade’

ANNEX D

TRANSLATION OF PRINTED INSTRUCTIONS AFFIXED TO A MANPADS GRIPSTOCK

■ Manually on slow or fixed target	■ Automatically on fast target		
■ Aim at target	■ Aim at target		
■ Open feed source	■ Open feed source		
■ Light and sound signals appear	■ Light and sound signals appear		
■ Pull the trigger – first stage	■ Fully pull the trigger		
■ Light and sound signals stabilise	■ Light and sound signals stabilise		
■ Make necessary distance compensation	■ Make necessary distance compensation		
■ Pull the trigger – second stage	■ Continue to track until launch		
■ Continue to track until launch	■ For retreating targets		
System-readiness time in seconds	13.5	Minimum height (metre)	50
Minimum range for fixed target (metre)	700	Maximum height (metre)	2300
Ideal range for helicopters (metre)	1500	Ground source span (seconds)	40
Maximum range for approaching target (metre)	2800	Standing shooting positions	15-70
Maximum range for retreating target (metre)	4200	Sitting shooting positions	20-45

Distance compensation value by degrees			Warnings: <ul style="list-style-type: none"> ■ When aiming, the target must be 30 degrees away from the sun. ■ Aiming at a low target must be with a top-down shot. ■ The front cap should be removed before opening the source. ■ It is forbidden to shoot at a target that deploys thermal balloons. ■ The trigger cannot be released if the rocket is not launched. ■ The light signal flashes regularly during the automatic shooting at a slow target.
Compensation on target:	Direction	Height	
Fixed or direct / high	0	10	
Fixed or direct / low	0	20	
Slow, high / horizontal	5	10	
Slow, low / horizontal	5	20	
Fast, high / horizontal	10	10	
Fast, low / horizontal	10	20	
Value on the sighting rod	10	20	
Range estimation through eyelets			

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